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Enhancing Interdisciplinary Practice of Science Education in the Realization of NGSS (Next Generation Science Standard)

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PREFACE

Praise to Allah SWT for all the blessings and guidance given to us all, so that the program of the International Seminar on Science Education (ISSE) 2017 with the topic about Enhancing Interdisciplinary Practice of Science Education in The Realization of NGSS (Next Generation Science Standards) which held on October 28th 2017 at Rectorate Hall, Yogyakarta State University can be completed successfully.

This proceeding is presented in four sections: 1) Science; 2) Physics; 3) Biology Chemistry; and 4) General Education. This comprises number of papers that have been presented in the seminar, written by lecturers and students from Yogyakarta State University and other universities.

We owe many parties for the success of the seminar. Therefore, we would like to sincerely extend our gratitude to:

1. The rector of Yogyakarta State University, Prof. Dr. Sutrisna Wibawa, M.Pd for facilitating all the activities of the International Seminar on Science Education (ISSE) 2017;
2. The director of Graduate School of Yogyakarta State University, Dr. Moch. Bruri Triyono for providing all the facilities of the International Seminar on Science Education (ISSE) 2017;
3. The invited speakers for their willingness to share thoughts and insights on science teaching and learning in the seminar;
4. All committee members for the time, effort, and thoughts for the success of this activity; and
5. All presenters and participants who have come a long way to contribute to the success of the seminar.

However, we truth fully understand that some imperfections might be find in this proceeding and in the seminar. Thus, suggestions and constructive criticisms are very much welcome. Finally, we hope that this proceeding may contribute in science and science education

Yogyakarta, Oktober 28th 2017

Chair Person

Prof. Dr. I Gusti Putu Suryadarma, M.S

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Learning Based Education for Sustainable Development to Enhance Scientific Literacy

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Abstrac. This article analyzes whether the learning based Education for Sustainable Development was supported to enhance scientific literacy of junior high school student. Researchers reviewed several sources from both the journal and the books that supported the article. The concept of sustainability is an excellent component of education because environmental preservation depends on ecological awareness, which depends on the educational process. Therefore, the concept of Education for Sustainable Development is very appropriately applied in science learning. Competencies of Education for Environmental Sustainable Development are Systems thinking, Foresighted thinking and strategizing, Collaborating, and Action orientation. The four competencies can support the improvement of the scientific literacy of junior high school students.
Keywords: *Education for Sustainable Development*, *Science*, *Scientific Literacy*

1. Introduction

Suprastowo, et al. (2009) states that Education for Sustainable Development (ESD) is a vast and lifelong effort that challenges every individual, institution, and community to view tomorrow as a day for all of us, or it will not belong to anyone. ESD is a dynamic concept that includes a new vision of education that seeks empowerment of people of all ages to take responsibility for creating a sustainable future.UNESCO (2012) states that sustainability perspective represents economic, social, cultural and environmental problems in pursuit of economic development, human welfare, and ecosystem integrity. Suprastowo, et al. (2009) also states that ESD has three perspectives, namely socio-cultural, environmental, and economic. Suprastowo, et al. (2009)

The Socio-Cultural Perspective is an understanding of social institutions and the role of people in change and development. Similarly, democratic systems and participation provide opportunities for expressing opinions, choosing governance, developing agreements and recognizing differences. TheEnvironmental Perspective is an awareness of natural resources, sensitive physical environment, the impact of human activities, and decision-making relating to commitments to create social and economic development policies. The Economic Perspective is a sensitivity to the limitations and potential of economic growth as well as its impact on society and the environment, is associated with a commitment to evaluate the level of consumption of individuals and communities as a matter of concern for the environment as well as social justice. These three perspectives are interrelated and are the driving forces for sustainable development.This means that in carrying out sustainable development can not consider only one aspect, such as economic aspects, but also consider other aspects such as socio-cultural and environmental aspects.

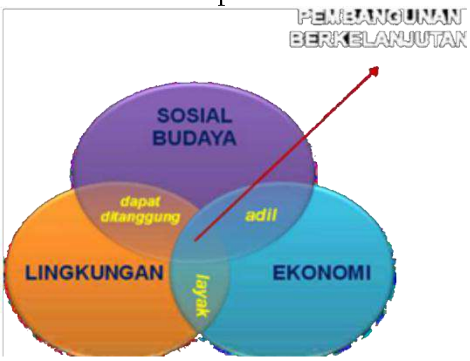

Figure 1. Three Perspectives in ESD

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Erin Redman (2013: 4) states that sustainability competitiveness encourages transformative action and empowers students to be agents of change in this transition to solve sustainability issues, in which the four competencies must be achieved sequentially. These competencies are (1) system thinking and understanding of interconnectedness, (2) longterm, foresighted reasoning, and strategizing, (3) stakeholder engagement and group collaboration, (4) action orientation and change-agent skills. Frisk & Larson (2011) revealed that the competence in education for sustainable development is (1) systems thinking and an understanding of interconnectedness, (2) long-term, foresighted thinking, (3) stakeholder engagement and group collaboration, (4) action-orientation and change-agent skills.

Robert Laurie (2016) conducted a study on the contribution of education for sustainable development to the quality of education. The existing analysis on the theme was repeated in 18 studies, suggesting ESD contributed in many ways to quality education in primary and summer schools. Teaching and learning transform in sustainability content, and ESD pedagogies promote the learning of skills, perspectives, and values necessary to foster sustainable societies.

Scientific Literacy is the ability to engage with science-related issues, and with the ideas of science, as a reflective citizen. Scientific literacy is the ability to use scientific knowledge, to anticipate questions and to draw conclusions from evidence to understand and make decisions about nature and the changes made to it through human activity (OECD, 2015).

Scientific literacy also requires not only knowledge of science concepts and theories but also knowledge of common procedures and practices related to scientific inquiry and how it enables science to move forward..

The aspects of scientific literacy based on PISA 2015 are 1) Contexts ; In the PISA 2015 scientific literacy, the focus of the context aspects will be in situations relating to the self, family and peer groups (personal), local, national and global issues, both current and historical, which demand some understanding of science and technology. 2) Knowledge; An understanding of the major facts, concepts and explanatory theories that form the basis of scientific knowledge. Such knowledge includes both knowledge of the natural world and technological artifacts (content knowledge), knowledge of how such ideas are produced (procedural knowledge) and an understanding of the underlying rationale for these procedures and the justification for their use (epistemic knowledge). 3) Competencies; The ability to explain phenomena scientifically, evaluate and design scientific inquiry, and interpret data and evidence scientifically. 4) Attitudes; A set of attitudes towards science indicated by an interest in science and technology; valuing of scientific approaches to inquiry, where appropriate, and a perception and awareness of environmental issues.

According to PISA (2015), scientific literacy is the ability to engage with science-related issues, and with science ideas, as caring citizens. Holbrook, J. & Rannikmae, M. (2009) states that scientific literacy is essential to develop the ability to be creative in utilizing science in everyday life or in careers, to solve problems, make decisions to improve the quality of life. PISA (2015) states there are four scientific literacy dimensions, namely Contexts, Knowledge, Competencies, and Attitudes.

Rizkita, et al. (2016) analyzed the early scientific literacy skills in SMA Malang. Science literacy is one of the most important issues and must be addressed in Indonesia. Based on the results of the analysis is known that the ability of science literacy students in general is still relatively low.

2. Problem

This article analyzes whether EESD was supported to enhance scientific literacy of junior high school student.The method used in this article is library research.

3. Conclusion

ESD can enhance the scientific literacy because ESD hass four competencies in three competencies that support literacy science.

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Part of Science Teacher Training Program: Science Teacher's Opinion about Lesson Plan

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Abstract. A good science teacher should prepare science learning systematically. A lesson plan will help science teacher arrange learning activity in class. This study is purposed to gather science teacher's opinion about lesson plan. The subject of this study is 16 science teacher as participant of a science teacher training program. To gather science teacher's opinion, there are four questions. The core of questions is the form of a lesson plan, right method of the workshop in science teacher training program, difficulties and obstacles in making lesson plan. Gathering the information is part of Science Teacher Training Program. There are three findings in this study. The first finding is a form of lesson plan determines the ease of reading. The second finding is obstacles and difficulties in making lesson plan can be overcame by discussion with colleagues. The third finding is the method of workshop determines the successful of making good lesson plan. From the comprehensive result and discussion, we can conclude that there must be workshop for lesson plan arrangement frequently to overcome difficulties, obstacles and renew knowledge. Another conclusion is the form of lesson plan determine a systematically science learning in real class.
Keywords: lesson plan, science teacher, training program

1. Introduction

Science learning in Junior High School must be prepared well and systematically by science teacher as one of their pedagogic competency improvement. Government as a policy makers must create broad maps that communicate guidelines addressing issues of science teacher quality [1]. Science teacher profession must be improved in quantity and also quality aspects, then we can see the impact of science teacher quality in science learning in real class. Government and private sector must recruit best available science teacher to improve science learning. Teacher and students play important role in science learning improvement, besides of school and policy factor. To improve teacher quality, teacher professional development is important in developing high quality science teacher [2]. Every teacher should improve themselves in professional and pedagogic aspect. Teacher training is one form of continuous professional development. So, government and education providers in private sector must organize science teacher training regularly as describe in recently research [3] to improve science teacher's competency.

A research suggests that quality of teachers determine students' success [4]. To gain teacher quality, firstly we must focus on previous student's achievement. With this way, there will be a process called continuous development, which previous conditions/ states will give effect to afterward condition like a cycle. Science teacher's competency especially pedagogic competency can be improved by various research focus on teacher's need in their profession as a science teacher [3] and also student's achievement [5]. Teacher experience also effects the quality of learning, beginner teacher may need an adjustment period where they learn the craft of good teaching practice [4] and also teaching preparation. This is the reason why teacher profession must be developed continuously.

2. Methodology

This Study is conducted in one part of the science teacher training program (lesson plan's workshop). Study procedure is described in Figure 1. Subject of this study is 16 science teacher above

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a Catholic education foundation in Bandung as a participants in science teacher training program. The aim of this study is gathering participant's opinion about lesson plan.

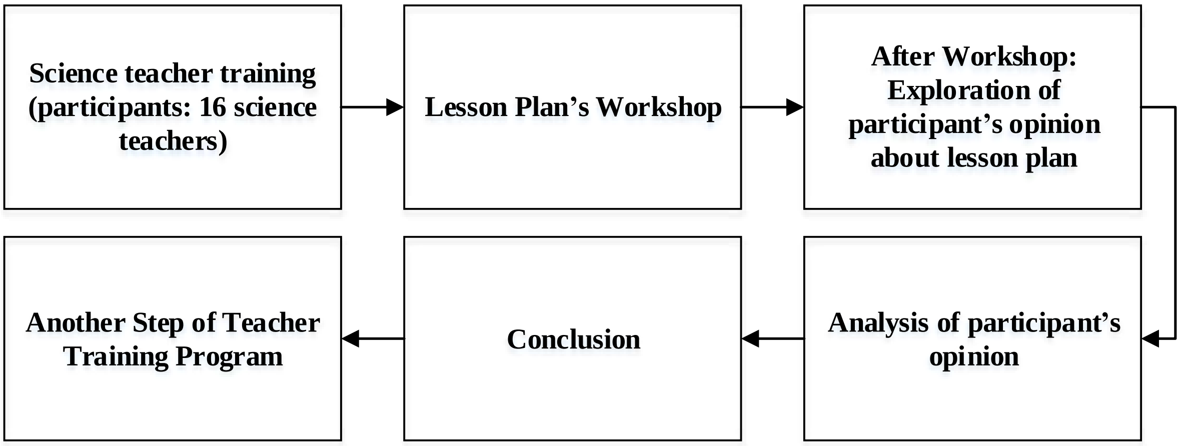

Figure 1. Study Procedure

Participant's opinion is gathered in the beginning of Lesson Plan's arrangement Workshop. There are four questions. There are four questions elaborate in order to explore participant's opinion about lesson plan:

(1) How is your opinion about lesson plan format especially landscape format?
(2) How is your opinion of sharing/ discussion method in Lesson plan arrangement workshop?
(3) What is the obstacles in arranging lesson plan?
(4) What is the difficulties in arranging lesson plan?

All the answer are analyzed to get a conclusion about lesson plan and method of workshop.

3.Result and Discussion

Participant's opinion about lesson plan is very essential for organizing training. By teacher training, teacher can resolve difficulties and obstacles in lesson plan arrangement. Science teacher itself through teacher education, build their efficacy and mastery experiences [6]. The challenging and difficult task will be performed by teachers who have high efficacy in instructional strategies, classroom management. With this study, we will know participant's opinion in lesson plan format, a method in workshop, difficulties and obstacles in lesson plan arrangement.

3.1 Landsape format

The landscape format is a matter of lesson plan layout. Most education practitioner use portrait, with this format, there will be some sentences cut into pieces. Teacher must be creative in learning [7] to make effective learning. The sffective lesson plan will ease teacher in reading lesson plan itself. Based on Table 1, there is 11 opinion. Four participant argue that they are unfamiliar with this landscape format. Formatting of lesson plan is a matter of paper saving, this opinion is argued by three participants.

Nine other opinion about lesson plant format argued by nine participants. First, elements of lesson plan can be written clearly, help teacher read it too. Second, landscape format represent column. Third, with landscape format, variables (activity, activity's description, time allocation) can be seen directly. Fourth, in core activity (center of learning activity), description and time allocation can be seen easily. One participant argued that there are no differences between landscape and portrait format. The four other opinion are (1) linkage between aim, matter and activity can be seen easily; (2) this landscape format is focused on important part of lesson plan; (3) time allocation is described clearly; (4) there is no obstacle in making lesson plan. Formatting lesson plan has a good aim, especially in reading and writing convenience. As a good science teacher, they have their selection which format should be used to make effective science learning in class.

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Table 1. Participant's opinion in lesson plan format

No	Opinion in landscape format	Frequency
1	Elements of lesson plant can be written clearly	1
2	Represent column completely	1
3	Variables (activity, activity's description, time allocation) can be seen directly	1
4	In core activity, description and time allocation can be seen easily	1
5	Unfamiliar with this landscape format	4
6	There is no differences between portrait and landscape format	1
7	Paper saving	3
8	Linkages between aim, matter, activity	1
9	Focus on important part	1
10	Time allocation is described clearly	1
11	Found no obstacles	1

3.2 Sharing/ discussion method in lesson plan arrangement workshop

The selection of workshop method will determine the success of workshop itself. Research shows that sharing and discussion method are selected based on science teacher's need [3]. Every participant gives their opinion about sharing/ discussion method that used in lesson plan arrangement workshop as described in Table 2. Sharing/ discussion used social behavior in group discussion. Training that used social context and increased the discussion would produce an effective training [8].

Table 2. Participant's opinion in workshop's method

No	Opinion of sharing method in workshop	Frequency
1	Making Lesson Plan is better with discussion method	3
2	Participant become more focus in making lesson plan	1
3	Sharing ideas and experiences between participant	7
4	Overcoming some obstacles in teaching practice	1
5	Sharing information, knowledge in making lesson plan	3
6	Correction each other if there are any mistake	1

Based on Table 2, there are six opinion. Most participants (as much as seven participants) argued that with sharing method, there will be sharing ideas and experiences between participants. Three participants expressed their opinion that making lesson plan in workshop is better with discussion method. On the other hand, as much as three participants expressed that sharing information, knowledge in making lesson plan will occur by sharing method. The other three opinion are with sharing/ discussion method, (1) participant become more focus in making lesson plan; (2) participant in group will overcoming some obstacles in teaching practice; (3) participants can make correction each other if there are any mistakes.

3.3 Obstacles and difficulties in making lesson plan

A good science teacher can overcome obstacles and difficulties in making lesson plan. Teacher itself are engaged and enthusiastic about teaching with enjoyment, excitement and pleasure feelings [9]. Overcoming difficulties and obstacles are form of expression in improving their competency as a teacher. Positive emotions are reflected in instruction's quality and then affect students learning outcomes. Participant's opinion in lesson plan's obstacles is described in Table 3. Based on opinion gathering, there are ten opinion. The most participant argued that the obstacles because of school is not yet using Current Curriculum (*Kurikulum* 2013). There are four opinion each expressed by two participant: (1) lesson plan is too detailed; (2) finding interesting method in delivering matter to student is not easy; (3) as a science teacher, they have to think how student center activity occurs in science class; (4) they have to determinate model/ method and learning media that fit with learning process.

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Table 3. Participant's opinion in lesson plan's obstacles

No	Obstacles	Frequency
1	Lesson plan is too detailed	2
2	More difficult in making lesson plan	1
3	School is not yet using Current Curriculum (*Kurikulum* 2013)	3
4	Finding interesting method in delivering matter to student	2
5	Teaching practice is not accordance with time allocation	1
6	Have to think how student center activity occurs in science class	2
7	Too much teaching hours	1
8	Getting match between approach/ model/ method with learning steps	1
9	Determinate model/ method and media that fit with learning process	2
10	Never participate in Curriculum workshop	1

Besides of five opinion above, there are five other opinion express by participant in lesson plan's arrangement workshop. First, they find more difficult in making lesson plan because of many items should be put in lesson plan. Second, teaching practice is not accordance with time allocation (time management). Third, they have too much teaching hours, sometimes it is difficult to find time for making lesson plan. Fourth, the obstacle is getting match between approach / model/ method with learning steps. Fifth, there are participant that never participate in Curriculum workshop. As a motivated teacher, they must have eager to overcome obstacles. Teacher itself act as a relevant role model for their students with respect to behaviors and strategies [11]. By knowing curriculum, teachers should be the main mediator between curriculum and its practice in class.

Table 4. Participant's opinion in lesson plan's difficulties

No	Difficulties	Frequency
1	Elaboration in preliminary, core, end activity	1
2	Complicated format, need more time, too much attachment	1
3	Determination of learning approach/ model	4
4	Time processing too long especially in making learning media	1
5	In core activity, adjustment with learning approach and method	3
6	Hard to determine which lesson model/ method appropriate with	1
7	Determination of learning steps	2
8	There is an obligation to put student's skill development in learning	1
9	Adjustment in lesson plan's components	1
10	There is less references/ books	1

Through gathering opinion, there are ten opinion in lesson plan's difficulties. Four participants argued that the difficulty is determinate learning approach/ model. In the other hand, three participants express an opinion that it is difficult in adjusting learning approach and method especially in core activity part. As much as two participants found that it is difficult to determine learning steps in lesson plan. Learning environment play important role in a good learning and can be a good challenge for teacher to recognize the condition of class [12]. To improve teacher's competency, a teacher must well prepare lesson by making lesson plan, knowing learning environment, and improve self-efficacy. Besides three opinion above, there are seven opinion expressed by participant. First, it is difficult to elaborate in preliminary, core and end activity. Second, the difficulty in lesson plan is teacher need more time in making lesson plan and too much attachment in lesson plan. Third, there is difficulty in making learning media. Fourth, it is hard to determine which lesson model/ method appropriate with lesson plan. Fifth, teacher must put student's skill development in learning, so that teacher must think a way to combine between cognitive and skill development. Sixth, there must be adjustment in lesson plan components. Seventh, there is less reference/ books available in school. Anyway, difficulties and obstacles should be overcome by teacher themselves, education organizer, government, stakeholder etc. Teacher must be adaptive to curriculum, preparing teachers for a curriculum reform is seen as a complex learning process [13]. Through this complex process, teachers can shape their professional growth to improve learning process also.

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4. Conclusion

From comprehensive discussion above, there are two conclusion. First, there must be a workshop for lesson plan arrangement frequently to overcome difficulties, obstacles and renew knowledge. Second, the form of lesson plan determine a systematically science learning in real class.

5. Acknowledgment

This study is a part of science teacher training program and dedicated for science education continuous improvement. Big appreciation for science teacher above one Catholic Education foundation as participants in Science teacher training program.

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Effectiveness of POE-based Student Worksheet to Improving Student's Argumentation Ability in Energy Materials

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Abstract. The purpose of this research is to describe the effectiveness of student worksheet based on Predict Observe Explain (POE) in improving students' argumentation ability on energy matter in life system. This study used a quantitative method with quasi experimental design in the form of nonequivalent pre-post control group design. The population of this study is the seventh-grade students of the Junior high school, Lampung, Indonesia, while the sample is class VII A (experiment) and class VII B (control) students selected by simple random sampling technique. The argumentation ability data were measured by argumentation ability test instrument then the data were analyzed by using t-test. The data of student's responses and learning implementation were obtained using questionnaire then the data were analyzed using an statistic data analysis by calculating average percentage achievement for every aspect observation. It was found that POE-based student worksheet was effective to improved student's argumentation ability. The result showed that the experimental class with n-*Gain* of (0.45 ± 0.17) belonging to the medium category were higher than the control class with n-*Gain* of (0.15 ± 0.16) belonging to the low category. Based on the results and discussion, it can be concluded that POE-based student worksheet was effective to improve students' argumentation abilities on energy materials in a medium category. Suggestions for further researchers should be used a worksheet with the same characteristics on other science materials not only on energy matter in life system.

Keywords: argumentation ability, predict observe explain, student worksheet

1. Introduction

The essence of Science as a "process" is how to acquire knowledge through the study of natural phenomena, interpret the research results, and can communicate them[3]. In general, science lessons in the classroom emphasizes the practical work rather than engage students in the thinking process through a series of scientific discourses such as discussion, argumentation, and negotiation[12]. In science learning, communication skills and providing reasons to seek support are a very important process[4]. Therefore science learning needs to pay attention to language skills and provide arguments to provide an understanding of the nature of science. TIMMS and PIRLS survey results showed that 40% of Indonesian students' reasoning ability was in the "low" category and as many as 60% of students' learning result was in the "low" category[9]. The student's argumentation ability was low because the student had not taught to argue well yet. Students face difficulties in developing arguments because teachers lack pedagogical abilities to develop argumentation in the classroom[20], teachers lack the knowledge of learning models that can improve student argumentation. These facts were reinforced by the observation result carried out on 20 junior high school teachers in the Lampung province-it showed that 68.33% of teachers had not innovated and developed the student's argumentation ability in school.

The form of student worksheet that can be used to improve the student's argumentation ability is Predict-Observe-Explain (POE)-based student worksheet. Through learning by using POE-based worksheet, students are trained to improve their argumentation ability because in it there is *explain* activity which is a process of student gives explanation about the conformity between the conjectures with observation results they have done from observation stage[19]

2. Methodology

This study used a quantitative method with quasi experimental design in the form of nonequivalent pre-post control group design[5]. The population of this study is the seventh-grade students of SMPN 1 Semaka, Lampung Province, Indonesia, in the odd semester, while the sample is class VII A (experiment) and class VII B (control) students selected by simple random sampling technique[16].

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The data of student's responses and learning implementation were obtained using questionnaire then the data were analyzed using nonstatistic data analysis by calculating average percentage achievement for every aspect observation. The argumentation ability data were measured by argumentation ability test instrument; the instrument consists of 15 essay questions. Assessment indicators were divided into six aspects: questions, tests, observations, conclusions, evidence and reflection[11].

The data analysis of the student worksheet effectiveness was done by using qualitative descriptive approach and quantitative statistical analysis. The study design used is a nonequivalent pre-post control group design (Table 1). Two groups were given pre-test then they were treated before they had post-test. The pre-test and post-test results then were compared[15].

Table 1. The Implementation Procedure of Experimental Design Research

Group	Pre test	Treatment	Post test
Experimental Class	O_1	X	O_2
Control Class	O_3	-	O_4

Note :
O_1 = the pre-test score of experimental class
O_3 = the pre-test score of control class
X = the treatment
O_2 = the post-test score of experimental class
O_4 = the post-test score of control class

The pre-test and post-test scores results then were analyzed with the gain-normalization test (n-Gain), using the following formula[6]:

$$\boxed{N - Gain = \frac{S_{post} - S_{pre}}{S_{maks} - S_{pre}}} \quad (1)$$

Note:
Spost = the post-test score,
Spre = the pre-test score,
Smaks = the maximum score

Table 2. The Classifications of average n-Gain

Average n-Gain	Classification	Effectiveness Level
$\langle g \rangle \geq 0.70$	High	Strongly Effective
$0.30 \leq \langle g \rangle < 0.70$	Medium	Effective
$\langle g \rangle < 0.30$	Low	Less Effective

Furthermore, the effectiveness was also described using independent sample t-test. The statistical analysis assisted with SPSS 17 program.

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3. Result

3.1 POE-Based Student Worksheet in Learning

The learning implementation in the class was recorded through the observation conducted by two observers at each learning progress. The recapitulation results of the learning implementation analysis in the classroom can be seen in table 3.

Table 3. The Recapitulation Results of the Learning Implementation

Observation Aspect Components	Percentage (%)		Achievement (%)	Criteria
	Observer 1	Observer 2		
Syntax	90.00	85.00	87.50	Performed very well
Social System	100.00	85.00	92.50	Performed very well
Reaction Principle	86.00	89.00	87.50	Performed very well
Mean	92.00	86.33	89.16	Performed very well

Based on the observation results, it shows that learning was successfully done in all aspects (89.16 %), the best percentage belonged to social system aspect.

3.2Student's Responses to POE-Based Student Worksheet Implementation in Learning

Students in the experimental class were given a response questionnaire after the learning process. The results of student's responses analysis of the learning using POE-based student worksheet on energy materials in living systems can be seen in Table 4.

Table 4. *The Students' Responses Analysis to The Learning Process*

Observation Aspect	Percentage (%)	Criteria
Student's enthusiasm in learning, the way how teacher holds lessons, and the way how teacher gives respond	96.00	Almost All
Easiness of the student worksheet	97.50	Almost All
Student's perception of the student worksheet	98.89	Almost All
Argumentation ability	94.44	Almost All
Mean	96.71	Almost All

The analysis result shows that almost all students give positive responses to all aspects of the learning process and the highest percentage belongs to student's understanding of the student worksheet (98.89%).

3.3 Effectiveness of POE-Based Student Worksheet

Effectiveness of POE-based student worksheet the effectiveness was described from the improvement of students' argumentation ability in learning. Tests of learning effectiveness were seen from the results of student tests when pre-test (before learning) and post-test (after learning) than in the analysis using t-test. The calculation results were described in the table as follows:

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Table 5. *N-Gain Scores of SWH Argumentation Ability*

Group	Mean			Criteria	Sig.(2- tailed) n-Gain t-test
	Pre-test $(\bar{x} \pm sd)$	Post-test $(x \pm sd)$	*n-Gain* $(\bar{x} \pm sd)$		
Control Class (n=30)	31.88 ± 4.051	38.27 ± 7.52	0.15 ± 0.16	Low	.000
Experimental Class (n=30)	32.68 ± 4.15	51.87 ± 7.40	0.45 ± 0.17	Medium	

Based on Table 5, the n-Gain experimental class has the mean score of 0.45 which means there is a significant difference in students' argumentation ability improvement what can be seen from the increase of pre-test and post-test scores, whereas for the n-Gain control class has the mean score of 0.15 which means there is also an increase in the ability of students' argumentation but the score is in low category. Therefore, the significant argumentation improvement occurs in the experimental class. Based on the calculation was also known that the value of Sig. (2-tailed) <0.05 so that H_0 was rejected, it means that there was a significant difference in n-Gain argumentation capability between learning of using POE-based student worksheets (experimental) and conventional (control). Then the increase of n-Gain on each student indicator can be seen in Figure 1.

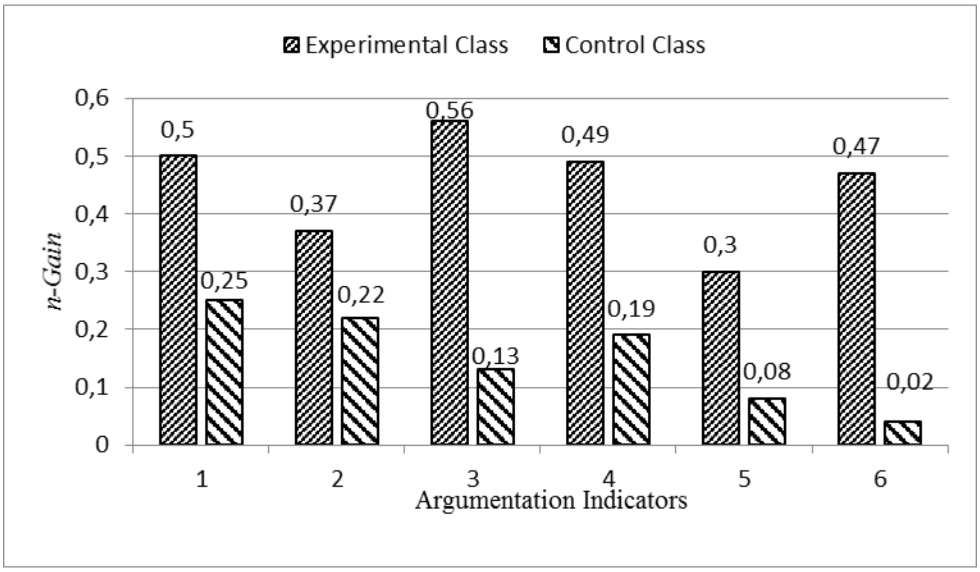

Figure 1. Gain Value of Argumentation Ability Indicators

Note:
1 = Beginning question
2 = Tests
3 = Observation
4 = Conclusion
5 = Evidence
6 = Reflection

Based on Figure 1, the use of POE-based student worksheet fostered students' argumentation abilities on all indicators but the highest achievement was in the *observation* indicator for the

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experimental class with n-Gain (0.56). Meanwhile, the lowest achievement was in *evidence* indicators for the experimental class with n-Gain (0.30). The results show that there was a growing process of argumentation ability in both test classes. But the growing process of the experimental class was higher than the control class.

4. Discussion

Based on the research results presented, POE-based student worksheet developed was able to improve the student's argumentation ability on energy materials in living systems in the effective category. The effectiveness of the student worksheet was supported by the results of n-Gain calculations obtained from the pre-test and post-test scores of the two classes (Table 5). It obtained the calculation results of 0.45 with the medium category. POE-based student worksheet could improve the student's argumentation ability regarding the beginning question, test, observation, conclusion, Evidence, and Reflection in the learning process (Figure 1) with the medium category.

The effectiveness of POE-based student worksheet was described based on the comparison between control class (VII B) and experiment class (VIIA) learning achievements. The result of independent t-test showed that Sig value. (2-tailed) Was 0,000 (Table 5), it means the learning achievement of two classes were significantly different. These results indicated that POE-based student worksheet was able to improve students' argumentation abilities. The overall result of student responses to learning using POE-based student worksheet was very good (Table 4), it can be seen from the average percentage obtained for each observed aspect of 96.71% with the almost all criteria. It identified that the learning using POE-based student worksheet was more helpful for students in learning activities, discussions and encourages students to learn because students feel happy in the learning process to solve problems and provide new learning experiences. The spirit of learning affects responses in the learning process[13].

The effectiveness of POE-based student worksheet could get the good result because students were trained to argue through an explanatory activity step which forced students to explain the suitability of the allegations with the observations they have made from the observation stage[19].

POE-based student worksheet was effective because the learning activities can be done successfully, it can be seen from the average percentage obtained for each observed aspect of 89.16% with the performed very well criteria. The high syntax implementation process, the social system, and principle of reactions provided information that teachers had capabilities to create conducive learning environment (Table 3). The learning process finally could improve students' argumentation abilities. This treatment gives an impact on students 'emotional maturity and self-development, as well as students' ability to make decisions.

Here is an example of the student's answers on the beginning question indicator.

1. Perhatikan gambar di bawah ini!

Berdasarkan hasil pengamatanmu terhadap gambar diatas, coba anda buat 4 pertanyaan tentang energi yang berhubungan dengan posisi buah masih di tangkai sampai jatuh ke tanah! (Kata kunci: energi)

4 c. Energi apa yang terdapat pada buah apel yang telah jatuh ke bawah ?
d. Mengapa buah apel selalu jatuh kebawah ? dan energi apa yang terdapat pada buah apel ?

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Comments:
The beginning question indicator written by the students got 4 points. It showed that the initial question the student made was related to a strong problem. The initial idea was significant. The result of data analysis showed that the begining question indicator was in a medium category with an n-Gain value of 0.50.

The test indicator in this study indicated that the indicator of the test was categorized as medium criteria with an n-Gain value of 0.37, because the students could follow the steps or procedures to be implemented during the learning process. POE-based student worksheet contains steps with rules in a simple procedure, judging from the structure and language. Overall the structure was clear so that the steps help students during the learning process of science in the classroom. This result was by the research of[2] which stated that science is a product and process, so student learning outcomes depend on the learning process in the classroom.

Here is an example of the student's answers on the test indicator.

2. Bagaimana pendapatmu jika seseorang yang akan melakuan aktifitas tidak memiliki energi karena belum makan? Terjadi perubahan energi apa pada makanan ketika digunakan untuk melakukan aktifitas?

1. Jika seseorang yang akan melakukan aktivitas tidak memiliki energi maka seseorang itu akan merasa lemas.
* Terjadi perubahan energi kimia menjadi energi gerak.

4

Comments:
The test indicator written by the students got 4 points. Based on the student's answer, it showed that the answers were almost specifically described.

The result of data analysis showed that the observation was in the highest indicator, with an n-Gain value of 0.56 in the medium category. The observation indicator could help the student to be easier in making an argument based on observation results. It was supported by the opinion of[18], by doing observation during the experiment, learning happens by doing science so that it can involve students directly by actualizing themselves into a real experience. Students will learn by experiencing everything themselves. Students felt happy in doing the observation so that the score in this indicator was also quite good.

Here is an example of the student's answers on the observation indicator.

8. Tiga buah bola massanya berbeda dan dijatuhkan dengan ketinggian berbeda-beda pula, diperoleh data sebagai berikut:

Tabel Pengamatan. Pengaruh massa dan ketinggian terhadap energi potensial

No bola	Massa Benda (kg)	Gravitasi bumi (m/s^2)	Ketinggian (m)	Energi potensial (.........)
1	2	10	3	....
2	4	10	5	....
3	5	10	7	....

Hitunglah Energi Potensial pada tabel pengamatan di atas!

= m . g . h
= (2 . 10) . 3 = 20 . 3
= 60

= m . g . h
= (4 . 10) . 5 = 40 . 5
= 200

3
= m . g . h
= (5 . 10) 7 = 50 . 7
= 350

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Comments:
The observation indicator written by the students got 3 points. Based on the student's answer, it showed that the data was displayed slightly. Students were incomplete in answering (not yet known and no unit yet)

The results of subsequent data analysis on the conclusion indicator showed the medium criteria with an n-Gain value of 0.49.

Here is an example of the student's answers on the conclusion indicator.

3. Pada kegiatan misalnya mendorong mobil, mendorong motor dan mendorong sepeda, apa yang dapat anda simpulkan dari kegiatan di atas tentang energi?

3. Pada kegiatan mendorong mobil energi yang dikeluarkan cukup besar karena mobil sangat berat. Sedangkan mendorong motor energi yang dikeluarkan tidak terlalu besar karena motor massanya tidak terlalu berat. Dan pada kegiatan mendorong sepeda energi yang dikeluarkan sedikit karena sepeda massanya ringan.

3

Comments:
The conclusion indicator written by the students got 3 points. Based on student answers, it can be seen that the conclusion was quite good.

In the conclusion indicator, students determined their conclusions obtained from investigations in the collaborative practice activities and later discussed in class discussions. Concluding relates to the reasoning, it was by the opinion of [10] that reasoning is a process of thinking by connecting evidence, facts, clues or evidence, to a conclusion.

The evidence was in the lowest indicator with an n-Gain value of 0.30. The low category of evidence indicator occurred because of the lack of time efficiency and the way students used relevant literature through sources when seeking information, so that when students were asked to write a form of argument in writing, the students could not answer correctly and accurately in theory. It indicated that the students were able to state their opinion in writing but they could not show the evidence that made their arguments to be true according to the theory. The results of this study were in line with[[14] research, that students often do not use sufficient evidence to justify their choice or use of evidence in the resulting argument.

Here is an example of the student's answers on the evidence indicator.

9. Berikan 2 bukti-bukti penerapan energi kinetik dalam kehidupan sehari-hari, jelaskan!

9. - Contoh saat anak ** melontarkan kelereng ke bawah
- Di ketahui pada saat kita melihat seseorang melemparkan umpan panjingnya ke sungai.

2

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Comments:

The evidence indicator written by students got 2 points. Based on the student's answers, it showed that the evidence almost had no reflection. Claims were unclear although they still answered the question and the evidence was weak.

The other result of data analysis showed that the *reflection* indicator in this study with n-Gain value of 0.47 was in a medium category. The *reflection* indicator allowed students to express their ideas directly in their groups; then the students compared the similarities or differences with other groups through written argumentation. It means the teacher had developed a POE based learning model because students were able to express their ideas directly in their group so that students' argumentation abilities increased. This result was in line with the opinion of[19], according to him, teachers need to develop an IPA learning model that can involve students actively in learning activities to find or implement their ideas.

The democratic principle in the learning process had gone well. There was a good interaction among students. This result was supported by the opinion of [1] that one of the signs that learning takes place in a conducive and democratic learning environment is the existence of social interaction in learning.

Here is an example of the student's answers on the *reflection* indicator.

). Perhatikan gambar bendungan di bawah ini!

10 Diketahui. Jika bendungan tersebut di tinggikan
Sedikit ataupun banyak, maka saat di buka, air nya
akan semakin besar energi kinetiknya. Jadi dan
juga semakin deras jadi dapat menghasilkan energi
3 yg besar juga.

Comments:

The reflection indicator written by the students got 3 points. Based on the student's answer, it showed that the student mentioned the new idea.

4. Conclusion

Based on the results and discussion, it can be concluded that Predict-Observe-Explain (POE)-based student worksheet was effective to improve students' argumentation abilities on energy materials in living systems in a medium category. The use of POE-based student worksheet could grow students' argumentation abilities on all indicators, but the highest achievement was in the *observation* indicator for the experimental class with n-Gain value of 0.56. Meanwhile, the lowest achievement was in the *evidence* indicator for the experimental class with n-Gain value of 0.30. It showed that there was a process of growing argumentation abilities in both test classes, but the process in experimental class was better than the control class. The effectiveness of POE-based student worksheet was also supported by learning activities which can be done successfully, and students gave a positive response to the learning process.

5. Suggestions

Suggestions for further researchers should be used a worksheet with the same characteristics on other science materials not only on energy matter in life system.

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Enhancing Generic Science Skills Through Cooperative Learning Group Investigation Model

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Abstract. Since the generic science skills (GSS) has played a significant role in the human life, it is important seem to be studied by students. For many years, the GSS has been integrated it into the learning activity. This paper is presented to devise a method for enhancing students' GSS using Group Investigation (GI) cooperative learning models. We proposed for using the GI models Because this models is one type of cooperative learning-oriented contextual approach that involves students from the planning, Determining the topic as well as a way to learn through investigation, conducting an investigation based planning Formulated, then report the results Obtained as a discussion material. Considering secondary school students' cognitive level, we take three of nine indicators of GGS items, namely: (1) direct observation, (2) causality, and (3) concept formation.

Keyword*:* Generic Science, Investigation Group, Cooperative Learning Model

1. Background

Natural Sciences (IPA) is one of the subjects that potentially build students' higher-order thinking skills. Learning science is not just a collection of knowledge in the form of facts, concepts, and principles, but also a form of the inventive process in the learning process emphasizes the direct experience scientifically. Learning science useful means there daily content or context that is useful for learning maturation and life long learning [1]. So, IPA at a more micro context it is a subject that is inseparably linked with the existing life on earth.

When we refer to the data released by TIMSS (Trends in International Mathematics and Science StudyTrend in International Mathematics and Science Study) in 2015 showed that the ability of students in Indonesia have not menunju kerahan change for the better. Kemampun natural science students only ranks 45th out of 47 participants of the survey [2]. Based on this research it is deduced that, Indonesian students easy to master the problems that are routine, simple computing, as well as measuring the contextual knowledge of the facts of everyday, but would be less able to integrate information, draw conclusions, and generalize knowledge to matters another thing [3].

There are several reasons that cause problems with the students this could happen. First Instance, the condition of students who simply memorize the emphasis on the ability to be an impact on the weak implementation of the concept in everyday life. If students have an interest and love of integrated science lessons and students will have the long-term memory about these subjects [4].

Second, The successful implementation of integrated science teaching would be optimal if teachers plan learning consider conditions and potential students as well as the ability of other supporting resources. The student's condition and potential covers interests, talents, needs, and abilities of students. The capability of supporting resources include the ability of teachers, availability of facilities and infrastructure for learning, and caring school stakeholders. The curriculum is integrated IPA should be provided with guidance for teachers without limiting the freedom and creativity of teachers in designing learning. Freedom in designing the learning curriculum teachers will likely build curiosity, interest and curious students [5].

Third,the learning process, the development potential of the student must be done thoroughly. Therefore, teachers are not only armed with enough knowledge regarding the subject areas being taught, but the need to master the aspects of the overall learning that support the realization of the development potential of learners [6]. This is consistent with the statement in the regulation of the

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Minister of National Education (game) No. 41 of 2007 on the Standard Process of Education stating that the learning process on each unit of primary and secondary education should be interactive, inspiring, fun, challenging, and motivating learners to actively participate and provide enough space for innovation, creativity and independence according talents, interests and physical and psychological development of students.

One attempt to solve the above problems is a learning process in the classroom should be bersfat powerful. So, appropriate learning will produce outup or appropriate learning outcomes degan expectations. There are ten ways in integrated learning, namely: (1) fragman ted, (2) connected, (3) nested, (4) sequenced, and (5) shared, (6) webbed, (7) threaded, (8) integrated, (9) immersed, (10) networked (Fogarty, 1991). The analysis result against a number of ways of learning that the Fogarty stated, there are four potential to be applied in integrated science teaching, ie, connected, webbed, shared and integrated. The fourth method chosen for concepts in science have different characteristics [7],

Junior Science syllabus contains a number of concepts that are interlocked in a basic competence. Learning in order to generate competencies intact, then those concepts must be attached (connected) in learning. In this connected alignment, the key concepts into core learning materials, while examples or applied concepts associated works to enrich ..

New curriculum of 2013 requires students to be able to master the integration concept. According Kemendikbud (2013) through an integrated learning some concepts relevant to be a topic does not need to be discussed repeatedly in different fields of study, so the use of more efficient time for discussion and achievement of learning objectives are also expected to be more effective. The interaction of living beings and the environment is one essential concept that can be assessed from the standpoint of biology, physics and chemistry, in this case focused on classroom materials VII Basic Competency (KD) 3.7. Analyzing the interaction between living things and their environment and the population dynamics as a result of such interaction and KD 4.7.Menyajikan observation of the interaction of living organisms with the surrounding environment.

Based on the background of the above problems, the issues raised in this research is formulated in the form of the question "How Application of Integrated Science Lesson Connected mode In the Matter Interactions of Living Things and the Environment against Mastery of Concepts and Skills Improvement Generic Science Students? "

2. Discussion

2.1 Integrated learning

An integrated learning aapproach in learning as a process for linking and integrating the teaching material in a subject or between subjects with all aspects of child development, needs and interests of children, as well as the needs and demands of the family's social environment (Toharuddin, 2011). Thus, integrated learning is seen as an effective approach used to develop students' skills and assist students in constructing knowledge. Integrated learning in ten ways, in terms of how to integrate the concepts, skills, topics, and thematic units. Tenth ways are: (1) fragmented, (2) connected, (3) nested, (4) sequenced, and (5) shared, (6) webbed, (7) threaded, (8) integrated, (9) immersed, (10) networked [8], It can be seen from the image below:

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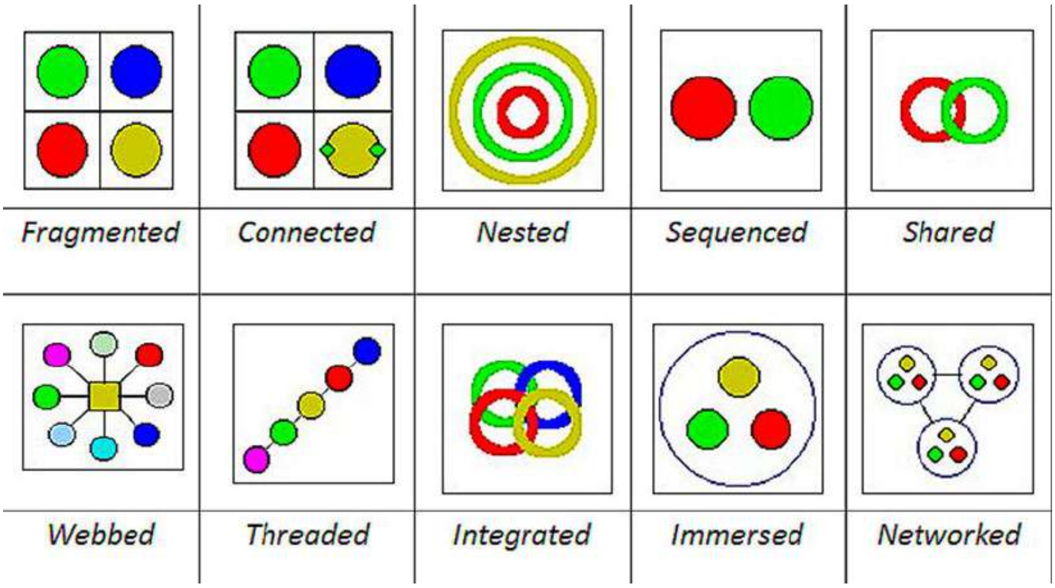


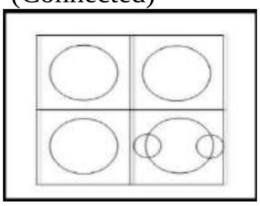
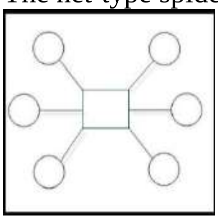
Figure 1. Integrated Learning Patterns

Based on the integration of the model, there are three pattern suitable for learning science developed in the education level in Indonesia [9]. Three integrated learning the appropriate way to be developed in the Indonesian education level is connectedness (connected), cobwebs (webbed), and integration (integrated). The reasons for the selection of the model are:

1. The concepts in the Basic Competence IPA have different characteristics
2. There are a number of basic competencies that contains the concept of overlapping / overlapping, so that when taught separately becomes inefficient.
3. There are basic competencies that contain concepts related to each other but do not intersect, the concepts must be associated with a specific theme
4. There are a number of concepts in basic competencies are linked with the concept of basic competencies another, these concepts must be attached in learning.

There are advantages and disadvantages in each of these patterns, it is certainly justified, because each pattern has the advantage of beberapan hand, it dap seen by the table below:

Table 1. Comparison of Patterns Integration Integrated Science Subjects

Cohesiveness	Characteristics	Advantages	Deficiency
Type connectedness (Connected) 	Connecting one concept to another, one topic to another topic of the skill with other skills, ideas one with another idea, but still within the scope of the field of study, such as IPA or IPS	Learners will be to find a link because it is still within the scope of the field of study	Less revealing interdisciplinary linkages
The net-type spider 	Starting with show theme is further developed with regard sub theme relation to disciplinary or other subject areas	A familiar theme makes the motivation to learn increases, providing work experience and interdisciplinary thinking	Difficult to find a theme
Integrated alignment	Starting with the	Relations	Focus on

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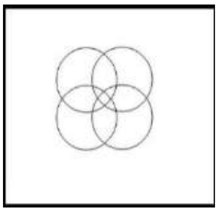
Cohesiveness	Characteristics	Advantages	Deficiency
mode 	identification of concepts, skills, attitudes that overlap in some or several fields of study. The theme serves as a context for learning.	between fields of study are clearly visible through learning activities	learning activities, sometimes ignoring the target mastery of concepts. Demanding extensive knowledge of the teacher.

source:

2.2 Integrated science teaching type Connected

Integrated learning connected type is used to connect the learning materials in the same discipline [9]. Teacher assumes that students will not automatically understand the relationship of the material being studied with other materials, both the learned and the material to be studied. Teachers should be keen to see the interconnectedness of various basic competences between the lesson topic with other topics. Therefore, teachers must seek to provoke students to capture the relationship between the concept by integrating the various aspects of one discipline.

This study discusses the integration of materials in science teaching consists of three studies are: biology, physics and chemistry. This is in line with the integrated learning guides IPA states that for material that could be taught in an integrated manner at least contains two areas of study that overlap or overlap . Example diagram illustrating the type of connected integrated learning can be seen in Figure 2.2

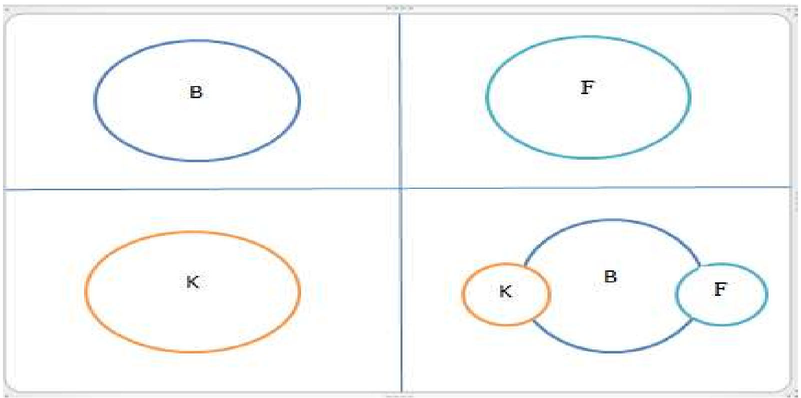


Figure 2. diagram illustrating the type of connected integrated

Materials science learning interactions of living beings and the environment in this study using the integration approach of the type connected. Connected mode chosen because this material can be associated with biological materials, physics and chemistry. Here is an overview of integration connected to the material type of interaction of living things and their environment. Generic science skills are always regarded as high-level skills that can be taught and applied in all areas. Harvard, Hughes and Clark defines generic science skills as a set of skills students need to succeed in learning and working life [10].

The results of several studies on skills generic mention there is not a single definition of the indicators of generic skills. The New Zealand Curriculum Framework proposes eight indicators of generic skills are communication skills, information skills, numeracy skills, problem solving skills, self-management and competitive skills, physical skills, numeracy skills, problem solving skills, work and study skills [11]. The Qualification and Curriculum Authority (QCA) proposes six indicators of the generic skills: information technology skills, application of number, skills in working with others, skills to improve learning and performance and problem solving skills[12]. The study discusses the generic skills in science as described by Brotosiswoyo [13], which basically stated no generic thinking skills that can grow through learning in science. Generic capabilities of science in science teaching

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can be categorized into nine indicators are: (1) direct observation (direct observation): (2) observation indirectly (indirect observation) (3) awareness of the scale of magnitude (sense of scale): (4) symbolic language (symbolic language): (5), consistent logical framework principles (logical self-consistency) of natural law: (6) inference logic: (7) the law of cause and effect (causality): (8) the mathematical modelling (mathematical modelling): (9) establish the concept (concept formation) [14]. Indicators of generic science skills on show in the table below:

Table 2. Indicators Generic Science Skills

No.	Skills generic Science	Indicator
1.	Direct observation	a. Using as many senses in observing the trial / natural phenomena. b. Viewing parameters of the phenomenon in question. c. Dividing the phenomenon (if the complex phenomenon)
2.	Indirect observation	a. Using a measuring tool as an aid in the sense of observing an experiment / natural phenomena. b. Identifying natural indicators (define-concept that concept applies) c. Or define objects and phenomena and parameters to be measured / observed.
3.	Awareness of the scale	Recognizing the natural objects and the high sensitivity of the numerical scale as the scale / size of the microscopic or macroscopic scale.
4.	Symbolic Language	a. Understanding symbol, symbols, terms. b. Understanding the meaning of quantitative units and magnitudes of the equation. c. Read a chart / charts, tables and mathematical signs.
5.	Thinking in terms of logical obey the principle	Looking for a logical relationship between the two rules
6.	Doing inference logic	a. Arguments based on rules b. Describing the problem based on rules c. Drawing conclusions from a symptom based on the rules / laws of History
7.	The law of causation	a. Denote the relationship between two or more variables in a certain natural phenomena b. Estimating the causes of natural phenomena
8.	Mathematical modeling	a. Revealing the phenomenon in the form of formula b. Propose alternative problem solving
9.	Build concept	Adding new concept

2.3 Learning Model Group Investigation

*Group Investigation*is a cooperative learning model that involves the participation and activities of the students to find their own material (information) lessons to be learned through sources available. The idea of this model stems from a philosophical perspective on the concept of learning. To be able to learn, one must have a spouse or friend [15]. This learning model developed by Herbert Thelen which states that the class should be a miniature democracy that aims to study the social problems of interpersonal [16]. This learning model emphasizes the development of problem solving in a democratic atmosphere, where knowledge is not taught directly to students,

According Winataputra [17] there are three main concepts in the learning model group investigation, namely: (1) investigation (inquiry), where students are stimulated in a way faced with the problem. In this process the students into a situation that requires them to respond to the issues

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they feel need to be solved. The problem itself may arise from the student or the teacher; (2) knowledge (knowledge), which is a process conducted continuously students to try different ways of looking at an experience; (3) study the dynamics of the group (the dynamics of the learning group), the atmosphere describing a group of people interacting on something accidentally seen or studied together, which involves a variety of ideas and sharing of experience through the process of arguing.

This model involves students from the planning, both in determining the topic as well as a way to learn through investigation. Students in groups to plan the investigation and agreed on the division of tasks to handle materials that have been formulated joint investigation. The group is conducting investigation plan drawn up, and then report the results obtained as a discussion. Results of a class discussion evaluation and feedback for each group of the results of the investigation [18].

For the formation of the group, states that at the time of the formation of groups, teachers make a heterogeneous group [19]. The formation of the group formed by taking into account academic ability. Reason heterogeneous grouping students are: first, to give an opportunity to teach each other (peer tutoring) and mutual support. Second, it can improve the relationship and interaction between race, ethnicity, and gender. Third, facilitate classroom management because each group has a highly capable children that can help other friends to plan a problem in the group [20].

A learner is said to have mastered the concept if able to define the concept, identify, and give examples or not an example of the concept that with this ability can bring a concept in another form that is not the same as the textbook. Through mastery of concepts, a learner is able to identify the procedure or the process of calculating the correct and incorrect, and be able to represent and interpret the idea to provide a simple deductive and inductive reason, either orally, in writing or demonstrating .Mastery of the concept can be gained through experience and learning is part of the learning component. Concepts, principles and structure of the knowledge and problem-solving is an important learning outcomes in the cognitive domain. Thus, the mastery of concepts is part of learning outcomes in the cognitive domain. Learning success depends not only on the environment and learning conditions, but also on the initial knowledge of learners. Learning involves the formation of meaning by students of what they do, see and hear. Cognitive learning aims at changing the learners understanding of the concepts learned [21].

Based on the various opinions on the above, it can be said that the mastery of the concept is a business that should be done by learners in recording and transferring back some information on a certain subject matter that can be used to solve problems, analyse, interpret in a certain situation. More summarily mastery of concepts is the result of intellectual activity. In addition students are able to master the concepts, critical thinking is much needed in solving the problem.

3. Method

This article kepustakaan.Studi literature study method is one way to study to analyze and review some of the research results, ideas and other relevant documents, both electronic documents or in the form of printed documents. The idea in this article tries to compare with some relevant research results.

4. Discussion

In this chapter the author tries to connect the material to be connected with any other material related to each other.Materials science learning interactions of living beings and the environment in this study using a type of integration connected. Connected mode selected for the material of living things and their environment interactions in life can be attributed to the materials, biology, physics, and chemistry.

4.1 The concept of physics

The concept of physics that is associated in the first meeting of this is the concept of temperature as the level (degree) heat to an object, the concept of sunlight as a source of primary energy needed for the process of photosynthesis and abiotic components in the environment such as water is a physical component in liquid form, the ground is a physical component that which are solid and the air is a physical component that is gaseous.

4.2 Cchemical concepts

Chemical concepts linked in the first meeting of this is the concept of photosynthesis reaction that converts light energy into chemical energy, the concept of chemical reactions in the formation of glucose in the process of photosynthesis and respiration burn glucose in the cells of living beings.

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For ease of viewing material that is taught at this first meeting, can be seen as in figure 2.4. below this.

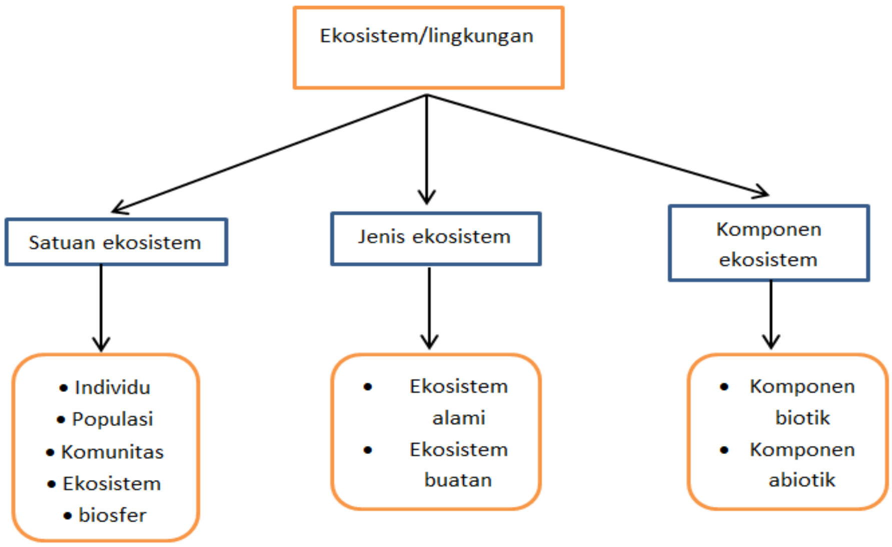

Figure 3. Creative Concept Map First Meeting

the interdependence between biotic components and the balance of the ecosystem.
4.3 Biological Concept

Among producers, consumers, and decomposers happen interdependence. As consumer level I depend on producers, consumers depend on the consumer level II I. level of interdependence is a circle that is not broken.

This interdependence will form a pattern of interaction. Wherein, the interaction between the components of biotic and abiotic components and the interaction between biotic and abiotic components. Patterns of interaction consists of:

- The food chain, is the process of energy transfer through the feeding process takes the form of certain circuits.

Figure 4. Food chain
Source: Kemendikbud (2014, p. 256)

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- Food webs, is a set of interconnected food chains form a food web. Example: see Figure 2.5

Figure 5. The net food
Source: Kemendikbud (2014, hlm.257)

- Food pyramid, the pyramid picture which shows a comparison of food between producers, consumers in an ecosystem.

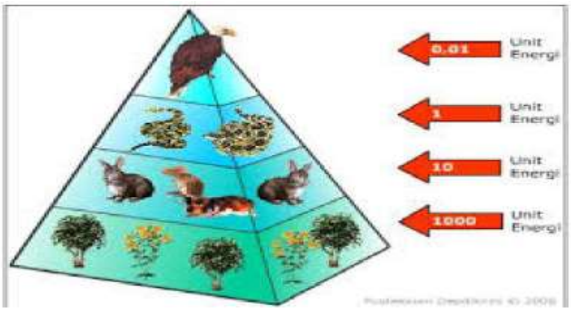

Figure 6. Pyramid of food (source: Kemendikbud 2014, p 257)

In the food chain, the energy in the food will move from one living thing to another living creature. Only 10% (one tenth) of energy stored in the body of the organism, and this is one-tenth the amount of energy available to organisms that eat it. In the food chain, there is the energy used for growth, released as waste products, and released as heat.

- Energy flow

The flow of energy is a transfer from producers to consumers. Solar light energy to help the process of photo synthesis photo tumbuhan.Proses produce carbohydrate synthesis. The first consumers eat plants, energy transfer occurs chemically transformed into heat energy and motion while doing the activity.

5. Conclusion

Integrated science teaching has to be applied through a good approach in order to make students more easily understand the context of existing, integrated IPA trying to connect separate the actual material but be a material that is intact and interconnected. Model investigation has superiority where student groups together to try to dig deeper into the material in the integrated IPA.

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Optimization of Learning Science by Using Teaching Materials Based Local Wisdom to Improve Science Process Skills of Junior High School Students

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Abstract. This article aimed to analyze the importance in optimizing of learning science by using teaching materials based on local wisdom. The mining industry in West Kalimantan which covered 5.4 million hectares of remaining vacant land was not utilized and gave too many effects to the environment. In case, it was used for learning science to create students' understanding becomes easier to the natural science subject because of its contextual to the students' live. One of its utilization was practical guidance. Therefore, it will be integrated to local wisdom with a hope of science process skill will be improved through the practical process of waste management.
Keyword: Practical guidance, local wisdom, science process skills

1. Introduction

Environment in West Kalimantan was polluted by mining activities, one of them was influencing to a balancing ecosystem of remaining land. The damage needs for social concern, including education. Because of the real condition, it will be important to discuss a learning process in helping students to understand how the real environment around them is.

There are many efforts to actively increase students' involvement to learn science to find their concept during learning process which was conducted by the practicum. Therefore, it is important to develop practical guidebook which is separate with student's worksheet, infrastructures and students' condition. Besides that, practical guidance was designed by the conventional approach. One of them is learning science which is integrated by local wisdom to teaching materials so that students will be more understand how the real condition is. Through the process, they can improve their practical skills. Practicum is the ways of presenting subject whereas students conducted experiments by proving of something new. In that process, students have the opportunity to do experiment by themselves, create a process, observe to object, analyzing, and generalize the conclusion related to the object, condition or a process [1].

Natural sciences have relation with the ways to explore nature systematically, so it was not only talked about knowledge of facts and fundamental or concepts but also talked about how to be innovative. Natural science must have learned by students with their abilities to gain their concepts. Then, that process is needed to emphasize learning experiences directly through utilizing and developing of science learning process and competency [2]. Science learning process is strongly recommended to develop in learning of natural science. Because of the skills, the conceptual framework is strong growth by students to be the expert in science [3].

2. Discussion

2.1 Practical Guidance

Learning sources is always needed by students and teachers in the learning process. It is utilized to gain learning objectives effectively. Its functions are as sources of information, media for overcoming of limited experiences, media for creating of direct interaction and same observation that will new interest and motivation for students [4].

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Learning activities oriented practicum need learning sources, one of them is the practical guidebook. It will make students be easier in applying of proposed experiment. Ideally, the guidance must have the systematic structure in making of procedures which will help students find an expecting goal correctly [5].

Practical module can be served as learning media for students and allows for developing directly by the teacher with a few of criteria. The mentioned criteria are the books which are contained practical procedures to improve students' learning science skills [6].

2.2 Local Wisdom

The local wisdom is main characters of an area as one of the identities which will grade the region to be greater than others, one of potencies or excess of one region. This aspect includes ecology which is developed by potential area of natural resources that will teach the society to keep and converse their environment. This research puts mining activities as an excellent character which will be integrated in practical guidance.

Kalimantan has the area of 5.4 million hectares which is covered by mining project. This character is a local excellence for economics, cultures, technology, information, communication, and ecology which are developed by local potency. There are many aspects of potential local excellences, such as human resources, natural resources, geographic cultures and history. This kind mining process of that region is one of the local potencies [7].

Mining was used by society for maintenance economics, but it was not followed by well management. Thus it will be feared to the ecosystem around mining process. But if the remaining land will be used for learning, it would have made students contextually understand about mining and the ways how to manage and converse that remaining vacant land.

2.3 Science process skills

Science process skills are the whole of competency which will be used as media to find and develop a concept, principle and theory. Through the process, science will make interaction with the concept, principle or theory which is developed by its scientific process [8]. Those skills are expanded to investigate the outer and create conceptual knowledge. That process can be established by continuous customs [9].

Through the process, students can actively help their environment. It was adapted by science process skill which is motivates them in developing abilities to do investigating, so the problems will be solved by learning and respecting each other [10]. Besides that, the process will make students to develop their thinking, opportunity to do observing, improve their memory, creating of intrinsic satisfaction, and help them in the understanding of scientific concepts [11].

This process would be divided into two categories of basic process skills (basic skills) and integrated process skills (integrated skills). It was explained by observing, clarifying, communicating, measuring, estimating, predicting, and intervening. While process skills cover identifying variables, controlling variables, defining operation, arranging hypothesis, experimenting, making a graphic, interpreting data, creating a model and investigating [12].

3. Conclusion And Suggestion

Learning of natural science can be maximized by using appropriate teaching materials which have a strong correlation to the students and their environment. The module based local wisdom will make learning process being more contextual. Through the process is expected by teachers in facilitating of science learning skills to optimize students' skills.

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Facilitating Students' Conceptual Development of Light Refraction through STEM-based Virtual Lab Utilization

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Abstract. The challenge of a learning process in 21st century urges teachers to make innovation of teaching media such as virtual laboratory that aids to visualize microscopic phenomena. Development of STEM-based virtual lab that integrates science, technology, engineering, and mathematics competency is essential to modify students' conception by presenting the cognitive conflict through its animation feature. This study conducts descriptive method through a purposive sampling of 8th grade students (n= 15). Data is analyzed by transcribing video and audio recordings of group discussion to investigate students' conceptual development. Cognitive mechanism of students' conceptual development shows significantly at reconceptualization stage where a significant change in the nature of and relationship between concepts occurs, such as students can determine the correlation of ray propagation within lenses and curved mirror, analyze nature of image formation at different refraction index, apply the geometrical equation, and analyze the properties of lenses to solve hypermetropia and myopia symptom.

1. Introduction

The implementation of constructing precious knowledge during teaching and learning concerns on the completion of thinking pattern to create future students who can comprehend 21st century skill that involves life and career skills, learning and innovation skills and information media and technology skills. These skills are required for students to succeed in competing globally, since in this modernization era students have to be well-prepared as well as develop essential skills such as the ability to adapt to a new situation, to think critical and creative, to innovate and solve problems, and to communicate and use technology[1]. The scientific approach is one of the efforts that have been implemented by Educational Ministry to establish 21st century skills in each learning process through observing, questioning, experimenting, associating and networking. The process of transferring scientific knowledge is expected to not only emphasized on science as product that contains law, theory, principal, and equation, but it is also focused on how students can apply their knowledge in different context, how to make innovation, and how students construct scientific attitude to be aware and solve real-life problems in their environment.

In the implementation of science teaching and learning, those expectations are not promising. According to a preliminary study that is conducted by the researcher that aims to figure out students' problem in learning Physics, it is obtained that most of students find several obstacles and difficulties that describes by these statements:

1. Majority of student face difficulties to learn Physics concepts that cover 85.7% from total twenty-one respondents whereas 14.3% feel that Physics is easy.
2. Students face difficulties to learn complicated formula and equation as stated by 47.6% respondents meanwhile other obstacles that are faced by students in learning physics are incapability to understand and solve problems, physics require a complex mathematical operation, physics contain lots of unit and dimension, therefore, it is hard to memorize all of them.
3. Students' motivation in learning physics is not essential since they have to comprehend physics concepts only to pass the exam criteria for entering university level as stated by 42.9%. Low motivation in learning physics is also indicated by low self-awareness to allocate time for learning independently (28,6%), low curiosity during learning process since students just write down the materials without proposing meaningful questions (19%), and only review materials if there will be exam or final-term test.

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4. Lack of school facilities such as physics laboratory affects students' low interest since the school management does not provide well-quality laboratory instruments. This condition also affects teachers to provide physics experiment using local resources materials such as using a rope to learn waves.

The challenge of learning process in 21st century urges teachers to think creatively by making innovations of learning media that is required for students to visualize abstract concepts or science phenomena that seems hard to be observed. Teaching media is utilized as representative media that able to create interaction within students and virtual environment, therefore, they can construct meaningful concepts independently [2]. Teaching media utilization to achieve learning experiences can be obtained through real objects or by using virtual environment in form of virtual laboratory.

A virtual laboratory is used as alternative media to visualize microscopic phenomena that seem hard to be observed. This media is essential to modify students' conception related to abstract and complex concepts as well as science process skill that involves an ability to observe, determine variables, collect and measure data, analyze the correlation within variables and conclude the result. Recent researches show the benefit of virtual lab utilization in science instructional process, such as; (a) improving students' active participation to design variables [3], (b) as substitute media to explain natural phenomena both in macroscopic and microscopic levels as well to improve scientific literacy [4], (c) enhancing students' critical thinking by manipulating variables of scientific observation [5], (d) solving problems and constructing accurate conclusion based on intercorrelation within variables [6], and (e) formulating scientific equation through data collecting and processing [7]. The role of a virtual lab is to represent aspect of science, technology, engineering and mathematics (STEM) through the interaction between students' virtual and social environment [8].

STEM is one of the essential approaches in educational practice that can be implemented through project-based learning or virtual based laboratory work. This approach is applied based on integration of four disciplines to construct student with well-STEM literacy who has; (a) knowledge, attitude, and skills to identify questions and real-life problems, (b) mastering characteristics and features of STEM disciplines as product of knowledge, investigation, and design, (c) has well-self-awareness that STEM disciplines aims to form material, intellectual and cultural environment, (d) active to be involved in STEM issues such as environmental quality, limitation of natural resources, and efficiency of energy by proposing scientific ideas and making innovations [9].

STEM approach is essential to modify students' conception since they do not change their minds easily and resist changing. As a result, it takes them a long time to learn the right scientific terms; therefore several misconceptions might be existed [10]. Misconception is not a wrong answer caused by faulty or missing information; instead it is information that is completely different from the scientific definition of a concept. Right at this point, it is of crucial importance to incorporate conceptual development process.

Conceptual development involves several sequences that are obtained based on students' needs such as recognizing, evaluating students' conception and believes, and deciding whether reconstruction is needed or not to construct new knowledge [11]. Students' dissatisfaction is considered as the main factor because it is related to psychological aspect based on individual cognition. The changing process of students' conception is one of the essential factors that aids to construct meaningful learning that needs well-organized, relevant knowledge structure and high commitment to finding relationships between new and exciting concepts [12].

The role of a virtual lab is to facilitate students' conception through the occurrence of cognitive conflict that is presented by its visual and interactive content. Virtual lab utilization on physics such as buoyancy topic can modify students' preconception and trigger cognitive conflict, for example, students think that buoyancy force is not affected by the density of any liquids [13]. The cognitive conflict occurs while students start to visualize the animation content that presents the magnitude of buoyancy force of particular object will be different in various liquids; such as water, juice, oil, and milk. Students can reflect that the buoyancy force is not also affected by the object density and weight, but it is also affected by the density of the liquid. Therefore, physics concept that seems difficult and hard to be observed at the microscopic level can be easily comprehended by students.

Light refraction is considered as a foundation to construct more complex and advanced concept such as interference and diffraction of light wave and spectrum of light, therefore it is essential to be

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taught since secondary level. The effective method by using appropriate teaching media is a solution to avoid students' misconception as well as to help them master the concept. The role of a STEM-based virtual lab in learning refraction concept aids to facilitate students in visualizing light propagation within different density that cannot be seen directly through their eyes.

According to the background that has already stated, the research problem is formulated as; "How is the significance of STEM-based virtual lab utilization to facilitate students' conceptual development on light refraction topic?"

Therefore, this research aims to investigate the significance of STEM-based virtual lab to facilitate students' conceptual development of light refraction.

2. Research Method

Type of descriptive design is used in this research to describe systematically a situation and phenomena for collecting qualitative data [14]. Samplings are selected by purposive sample technique. The sample is all of the students' significance in conceptual development and conceptual mastery of refraction topic that consists of 15 students of 8th grade. Research is conducted at one of Secondary Level Schools in West Java that used both Cambridge and national curriculum.

Significance of students' conceptual development as qualitative data is analyzed by discourse analysis at each taxonomy of conceptual change such as; (a) differentiation where new concepts emerge from the general concept, (b) class extension where exciting concepts considered different are found to be cases of one subsuming concepts and (c) reconceptualization where a significant change in the nature of and relationship between concepts occurs [5]. The analysis process is started by transcribing the video and audio recordings during learning process to address and describe every single process of students' cognitive construction.

Research procedure is carried out into three stages; preparation, implementation and final stage. The preparation stage consists of preliminary study, literature study and research instrument design. The Preliminary study in form of questionnaire aims to identify the real problems in physics lesson that were faced by students. The questionnaire consists of ten questions is given to each student one week before entering the research treatment. Literature study aims to review essential theories from trusted resources to support research implementation. Curricula analysis as well as content analysis of both depth and broadness of light refraction topic is also conducted for formulating essential sub-concepts that aligned with students' cognitive development. Designing the STEM-based virtual lab by making a flowchart, a storyboard as well user interface is also carried out during this preparation stage. The media is assessed through content validity by experts. The content of virtual lab that consists of science, technology, engineering, and mathematics is elaborated form learning indicators that should be achieved by students. Learning process of refraction topic through STEM-based virtual lab utilization is applied during the implementation stage. In this stage, students are divided into a group consists of four members to solve the problems related to light refraction phenomena such as bending pencil, mirage at desert and refraction at both curved lenses to solve hypermetropia and myopia symptom. The role of a teacher is to assist that each group can use the whole component of STEM-based virtual lab precisely. The teacher is not allowed to answer every single problem that was proposed by students, since the discussion process has to be carried out based on students' conception whether it indicates misconception or accurate concept. The final stage consists of data analysis of students' conceptual development. The framework of STEM-based virtual lab content is described by the table below:

Table 1. Content framework of STEM-based virtual lab

STEM aspect	Competencies
Science	Both content and procedural knowledge of light refraction phenomena in daily life. Content knowledge emphasizes on different medium density that causes light to change its direction. Index of refraction (or refractive index) is used to describe the extent to which the speed of light in a material medium differs from that in a vacuum. The refraction index depends on the speed of light in particular material due to its density, as the object is denser, the refraction index is higher.

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	Procedural knowledge emphasizes on how three special rays both in convex and concave lens form the nature of an image.
Technology	Ability to use technology that involves during the process of light refraction at optical instrument, such as how to manipulate the power of lenses for capturing exact image for hypermetropy and myopia symptom
Engineering	Ability to design creatively and systematically particular system that aligned with the light refraction concepts, such as how to design glasses with exact lenses power for hypermetropy and myopia symptom.
Mathematics	Ability to communicate the data in form of the graph to analyze the relation between variables such as the relation of image distance towards object distance to determine the magnitude of lens' focal length. Mathematical operation is also carried out to determine magnification based on the geometrical optic formula such as based on the comparison of image height towards object height along with image distance towards object distance.

3. Result and Discussion

The STEM-based virtual lab is developed based on the integration of science, technology, engineering and mathematics aspect. Figure 1 below describes the user interface of virtual lab as well as the simulation content.

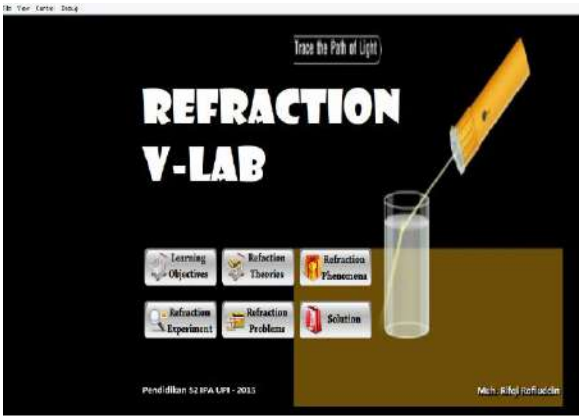

Figure 1. The Interface of STEM-based Virtual Lab.

Cognitive mechanism of students' conceptual development shows significantly at reconceptualization stage where a significant change of the relationship between concepts occurs. The data is found based on the video transcription result that contains discussion among students in a group related to refraction phenomena. The reconceptualization that concern on the massive change of students' preconception occurs while students face cognitive conflict; therefore they tried to refine their preconception. Those cognitive conflicts were aroused by the visualization of virtual lab. This following transcript is described as follows:

Student A: "I know that the curved mirror such convex mirror that is used as side mirror at my brother's motorcycle is used to reflect the light, therefore, I can see cars and other motorcycles behind me. But what about the lenses? Is it also reflecting the light?"

Student B: "Well, the lens is really transparent so I doubt it will reflect the light like the curved mirror."

Student C: "You see that each mirror has only a single focal point. What about the lens?"

Student B: "Well, it must have two focal points since the lens is the combination of two mirror.

Student A: "What do you mean by the combination of two mirrors?"

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Student B: "Well you see that each side of lens are curved outside." (point to the picture of convex lens that was displayed by virtual lab)
Student D: "Maybe it has two focal points since it is the combination of convex mirror."
Student C: "So how about the light propagation?"
Student B: "You have to relate with the phenomena of using magnifying glass."
Student C: "It will burn the paper"
Student A: "So, all of the rays will strike to only one point, won't they?"
Student B: "Exactly. So, I think that both convex lens and concave mirror has same properties to collect rays at one point only."
Student D: "So the convex mirror and concave lens has same characteristic to spread rays. I got it know that both lens and mirror are related each other."
Student A: "Then what about the ray propagation? Is it reflected or refracted?
Student B: "I think it will be refracted since the light travels in different way."
Student C: "What do you mean?"
Student B: "Well, since light from air travels straight and while entering the glass it will be bent. The light then probably travels to other focal point then refracted outside to the air"
Student D: "Is it the same as we see the pencil inside the water?"
Student C: "I don't think so. Water and glass are two different things."
Student A: "But water and glass has different density than air, right?"
Student B: "Exactly. Since its density is different, maybe the light travels different. Well, I think we have to observe the phenomena by doing experiment." (directly click the menu of simulation of light refraction in convex lens)
Student A: "So we have to change the object position, radius of curvature and the refractive index."
Student D: "I don't think those elements affecting the image formation."
Student A: "What is the refractive index?"
Student C: "Maybe it is something that is affected by the density, isn't it?"
Student B: "Correct. We know that each particular object has different density so it affects the magnitude of light refraction. It's like a parameter and it's constant."
All of students are conducting the experiment by using virtual lab.
Student A: "How to interpret the data?"
Student C: "I think that the object position and refractive index affect the image magnification. If we place the object really near to the lens, the image will be formed at the front of lens and it will be upright and magnified. If we place the object really far from the lens, the image will be inverted behind the lens."
Student D: "I found that the refraction index also affects the image formation. Higher the index value also makes the ray will be refracted like it is more bended.
Student B: "In my opinion, refractive index affects the angle of refraction. As we see if light travels from air to the lens, the light will be bent towards the optical centre. If we strike the light from lenses to air it will be bent outwards the optical centre."
Student D: "It make sense now. So, we can analyze each ray that strikes to the lens will have different properties."

The transcript of students' discussion as illustrated above indicates how STEM-based virtual lab can facilitate students to modify their preconception. Reconceptualization occurs through group discussion. It can be identified that Student B is classify as an expert in this group, since he helped his teammates to change their wrong and misconception through accurate and rational explanation. Since each group are divided with homogenous composition; one student with higher intelligence and ability to comprehend the concept faster compared to others, the discussion flow was conducted well. Through social interaction, students can internalize their wrong or misunderstandings to reconstruct their conception [15]. Conceptual development is also indicated by students' ability to infer that the negative value of focal point f = (-) is applied only on concave lens and convex mirror that has same

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ability to distribute rays, therefore it affects the image position through the geometrical optic formula. STEM-based virtual lab plays essential role in this concept reconstruction process by visualizing animation such as how light propagates in different angle within specific refractive index. The specific process reconceptualization process in each concept is described as follows:

Table 2. Students' Reconceptualization Cognitive Mechanism of Conceptual Development in Learning Light Refraction

Preconception	Cognitive Conflict	Concept Modification
Lens is reflected the light like curved mirror.	Unlike curved mirror, lens is transparent in its both side therefore the light is being directly propagated and transmitted to other point.	Lens has two focal points in its both side to collect the rays (for convex lens) and to spread rays (for concave lens)
Lens and curved mirror doesn't have the same characteristic since lens refracted the light and curved mirror is reflected the light.	The ray that strikes to the centre of lens is not bended unlike other two rays.	Similar with ray tracing in curved mirror, the third special ray in lenses has same properties that travels directly through the centre of the thin lens without any appreciable bending.
Lens and curved mirror doesn't have the same characteristic since lens refracted the light and curved mirror is reflected the light.	The image formation of convex lens is affected by the object position and the rays that strike object will aim the focal point like concave mirror.	The convex lens has same properties to collect rays at focal point (convergent) same as concave mirror meanwhile the concave lens has same properties to disperse rays from focal point (divergent) same as convex mirror.
Refraction index affect the image position.	If light travels from air to the lens, the light will be bent towards the optical centre meanwhile if the light strikes from lenses to air, it will be bent outwards the optical centre.	Whenever a ray of light is travelling from a rarer medium to a denser medium, the refracted ray bends towards the normal, and if the ray of light is travelling from a denser medium to a rarer medium, the refracted ray bends away from the normal.
Eye defects such as hypermetropy and myopia symptom is helped by using convex lens to converge rays.	Unlike hypermetropy symptom, in myopic eyes the image is formed in front of retina.	Concave lens has the nature of diverging light, so that parallel rays received by eye lenses will be scattered. This makes all the light as if they are receiving from nearby objects and the image will exactly be formed at retina.

The role of STEM-based virtual lab is really essential for students to help them in applying geometrical optic formula for measuring exact location of image, size of image as well as direction of image by making connection with the nature of image. Students also succeed in analysing the

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interrelation among concepts; such as relate converging ability in concave mirror and convex lens affect the value of focal length; therefore, produce variety of image that depends on object location in front of focal length (F), between curvature (C) and focal length (F) and behind curvature (2F). Students can analyze that nature of image for curved mirror and lenses will be same as long as it has same ability to collect or to distribute ray. Analysis regarding with nature of image formation also is well-established since students can draw image based on three special rays during restructure of ideas phase. Students only find obstacle in calculating image distance if the value of focal length is negative; such in concave lens and convex mirror. The negative value makes them confuse in applying formula for measuring image distance therefore high accuracy of calculation is needed.

Students' prior conception of light that is obtained since secondary level seems contain lots of confusion and misconception [16]. This factor is caused by the inappropriate teaching method that is not emphasize with students' needs such as using speech in describing complex concept that involve formulas and mathematical calculation. The teacher should maximize the role of media to visualize concept for constructing stronger conception to omit students' confusion. STEM-based virtual lab utilization that is used as prototype media in helping students to construct their conception after constructing new ideas of image formation based on three special rays as well as graph of refraction based on Snell's law also evaluating their conception in solving problems that requires ability to apply formula and analysis the image is really essential to be implemented since students can construct and visualize the concept better.

Significance improvement students' reconceptualization through STEM-based virtual lab utilization affects the improvement of motivation and interest and positive cognition that is classified as internal factor. Internal and external as factors that influence significance result of cognitive learning outcomes. Students' psychological factors as addressed based on questionnaire result shows positive improvement of motivation and interest. Students are being more passionate towards Physics lesson since they can classify, analyze, and elaborate essential concepts, organize concepts, and can apply formula of geometrical optics by utilizing STEM-based virtual lab therefore they will be aware in changing their interest towards Physics since based on preliminary study result, 85.7% students feel that physics is difficult lesson. The role of STEM-based virtual lab can facilitate change of students' conception by repairing students' preconceptions that seems contain lots of misconception into scientific conception. This media is essential to stimulate students' discussion and triggering many cognitive conflicts, since STEM approach emphasizes to work collaboratively as a group to solve problems. Virtual environment that is created by the virtual lab aids students to construct complex cognitive structure.

4. Conclusion

This research demonstrates how learning process by utilizing STEM-based virtual lab successfully construct scientific understanding of light refraction concept. Students' reconceptualization that is analyzed based on video transcription of discussion process shows significance change of how students can modify their preconception that seems contain lots of misconception into more accurate scientific concepts. The content animation of virtual lab aids to stimulate cognitive conflict therefore students can easily identify, analyze, correlate and make judgment regarding whether they have to resist or change their conception. Cognitive mechanism of students' conceptual development shows significantly at reconceptualization stage where a significant change in the nature of and relationship between concepts occurs, such as students can determine the correlation of ray propagation within lenses and curved mirror, analyze nature of image formation at different refraction index, apply the geometrical equation, and analyze the properties of lenses to solve hypermetropia and myopia symptom.

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Asses ing Pedagogical Content Knowledge in STEM Education: Literature Review

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Abstract. Integrating science, technology, engineering, and mathematics concept has been found to increase student's interest in science and Technology. Next Generation Science Standard (NGSS) describes how to practice of science and engineering that are essential for students and educators, however preparing teachers to teach STEM education is significant challenge. This study reviewed the pedagogical content knowledge (PCK) skills in STEM education. Methodology used in this study was systematical reviews based on 29 articles focusing on Pedagogical Content Knowledge in STEM education. Articles were selected based on Google Scholar Metrics by following term "Science Education" Journal and it was chosen among 10 Top rank journals. Extraction of the article followed five components in PCK by Gess (2015). Those skills are including of assessments knowledge, pedagogical knowledge, content knowledge, knowledge of the students, and circular knowledge. Result showing of training in curricula in STEM education based on NGSS is lack because researchers argued that that skill was included in the pedagogical knowledge.
Keywords: Pedagogical Content Knowledge (PCK), STEM education, NGSS

1. Introduction

Effort to improve science and mathematics education has been done continuously. To coverage of science and mathematic, many experts made an approach called STEM. In STEM, educators were pushed to prepare their students for take on 21th century (Gu and Belland, 2015). Educators commonly use the acronym of STEM to explain integration science, technology, engineering, and mathematic. The integration STEM discipline has to potential to provide an invigorating and relevant form of education to prepare students for future citizenship (1).

Yet, there are barriers in the implementation on STEM education. Firstly, Radloff & Guzey,(2016) reported that current STEM educators felt uncomfortable with using STEM instruction and content, making them unlikely to adopt STEM approaches in their classroom. The lack of STEM qualified teachers caused declining student's enrolment in science, technology, engineering, and mathematics (3). In the dimension of a STEM education reform, the practice in STEM is was embedded and developed in 7 – 10 years (4), so preparing effective STEM teacher's proficient in STEM is needed in large quantities (Lynch, et al.,2015).

For the balance program of STEM education, it is very urgent to improve educator skills of STEM education. Talanquer (2014) argued that there was need reform that will nit only demand the reconceptualization of circular, instructional, and assessment practice but also the enrichment and transformation knowledge, beliefs, attitudes, and behaviors of students, instruction, and administrators. One of five element program ITETS framework for STEM is Educator professional development, in this level of program in grade fourth from ITETS after STEM context development activities, STEM career development activities, and partnership called Helix education workplace (6).

The provisions of literacy in professional development of STEM education are less on this moment but it is critically to ascertain a synthesis collection about professional development of STEM education. The prospect of this shape is to remain scholarly community to understanding current research in professional development of STEM education. Furthermore, the purpose of this systematic review to determine the effect of professional development of STEM education for student learning, so to guide this research, the questions determined are:

1. In professional development of STEM education, what were major research purpose, methodology and outcomes of the study?

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2. In professional development of STEM education, what is the participant majority included in this program, pre- or in-service teacher?

2. Method

A systematic review was used for this research to provide information and analyze teachers' professional development that consists of: Assessment knowledge, pedagogical knowledge, content knowledge, knowledge of students, and circular knowledge (Gess, 2015). The systematic reviews are a method of making sense of larges body of information to identifying, selecting, and synthesizing research studies (7). Researched used a qualitative synthesis approach to organize, integrate, and interpret the qualitative finding.

2.1 Research Strategy

Our research was carried out in Google Scholar Metrics to identify the list of top journals based on their five-year h-index and h-median index metrics. Due to specific content, researcher used the term Science education, and found the top list of journal to identify.

1. Science Education Journal
2. International of Science Education
3. Journal of science education and technology
4. CBE-life Science education
5. Science and Education
6. International Journal of science and Mathematical education
7. Research in Science Education
8. Educational Science: theory and practices
9. Cultural studies of science education
10. International Journal of mathematical Education in science and technological education.

In these of the journals, articles were selected, using the following term: STEM Education, professional development, in-service teacher, pre-service teacher, and academic development. The articles were limited the last five years in 2013 – 2017 because STEM education began familiar in 2013.

2.2 Study Selection

On the basis of title and abstract screening, the researcher decided to concern empirical and practical studies in the English language that were focused with STEM education in university and teacher. The total number of articles found was 125 articles.

2.3 Analysis and synthesis framework

All of articles that have been selected were analyzed. If the articles were not included the subject matter dominant in STEM, the article would not be analyzed. Figure 1 show a diagrammatic representation was developed by (8). The purpose of our synthesis was to summarize the data in order to understanding teachers' pedagogical content knowledge in STEM education. First, The articles collected were correctly read line by line in order to ensure that article of the major themes of the studies. Then, if the article included in the themes of studies, will that articles were coded. Second, Full text readings were conducted the selected studies. A narrative method was used to analyze the article selected (9). The researcher make sense of the literature and look for patterns in the result by carefully reading and interpreting the studies, to extract following data: research purpose, learning outcome (positive, negative, neutral), research methodology, and participants, (pre-service teacher or in-service teacher).

Based on its purposes, the articles were classified as five types. The articles had more than one purposes (e.g included curriculum and content knowledge), the researches focused in majority of the articles' problem. Those purposes have been classified by Gess (2015) in table 1.

Table 1. Teachers' Provisional Development

Assessment knowledge	Knowledge of the design and use of formative and summative assessment and how to use results from those assessment to design or modify instruction
Pedagogical knowledge	Strategies for classroom management and student engagement, for example questioning, techniques, instructional strategies to support differentiation based on student need, or how to design a lesson plan.

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Content knowledge	Academic content of discipline plane used NGSS.
Knowledge of the students	Student cognitive and physical development, understanding student differences that make require instructional differentiation, and how to rich instruction
Circular Knowledge	Goals of curriculum, curriculum structure, the role of the scope and sequence and the ability to assess a curriculum for coherence and articulation

Learning outcome was coded as positive, negative, neutral and other. Studies ware coded positive if the findings improved teachers' pedagogical content knowledge. Research methodologies were coded by qualitative, quantitative and mix-methods (10).

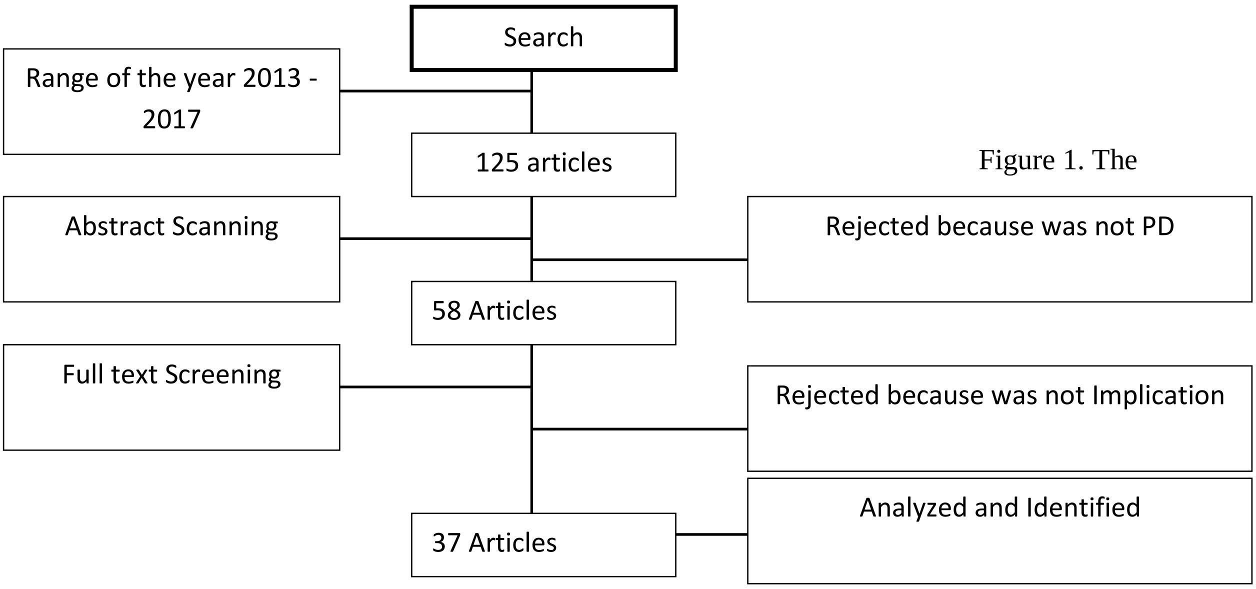

Figure 1. Flowchart of the selection and analysis's procedure.

3. Result and discussion

3.1Purposes of the research

Seven teen studies described that they focused in Pedagogical Knowledge. The second majority in nine studies explained knowledge of students. This is emphasized that pedagogical knowledge has relation with knowledge of student (11). When educator would be to design teaching strategy for classroom, educator had to learn condition of student. However, there is a minority of the result from this studies that assessment knowledge was found only one case. In the reality assessment was very important to develop the teaching instruction. Psycharis (2016) had investigated that a developments of a rubric in the design for teaching were very helpful and they also provide guidelines for a step-by step development of teaching scenario. Despite, the assessment could be embedded in the instructional approach and formal assessment rarely used. All of the result in this studies described in fig 2.

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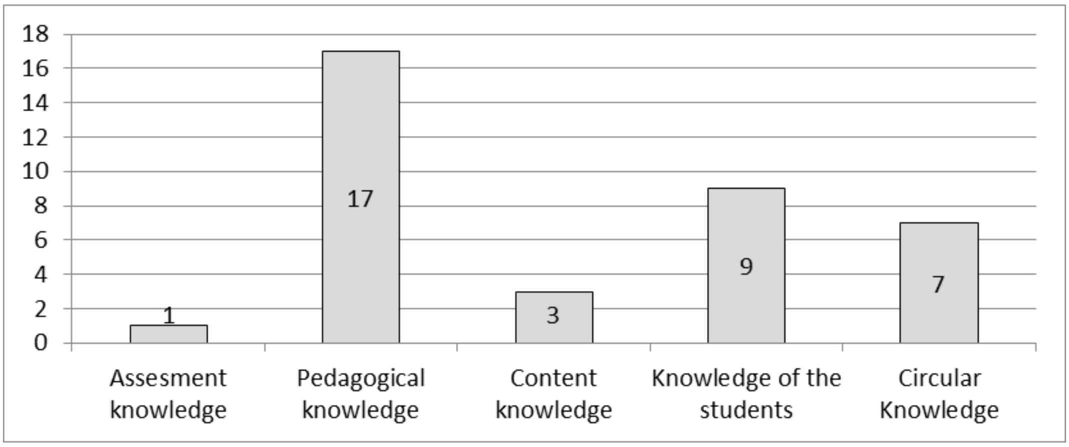

Figure 2. Graph of Research purposes distribution

3.2 Outcome of the studies

Table 2 showed the result of the learning outcome of these studies. A total of 62.16 % gave positive effect in these studies, meaning that professional development that has been done could improve educators' pedagogical skills. Then, 16.22% have negative effect because the learning outcome no significant to improve teachers' pedagogical Skills. Some studies have been found that had two or more learning outcome, a total number 13.51% gave both positive and negative effect in professional development. The Last result did not show clearly.

Table 2. Learning Outcome Distribution

	Number of studies	Percentage
Positive effect	23	62.16%
Negative effect	6	16.22%
Both positive and negative	5	13.51%
Others	3	8.11%
Total Number of studies	37	100.00%

Perception of educator in STEM education is very important. Radloff & Guzey, (2016) reported that Professional Development participants felt hard to teach to students, STEM was different study from traditional elementary education classes that have emphasis on language arts and mathematics. Engineering part in STEM was new phenomena in this approach. Professional developments for educator in STEM curriculum many were successful in middle school level (13).

Some studies gave others learning outcome. For instance, Chalmers, Carter, Cooper, & Nason, (2017) resulted a six-component framework that can be used to scaffold pre- and in-service teachers' development of integrated STEM curriculum unit. As much as 8.11%, the studies had not conducted to implement in professional development. They focused in development of instrument or new frames work.

3.3 Method distribution

In this studies have been found many methodologies that can be used to conduct educators' professional development in STEM approach. The best common result (24,32%), research used questionnaire to improve educators' pedagogical. The selection of questioner for the research was to get many participants following in the research. In second position, experiment and case study also become alternative (18.92%). Experiment design in professional development was done to investigate comparison of both teaching method using STEM approach and traditional classes. The resume of the using methodology can be looked in table 3.

There are four studies that used of others methodology. Demir & Abell (2010) used a phenomenographic approach that concerned on developing, recognizing, describing, and apprehending the quality different ways in which people experience certain phenomena or certain aspect of the world them. Overall, the methodologies that were described purposed for many scholarly to understand STEM implementation of professional development from others point of view.

Table 3. Research Methodology organized

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	Number of studies	Percentage
Pre and post test	3	8.11%
Questionnaire	9	24.32%
Quasi experiment	2	5.41%
Interview	3	8.11%
Case Study	7	18.92%
Experimental	7	18.92%
Mix-method	2	5.41%
Other	4	10.81%
Total Number of studies	37	100%

3.4 Participants

Commonly, Professional development was carried out for the pre-service teacher (62%). Even, Jaipal-Jamani & Angeli (2017) had been done a research showing that the majority of pre-service teacher did not have STEM teaching experience in the school. Through of a provisional development training, pre-service teacher can learn technique and professional knowledge for teaching. In spite of, some studies suggested that a rule of mentor was needed to get good results (17).

Remaining (38%), participants selected in those studies were in-service teacher. They had many experience to teach science in elementary, middle, or high school. The manner of teaching to transfer their world work have to be done in the development their knowledge and skills. This case must be purposefully conceptualized, thoughtfully implemented, and meaningfully employed (17) for STEM education (4).

4. Discussion

The study shows a review from professional development that had been done in the last five years. First, The purposes of theses studies were classified by five types development. Pedagogical knowledge that one important was improved in provisional development compared the others types. For the development of teaching strategies, teachers might know the goals of the learning process in their classroom. In this type, teachers' perceptions about STEM were constructed. Bell (2016) argued that the teacher perception of STEM, their personal knowledge, and understanding of the knowledge was intrinsically linked to the effectiveness of STEM delivery their own classroom. Thronging a professional development, it clams that STEM-engage teacher/educator increase their personal content knowledge and more "reform-orientated" having participated in professional learning communities (19). Basically, all of the types factors in teachers' professional developments are needed, because all of types would make correlation. If the teachers get all the types of factor in professional development, they will give good performance in STEM education.

Secondly, the outcomes of the research provided the diverse effects. When the studies have negative effect (not significant), the researcher should be give obvious reason, so the others researcher can build and know the main factor of the cause of a failure. Additionally, in the future research, the factor of failure can be avoided to get positive outcome. Almost of methodologies in these studies used qualitative approach. A lack quantitative research was conducted in professional development. A quantitative research will provide many data that were evidenced by statistical information. Quantities research can describe and generalize of the population in widely scale. The emphasis of the research will be better if it is both qualitative and quantitative approach.

Professional development in STEM education has been appropriated the recommendation for five-year federal STEM education strategy plan. Bybee, (2013) stated that professional development of teachers become second priority, so these professional development programs should be concentrated and continued. The professional development can be addressed both in-service and pre-service teacher. Giving professional development to pre-service teachers can build their self-construction to understand and implement STEM perception while in-service teacher can improve their skills in teaching STEM. Comparison research between pre- and in- service teacher need to know for investigating the good effect of provisional development.

5. Limitation

The limitations of this research are: the articles were from only top ten rank journal listed in Google Scholar metrics so some articles explained STEM in other journal were not included to

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investigate. Additionally these journals were selected only in English language so the results do not represent in others language.

6. Conclusion

The purpose of this study was to provide the currents synthesis professional development of STEM education that includes teaching skills of knowledge (Gess, 2015). The results show that the purposes of the studies based on grade were pedagogical knowledge (45.95%), knowledge of students (24.32%), circular knowledge (18.92%), content knowledge (24.32%) and assessment knowledge (2.70%). The majority of professional development that was conducted gives positive effect, and multi methodologies could be used for professional development of STEM education. The participant in the professional development dominated by pre service teacher.

Professional development of STEM education has to improve gradually for support STEM framework in 5 – 10 future years (4). There was need reform that will transform knowledge, beliefs, attitudes, and behaviors of educator for STEM recognition deeply. The beneficial of the studies provide for the researcher that understood the current systematical review and identify gap of professional development of STEM education.

7. Finding

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Studies on Experiential Science Education Program Development for Young Children and Their Parents at the Shizuoka Science Museum; RUKURU

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Abstract. These studies discuss the development of the experiential program for young children at informal science facilities and models for science education by reflecting on the science education activities, called "Mebae no Kagaku – Science for Sprouts." The activities have taken places at Shizuoka Science Museum RUKURU since 2015, and are intended for young children and their parents. What these studies have been finding out is whether the programs are "appropriate forms or methods" and "effective activity programs" or not. After reflecting on certain practices and one-year investigations, the best possible programs have been gradually developed. The studies confirm that the program contents should include: 1. Using the five senses by incorporating various events such as aesthetic activities or scientific experiments, 2. Including familiar objects and phenomena that young children have experienced in their daily life, 3. Using materials that are safe and manageable for children, 4. Maintaining the context-dependent multi-layered activities, and 5. Configuring the contents so that they can be carried out by a smaller group, considered as guidelines from the beginning of these studies. Additionally, these studies show parents' high satisfaction for attending the science museum when their children work on a project independently, enjoy experiential scientific activities, and can also retain many of the educational benefits. There is also discussion on the relationship between the guidelines presented here and 21st Century Skills.
Keywords: informal science education, experiential science education program, young children and their parents, social education facilities, relations to 21st Century Skills

1. Introduction

A new trend in the past several years has been the diversification of visitors at social educational facilities especially public museums. The most remarkable demographic rise is in children. In reaction to this change, each facility aims to cater to this new audience in various ways. The eight facilities and eight booths: including "Oya? Ko Hiroba – Curiosity Field" at Miraikan, "Kodomo Taiken Kyoushitsu – Experience Room for Child" at Mie Museum MieMu, "Kodomo Museum – Museum for Child" at Kitakyushu Museum of Natural History & Human History, and "Discovery Room" at Lake Biwa Museum, are reported as precedents for permanent booths at these national and prefectural museums.

Additionally, Somekawa (2015) says understanding the various needs of museums, and acquiring this new class of visitors, especially infants and their parents, are necessary.

The trend of younger visitors is observed at Shizuoka Science Museum RUKURU over these past few years as well, and a new approach to benefit the education of young children and their parents are taken up as an issue. Shizuoka Science Museum RUKURU is well known by Shizuoka citizens as an experimental museum and is also a place where learning is enjoyed. Many elementary students and their younger siblings visit the museum. However, because some experiential exhibitions are limited by height and age, intended to provide safe and enhanced experiences to the children, young children are not able to join some activities which leads to the low satisfaction of younger children's parents. (Sakata&Nagasawa 2016)

The existing permanent exhibitions have been designed for young children, and the everyday activities and events, have been accepting young children as much as possible. Executing activities for the younger demographic has sparked more interest in activities for children and their parents.

Since 2013, "Oyako Kagaku Kyoushitsu – Science Class for Children and Parents" has been held twice every year. Following this project, the workshop targeting young children and their parents "Mebae no Kagaku – Science for Sprouts" has been started twice every month to provide more experiential opportunities and activities to the visitors.

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This study discusses how “Mebae no Kagaku – Science for Sprouts” should be designed, to plan and hold this experimental science program for young children at social education facilities. The study seeks a model for an effective science education program. Additionally, this study discusses an activity that is supported by many people to acquire high satisfaction of younger children’s parents from a management aspect. In this study, experiential science activities for children are discussed with a focus on education.

2. Methods

The programs referred to several previous studies regarding educational viewpoints for similar programs at scientific museums. The previous study “The System of Scientific Literacy Cultivation in Scientific Museum; Four Goals and Five Generations” is systemized by Ogawa et al. (2011). This study indicates that “an activity that excites children’s curiosity for phenomenon happening around them by experiencing science and technology,” is important for infants and children throughout the lower classes of primary schools. Saitou (2006) comments in the study Hard Soft Management of Children’s Museums; that children should experience things that they cannot in school, to support play and learning. He also mentions that the classes in schools that are receiving a cut in hours such as art, music, or laboratory activities need to be focused on in science museums.

Sakata and Kumano (2006) propose that the appropriate content of scientific educational activities for infants are “focusing on developing their ability to see, which becomes the basis of observation and comparison,” “using materials that are manageable for children,” “being designed as an extension of everyday life,” and “configuring the contents so that it can be carried out by a smaller group.” This study referred to these guidelines to decide the program contents: additionally, this study relates to informal education in social facilities.

The experiential science education program for infants was configured by the following conditions: 1.Using the five senses by incorporating various events such as artistic activities or scientific experiments, 2. Including familiar objects and phenomenon that young children experience in their daily life, 3. Using materials that are safe and manageable for children. The framework of execution is designed depending on the science museum’s schedule.

The experiential science education program “Mebae no Kagaku – Science for Sprouts” is currently ongoing, and the framework for execution and program contents has remained the same as the beginning. The first and second year’s framework and contents are introduced, and the data from these past two years is mainly used in this paper. The data includes survey results done by parents on two separate occasions, observation results of participants by staff, and reflections by staff for each class session. The survey was done in December 2015 and January 2016. This project was designed for parents to participate with their children, and many of them spent more time participating in the program, especially in January. Thus, there was less cooperation to complete the survey; December had 17 completed surveys, January had 9.

The evaluation of the management of the program and the program as a whole was done based on this data. The science educational aspect of this program was evaluated as “an activity that brings up scientific nature,” by Sakata and Kumano (2006) and also as “an activity that supports to develop the scientific view and way of thinking” mentioned by Sakata at al. (2008). The evaluation, consideration, and inspection were carried out by four items: if the program is an activity that “grabs children’s attention and curiosity,” “requires them to think,” “leads them to discover and be aware of something,” and “is repeatable and developable.”

3. Results

3.1 Plan and Content

3.3.1 Structure of Execution (April 2015 – May 2016)

Subject: Children up to second grade and their parents
Concept: The first science experience for young children
Date: The second and forth Saturdays (mostly), Once or twice in a month (Table 2)
Time: 10:00 – 11:30 (last reception: 11:00)
Number of people: Participants of scientific work for each class session
3 to 5 children and their parents/1 table (1 staff)
Location: Shizuoka Science Museum, 8F Workshop booth
Cost: Free (Parents pay the museum entrance fee)

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Others: Provide a printed document (size: A5) of a simple explanation for the process and the principle for parents.

3.1.2 Contents

Each program content is on the following Table 3.

Table 3. Date and Theme for "Mebae no Kagaku" (2015)

Date	Program Theme
April 11	Let's Draw a Picture by Stone☆
April 25	
May 9	Thaumatrope (Bird and Birdcage)▽
May 23	
June 13	Transformed Tadpole★
June 27	Let's Create and Play Paper Flog☆
July 11	Let's Draw a Fish by Sand☆
July 25	
September 12	Flying Swallowtail Butterfly★
September 26	Let's Create and Play Paper Grasshopper★
October 10	Let's Create and Play Paper Grasshopper★
October 24	Ptarmigan Workshop▽
November 14	Play with Light Colors☆
November 28	
December 26	Love Orange★
January 9	Floating Plastic Jellyfish☆
January 23	
February 13	Let's Make a Key Ring by Plastic Cup☆
March 12	Kneading Flour Clay
★: Display substance (creature or specimen) ☆: Display works ▽: Display related objects	

Each program is configured by three steps: 1. Storytelling or a picture-story of a children's science book, 2.Scientific work, and 3. Play with the work, following each theme. 15 to 20 minutes of set up time is arranged for Step 1 and 2, but there is no time limit for Step 3.

3.1.3 Staff and Their Role

-three science museum staff members are needed to run the program; tasks include doing workshops, supporting participants, guiding guests to the reception, and observing the participants.

- Storytelling volunteers (3 to 5 people): tasks include reading a story and conducting a picture-story show.

- Recording staff (1 person); tasks include observing the participants while taking pictures of them (occasionally)

3.2 Result

3.2.1 Children's Age and Sex

The participating children's age, sex, and the number of times they participated (from April 2015 to the applicable month) are shown in Table 4. There was no participant age 1 to 2 years old. The participants were ranged from 3 to 8 years old in a good balance. There were almost the same numbers of males and females, and both sexes of children participated in a good balance.

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Table 4. The Basic Information of Children

December 26 "Love Orange"							
1	2	3	4	5	6	7	Age 8
0	0	3	3	3	4	2	2
Sex		Girls: 9 Boys: 8					
Frequency		0-3 time: 16 4-6 time: 1					
January 9 "Floating Plastic Jellyfish"							
1	2	3	4	5	6	7	Age 8
0	0	1	2	1	2	1	2
Sex		Girls: 3 Boys: 5					
Frequency		0-3 time: 9 4-6 time: 0					

3.2.2 Result of Survey and Interview

I asked a survey question about how to feel to participants in the class session. On December 26, all of the participants answered “very fun” and “fun.” On January 9, four of participants answered “very fun”, and another four of them answered “fun.” The result indicated that these activities were enjoyable for the participants.

Table 5. General Impression

	Very fun	**Fun**	**No answer**	n
December 26	70.6% (12)	29.4% (5)	0% (0)	17
January 9	44.5% (4)	44.5% (4)	11% (1)	9

(1) Children
- Children did well observing with a magnifying glass.
- They listened to a story with interest.
- The project seemed a little difficult for three-year-olds to understand, but they enjoyed playing with objects around them.

Children seemed to be interested, and they had curiosity in the subject. The children remarked saying that the previous activity lead them to want to do the next and they said, “I want to take a hot orange bath,” and “I want to try it again.”
- Children enjoyed a lot of experiential activities.
- They enjoyed touching oranges.
- They seemed to enjoy writing with an orange that they usually eat, and how it can be used in different ways.
- They enjoyed it more because of a previously watched video that showed them how oranges could be used to create invisible ink (Aburidashi technique).
- They said they enjoyed finding a new and different way of using an orange that they also love.
- They seemed to enjoy watching a plastic jellyfish floating.
- They seemed to enjoy participating and experiencing the activity.
- In its entirety, children liked the activities.

Both the survey results by parents and the observations by staff reported that children “enjoyed” and “liked” the activity, and also children remained focused on the activity.

(2) Other things relating to operation management

The parents had affirmative opinions about the activity, such as:
- Children enjoyed not only working, but also the storytelling, and the picture-story show.
- They recognized the jellyfish, and enjoyed creating the plastic jellyfish with a color of their choice.

Parents wrote in their surveys that:
- I liked the activity because it was intended for young children.

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- I enjoyed getting a detailed explanation about oranges, which are something that is already very familiar to us.
- It was good that children could enjoy something familiar to them that is also seasonal.
- The activity for young children was enjoyable and interesting.
- I enjoyed seeing static electricity turned into a play.

And also, the parents had suggestions to improve the activity and the schedule.

- It would be more enjoyable if my child were a little older.
- Sundays would be better.
- It would be better if the children's book was about static electricity.
- It would be better if children could play with the work that they created in the activity.

Figure 3. Participants listening to the explanation of the work

Figure 4. Participants and their parents playing with the creations they made in the activity

4. Discussion

4.1 Educational Effect

Children showed their curiosity and interest in the themes, creatures, and the phenomenon that they came across through participating in the activity. Also, children stayed focused on the activity. According to these observed results, it could be said that the activities were "activities that grab children's attention and curiosity." Creating and playing with the work during the activities motivated children to want to play more and be able to move it better, and let them learn by trial and error. The activities are "activities that require children to think." Additionally, observing the display of creatures and specimens and the interesting movements of the created work, constructed "activities that lead children to discover and be aware of something." Some families stayed in the work area or the play area, they played together for a long time, and talked about what they wanted to do with the work they created in their house. Therefore, the activity could be considered "repeatable and developable," even though the program was designed as a single activity to be completed each time. This study confirmed that the activity brought out the scientific nature of the children, and helped develop the scientific view and way of thinking, as intended from the beginning.

4.2 Execution and Operation at Facilities

More people than expected joined the activities. Some people came several times, and there were some families who participated in the activities every time. The participants said they look forward to the activity. The project met the needs of young children and their parents, and resulted in an increased number of visitors at the museum.

The survey showed the parents' satisfaction with watching their children having fun. Additionally, letting parents join the activity with their children and putting the displays intended to arouse their expectations while they are waiting in a line, acquired a high satisfaction for the project. Keeping the activity to a small group of people guaranteed high productivity for each participant. The reflections by staff indicated that small groupings resulted in high satisfaction.

Encouraging parents to not entrust all the work to the staff and to participate and enjoy the activity with their children, in order to share the experience with them was most effective to increase their satisfaction.

5. Conclusion

5.1. Suggestions for program development for parents and their children

The investigation in this study found two expressions that require attention, from survey results of "Mebae no Kagaku – Science for Sprouts." The words such as "…always eat," "the things that they familiar with," or "from the things they know…" revealed two keywords "always" and "familiar." These two keywords were found in many parents' opinions and suggestions. The result showed that the suggestions for program contents should include "ordinariness" in an activity, and that this was most effective for the young participants.

Also, "developable" is another keyword derived from the comments, such as "I would like to do … when I am home" and "I would like to try this again." This keyword is included in four items of standards used for evaluating an experiential science education program. This result indicates if an activity is "repeatable and developable" and is an effective point which should be considered when designing an activity for infants.

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To provide different experiences in each program, the activity was configured to follow three steps: 1. Storytelling or a picture-story of a children's science book, 2.Scientific work, and 3. Play with the work. The theme of activity is introduced during the time participants are waiting in line, and a specimen or a showpiece related to the activity that they can observe, touch or play with are displayed to design a multi-layer activity. The staff points out that maintaining the context-dependent in each activity leads to rouse interests and curiosities of the children and their parents, and that makes it possible to provide a better activity. Additionally, the staff reflect on two points which had been considered since the planning stage; arranging the staff as much as possible and "conducting an activity with a small number of participants," is necessary to conduct an activity effectively.

According to the results, the program contents where an educational effect is anticipated should include: 1.Using the five senses by incorporating various events such as artistic activities or scientific experiments, 2. Including familiar objects and phenomenon that young children experience in their daily life, and 3.Using materials that are safe and manageable for children. These were considered as guidelines from the beginning of this study. Also, 4. Maintaining the context-dependent in its multi-layered activities, and 5. Configuring the contents so that it can be carried out by a smaller group, are confirmed by the results of the study.

Conducting a program following these five instructions can meet conditions of the 21st century model skills 4Cs (Lindeman & Anderson 2015): Creativity, Critical Thinking, Communication, Collaboration: Creativity from guideline 1, and Communication from guideline 5. However, Critical Thinking was not detected from the program for this examination. Almost no collaboration between children and family members was detected. Therefore, further study will be necessary for a future program to bring up these skills.

5.2 Afterword

This study indicated guidance for experiential programs for infants and their parents at scientific museums by evaluating and reflecting the result that the author has been working on at Shizuoka Science Museum RUKURU. "Mebae no Kagaku – Science for Sprouts" considers the conduct schedule, difficulty of the work, and the choice of children books all while continuing to create a new program. Based on this study, a higher quality experiential science education program is aimed to satisfy the needs of a social educational facility. Conducting the same survey from parents as much as possible, and evaluating and reflecting the results is necessary to strengthen the results of this research.

I would like to discuss new figure of science education suggested by the 21st Century Skills or NGSS for the way of science education in the future. Especially in STEM education, what kind of activities are possible, what kind of programs can be provided in social facilities, and how effective the program is for young children.Science education should continue to be studied. I would like to utilize my findings not only at Shizuoka Science Museum RUKURU, but also at zoos and other museums that I plan to conduct activities.

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Science Learning Integrated Local Potential Through Video To Optimize Science Process Skills Of Students

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Abstract. The sciences learning leads the students to achieve three important aspects, which are science as a body of knowledge, science as a way of investigation and science as a way of thinking in pursuit of understanding of nature. Sciences learning will help the students improve their thinking skills to solving the problems related to the phenomena in the universe by employing a sequence of the scientific method and also by applying scientific attitude to build scientific explanations of natural phenomena. One of the way in sciences learning which can applied in the school is sciences learning integrated with local potential. Local potential refers to specific resources found in a definite region including nature, social and cultural environment which can be made use as learning media. To optimize science learning integrated with local potential needs learning media which can engage the students' interest and motivation to learn. One of learning media is video. It is the type of audio-visual learning which can be employed to deliver messages in learning, such as concepts, principles, procedures, theories and applied knowledge to help the students understand the materials being taught. The advantages of using video for sciences learning integrated with local potential, it is hoped that the learning media can increase the students' interest and improve their motivation. By increasing the students' interest and improving their motivation, is hoped that their science process skills can be optimized.
Keywords: natural sciences learning, local potential, learning video

1. Introduction

Learning Natural science is one of the lessons that play an important role in the formation of student character. This is because the nature of science learning is: A body of Knowledge, A way of Investigation and A way of thinking in pursuit of an understanding of nature [10]. In more detail, it can be spelled out that Natural Science Learning can change one's attitude through additional knowledge gained. Increasing knowledge of a person will affect the behavior of a better person and indirectly change one's thinking.

Benefits of natural science learning it becomes the responsibility of a teacher to teach this material well. One approach to learning that can be applied is local potential based learning. Through local potential-based on the learning, the students are led to study science in a contextual way by looking at the various potentials that exist in the student area.

Natural science learning based local potential have applied in the some junior high school in Indonesia. Based on observation result, this learning have been given benefit to increase science process skills and scientific attitude [7]. While give benefit, in implementation this learning found some problems, namely : spend many time and money. One of effort to perfecting the learning tools based on local potential is developing of learning video.

The preliminary observation of the learning process in junior high school students shows the fact that science learning has not utilized local potentials. This is because the teachers do not know what media is suitable to be used to integrate local potential in science learning.

Utilization of technology to maximize learning based on local potential will provide excellent benefits when viewed from the positive side. Reference [12] stated that along with the development of technology, the computer ultimately made by most teachers as a medium of learning so that the term computer-based learning (CBL). But the most commonly used is a combination of audio/data technology, video/data, audio/video.

Video learning is one of the learning media that is categorized as an audiovisual media that has various advantages both in terms of cognitive, affective and psychomotor. Reference [1] explains that

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the use of learning videos can provide motivational motivation for students. Motivation is the initial capital to attract students' attention to learning. Various advantages of video as a learning medium is expected to improve the skills of the learner's process.

2. Review of literature

"Science" (Science) is a branch of science that plays an important role in the advancement of science and technology. IPA is a step to explain the natural occurrence that occurs in the world through an observation and testing of data whose test results can only be received after through empirical evidence [9]. Reference [10] explains the nature of science learning there are three, namely: A body of Knowladge, A way of Investigation and A way of thinking in the persuit of an understanding of nature.

Natural science learning must be learn with contextual evidence. One of types in learning is natural science learning integrated with local wisdom. Local wisdom is part of a culture that has become a tradition, heritage and functional to solve problems, after passing experience in the dimension of space and time in a sustainable manner. These experiences include interactions between humans and human relationships with nature. This is certainly in line with the study of science that studies the symptoms that exist in nature by not forgetting the greatness and power of the creator of the universe so that students will consciously build good relationships with God, people and the environment [6].

To optimize learning process,it need the learning media. One of learning media is video. Video of learning is one of the audiovisual media in the form of dynamic visual projected [1]. While Reference [4] explains that video is a very effective media for use in mass learning, individually or in groups. The video is one of the non-print media that can present various information and display images that move along with the sound.

The benefit of using video based on [13] namely:

1. Messages delivered can be comprehensive for all learners
2. It is very effective to explain a process
3. Solutions to overcome the limitations of space and time
4. Can be played repeatedly as needed
5. Provide a deep impression on the learners that can affect the attitude of learners

Reference [8] describe the benefits of learning videos that provide improved student learning outcomes. Another research also conducted by [14] on the Development of Water Resource Learning Media to Improve the Process and Results of Learning Elementary School Students. The result of this research is video learning media of water cycle can improve the process and result of science learning of grade V student of SD Negeri Bintoro 02 Jember.

While the easy way to make videos by Fauziyah [11], namely:

1. Setting a scene or theme that matches the intended purpose
2. Develop the theme by dividing the event into a series of coherent shots.
3. Set up the shooting technique
4. If you want to change or pose a particular scene, you should provide inserts with different and striking shots
5. Anticipate the continuation of the expected scene of the audience
6. Not taking a particular object with a long duration.
7. Provide a convincing impression by recording something clearly about 3 seconds.

Reference [2] explain that the skills of the science process is a person's skill that will help a person to think creatively and become an intellectual material to solve problems and make decisions related to Science, Technology, and Society.

3. Discussion

Integrated science learning with local potentials is being utilized by teachers in junior high schools as an effort to preserve local potentials in the region. Some researchers have done the development of local potential based learning tools. Reference [5] developed science-based learning tools based on Jepara's local potential and gained significant results on improving the science process skills. In addition, [3] who also developed a local onion-based potential instructional tool also showed similar results that there was a significant increase in the science process skills of students taught using the device.

Significant results of IPA process skills taught using local potential-based learning tools will be more optimal with the use of instructional media. Learning should be done in local potential creation

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sites, with the help of media in the form of video can make it easier for students to keep learning in the classroom without reducing the essence of natural science learning. In addition, the large costs to be incurred by students or school parties can be minimized by simply showing lessons in the classroom. The many benefits of video learning are expected to further optimize potential-based learning in local junior secondary schools.

4. Conclusion

Natural science learning based on local potential is one of alternative method to send massage to student. This method give more benefit. For example is can be improve science science process skills and scientific attitude. So, to maximize this learning, need one of learning media. One of learning media estimated effective to improve this learning is video based on local potential.

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The Influence of Collaborative Learning on The Science Student's Achievement on Primary School

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Abstract. This study is aimed to describe the influence of collaborative learning on the science student's achievement on primary school. The implementation of collaborative learning at the primary school is rarely using in learning. Improving of learning achievement needs innovation in any learning process for learners. The material of this research is about soil and earth. The categorized of this research is quasy experiment research study design with *posttest control group design*. The population was Sidomulyo primary school learners as many as 298 students. The sample is determined by random sampling by using fifth grade which consists of two classes totaling 50 student as an experimental class of collaborative learning, 25 as an experimental class collaborative learning and 25 as the control class. Science learning achievement data using essay test data is analyzed using t-test. The results showed that the effectiveness of the application of learning for improving learning achievement more effectively used in collaborative learning than conventional learning.
Keywords: collaborative learning, science, student's achievement.

1. Introduction

Education is one of way to reach dream child**.** The implementation of education in school must be fun and meaningfull for children. Many method which is used in classes to develop children potential. The concern is important learning fun both understanding and student active in classes. One of method to make children active in classes is using active learning method. This method is not using teacher centered but student centered. Both student and teacher are important to active learning. Brodie (2010:57) collaborative learning as a communicative process whereby two or parties gain new konowledge as a resulr of their interaction. That explanation learning collaborative is be able active learning in classes. Collaborative learning also helping the world of education during using teacher centered and more emphasize conventional learning. Maxim (2010:360) collaborative learning as a some-what informal method of teaching and learning where student join together to further certain learning goals or create a major project. The process of colaborative learning is based an the idea that learning is a natural social act in which the participant talk share, plan together, and work together. That student learning together to finish project. These activity learning student had chance to speak, report, and team work. All of thing that explanation is different with realization in conventional learning.

Learning collaborative have different structure with others. Watskin, Ellen & Logde (2007:94) structure of collaborative learning are:

1. Formulate your answer to the question individually
2. Share your answer with your partner
3. Listen carefully to your partner. Note similaritiesand differences in your answer
4. Create a new answer that incorporatesthe best of the best idea. Be prepared to present your answer if called upon.

Collaborative learning structure excellence are making studebt active and directed looking for information about knowledge by their self. One of subject lesson which is corresponding caracteristic student active looking for information is science. Madison (1986*)* is human activity from problem and question are connecting with natural phenomena which can identification and describe until had a solution what is true in the fact. People often ask about something in nature can be called pheomena. Phenomena can be seen with other person in the world and rtrue in the fact can be felt with human sense.

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Bunn (2013) science embrace 4 matter: process, product, aplication, and attitude. Science as product are fact, concept, principle, teory and law. Science as process are doing the manner to work. Science as aplication is implementation knowledge abaout science in life. The ability must have to indentification relationship concet science in real life. Science as attitude is scientific attitude to take and develop scientiststo reach result. Result must be objective, not hurry, open minded, can distinguish fact and opinion, impartial opinion, unbelieve fiction, can teamwork with other, curios in phenomena. The explanation that science learning make a subject which is activity in which is activity emphasize to active in exploration for developing knowledge. That is science learning more precese using colaborative learning. Besides making student active and understand, collaborative learning can helkp student to improve student achievement on science.

2. Method

This research using true experimental design with posstest only control design. The research used 2 classes with five grade, one class experiment and one class control. The experiment class are given treatment to collaborative learning and control class are given conventional learning. The population are 298 student from one grade until six grade. The sample are 50 partisipant. There were 25 student experimental condition and 25 control class.

The experimental and control classes were equivalent in age, amount of student, and sex. Student in experimental class form groups. The group consist of five student. Measurement the dependent variable using instrument test. The type of test is essay with fourthteen number test. Every number are different qualification. The assesment of the test are maximal score is shared one hundred and multiplication one hundred. The result is compare both experimental class and control class. Data analysis using SPSS v16.00.

3. Result

Normalitas data test used data sampel from population will be analizing normal distribution. Normalitas test is one of requirement t test. Technique will be used is kolmogorov-smirnov with SPSS v16.0.

Table 1. Result of Normalitas Test One-Sample Kolmogorov-Smirnov Test

		Eksp	Kontrol
N		25	25
Normal Parameters[a]	Mean	70.9600	67.8800
	Std. Deviation	4.16813	4.05504
Most Extreme Diff	Absolute	.191	.249
	Positive	.191	.191
	Negative	-.167	-.249
Kolmogorov-Smirnov Z		.955	1.244
Asymp. Sig. (2-tailed)		.321	.091

Normalitas data test experiment from SPSS v16.0 based on kolmogorov smirnov test is 0,321. The comparation with significant level 5% that 0.321>0.05. the result is diferent from kontrol class. The result of normalitas test from significant level 5% is 0.091>0.05. the result can be conclusion that data test is normal.

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Tabel 2. Homogenitas dan Uji t

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	Df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference Lower	Upper
hasil belajar	Equal variances assumed	.005	.947	2.648	48	.011	3.08000	1.16304	.74155	5.41845
	Equal variances not assumed			2.648	47.964	.011	3.08000	1.16304	.74150	5.41850

The result of score homogenitas is 0.947. The meaning from result is hight signficant from 5%. This is 0.947>0.05 that data is taken from homogen data. Based on table in bottom is known that t-test with significant 5% and degree of freedom (df) 48 result obtained 2.468 while result of significant 2-tailed for t-test is 0.011, so the significant is 0.011<0.05 can declare that Ho are rejected. It is mean that 2 classes had diferent average. That result is there influence of science student achievement in material soil and earth on student grade V SDN Sidomulyo Kecamatan Semen Kabupaten Kediri on periode 2013/2014 after implementation of collaboratif learning.

4. Discusscion

Research are used 2 class, that is experiment class and control class. Experiment class get a treatment and control class did not get a treatment. Based on this research, result analysis can conclude that student achievement control class is lower than experiment class. Experiment class is given treatment colla-borative learning get hight average reach 70,96. The result of calcullation is use SPSS for windows v16.0 can know if probabilitas <0.05 is hyphothesis rejected. The meaning of significant 0.011is lower from 0.05 (0.011<0.05) that is Ho rejected. That result is there influence of science student achievement in material soil and earth on student grade 5 SDN Sidomulyo Kecamatan Semen Kabupaten Kediri on periode 2013/2014 after imple-mentation of collaboratif learning.

5. Conclusion

Based on research can conclude that collaborative learning be able to improve student achievement on material soil and earth grade 5 in primary scool. Improving student reseach that known from result post test after using collaborative learning.

6. Suggestion

Colaborative learning can improve student interaction and passion learning student. The other side can improve active learning in the class. The author suggetion are used this treatment in science learning.

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Development of STEM Learning Materials and Lessons through Project Based Learning Model for Middle School: NGSS Framework

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Abstract. According to the results of PISA 2015, the rank of Japanese students' skills was dropped in motivation on learning science fields (OECD, 2016) even though the score of PISA had increased. Integrated STEM education through Project Based Learning can increase student interest in Science, Technology, Engineering, and Mathematics because they involve students in solving authentic problems, working with others, and building real solutions. This research was to investigate the effectiveness of learning materials and lessons plan to provide cleaning wastewater by using STEM education approach. STEM learning through Project Based Learning was developed by NGSS (*Next Generation Science Standard*). Furthermore, the goal of this study is to define students` critical thinking skill. In these lessons, the participants were 160 first grade Japanese middle school students from four classes. They were divided into nine groups each class. Students were asked to design tools to clean up the wastewater. Students were given more than one chance to design the best product for wastewater treatment. The lessons consisted of six lessons. First lesson was introduction of colloid, solution, and suspension, and discussion about wastewater. Second lesson to fourth lessons were finding solutions and designing products. Fifth lesson was to watch video of wastewater treatments in Japan and to optimize the solutions or products. Last lesson was to make conclusion, to exchange presentations, and to develop discussion. In order to collect data, students had to draw their designs in the worksheets. The results showed that STEM learning through Project Based Learning suitable with NGSS framework consist of *Crosscutting Concept, Scientific and Engineering Practices, and Disciplinary Core Ideas*. Their ideas and strategies changed after they develop and try their product. The result of students` design were various of wastewater treatment; biological system, physical system, chemical system, or combination of systems. Therefore, we concluded that these lessons provide students to improve their 21st century skills
Keywords*: STEM education, Project Based Learning, NGSS framework*

4. Introduction

According to predictions, the job in STEM (Science, Technology, Engineering, and Mathematics) sectors will increase in the next decade more than jobs in other sectors (Committee on STEM Education National Science and Technology Council 2013; Klobuchar, 2014). Therefore, the importance of STEM education has been realized by government, academia, industry, and society. In the future, the students possibly do not work based on their educational background. The role of education as basic to career advancement has been aimed in international setting (OECD 2013). Therefore, STEM education could be a way to bridge the gap between education and required workplace 21st century skills.

According to data from the United State Department of Labor, the importance of STEM skills are *problem solving skills (ill-defined problem), system skills, technology and engineering skills, and time, resource, and knowledge management skills* (Jang, 2015). The learning in this new era, scientific experiments are not sufficient to improve students' 21st century skills, but how to apply scientific concepts to design the technologies or products and solving problems are required. The change of human life will be accompanied by the evolution of technology. Therefore, students have to be prepared for the future challenges. Scientific inquiry, scientific practices, and engineering practices are required to encourage students to be a citizen who can adapt to face new conditions and problems

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(Bybee, 2013; NRC, 2012). Scientific practices involve the habits and skills that used by scientist and engineers to solve problems and strive the human being needs.

STEM education and 21st century teaching and learning will succeed through *Project-Based Learning* model (Capraro, et. al, 2013; Vasquez, 2014; Kertil and Gurel, 2016). Integrated STEM education through *Project-Based Learning* can increase student interest in science, technology, engineering, and Mathematics because they involve students in solving authentic problems, working with others, and building real solutions (Rush, 2010). Encourages an interdisciplinary approach by giving students *Project-Based Learning* on a regular and consistent basis where they have an opportunity to identify a problem, develop a solution, follow a processes, and then design and market products. In addition, students create and present project-based assignments outside of the traditional classroom that connect what they learn to real-world applications. STEM *Project-Based Learning* in school motivated low performing students to more interest study hard in STEM fields and decrease the achievement gap (Capraro, 2014).

Multiple studies have reported that students in PBL taught classrooms demonstrate improved critical thinking and problem solving skills (Shepherd, 1998; Thomas, 2000). Researchers have also found that PBL has been a successful way of teaching 21st century skills, and that it increases student engagements and content learning. Further, students have showed more initiative by utilizing resources and revising works, also students' behaviors were uncharacteristic before they were immersed in the PBL-instructed classes (Baron, Schwartz, 1998).

5. Methodology

The study applied descriptive research design. Descriptive research is used to obtain information concerning the current status of the phenomena to describe "what exists" with respect to variables or conditions in a situation. The participants were 160 first grade Japanese middle school students from four classes. They were divided into nine groups in each class. The instruments were worksheets to explore problem solving processes. Besides, the instruments were wastewater, filter paper, beaker glass, plastic bottles, litmus paper, and some materials or tools which needed by students. Therefore, students had to think the materials in order to solve problems.

In these lessons, students not only wrote worksheets, but also designed tools to clean up the wastewater. Students were given more than one chance to design the best product for wastewater treatment. The lessons consist of six lessons, first lesson was the introduction of colloid, solution, and suspension, and discussion about wastewater. From the second lesson to fourth lesson were to find solutions and design products. Fifth lesson is watch video of wastewater treatment in Japan and optimize the solutions or products. Last lesson was to make conclusion, presentation, and discussion. The lessons were started by explanation of different solution and colloid, furthermore, illustration problem about the need of wastewater system in our city to conserve the sea. And then, students had to find solutions to clean wastewater.

6. Result and Discussion

STEM learning through Project Based Learning was developed by NGSS (*Next Generation Science Standard*) framework. In this study, the lessons consisted of six lessons, first lesson was introduction of colloid, solution, and suspension, and discussion about wastewater. Second lesson to fourth lesson were to find solutions and design products. Fifth lesson was to watch video of wastewater treatment in Japan and optimize the solutions or products. Last lesson was to make conclusion, presentation, and discussion. Each learning was described in the following table 1.

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Table 1. STEM Lessons

Activity	**Crosscutting Concepts**	**Scientific and Engineering Practices (NGSS Framework)**	**Disciplinary Core Ideas**
First Lesson			
Introduction of the theme of lessons and dividing the groups. (9 groups)			
Provide students to mention examples of solid, liquid, and gas (state of matter) in their daily life. (**Physics**)	Molecules pattern of solid, liquid, and gas. (CCs 1)	Asking questions and defining problems. (SEPs 1)	**Structure and Properties of Matter** The fact that matter is composed of atoms and molecules can be used to explain the properties of substances, diversity of materials, states of matter, phase changes, and conservation of matter. (PSs 1.A)
Students observe the demonstration and determine the colloid. (**Chemistry**)	Pattern, Cause and Effect, Scale. (CCs 1, CCs 2, CCs 3)	Asking questions and defining problems. (SEPs 1) Engaging in argument from evidence. (SEPs 7)	
Teacher introduce wastewater treatment plant/ cleaning water system and asks students to find any information about how to clean wastewater. (**Science, Technology, Engineering, and Mathematics**).	Matter is conserved because atoms are conserved in physical and chemical processes. (CCs 5)	Constructing explanations and design solutions. (SEPs 6)	**Type of Interaction** Electric and magnetic (electromagnetic) forces can be attractive or repulsive, and their sizes depend on the magnitudes of the charges, currents, or magnetic strengths involved and on the distances between the interacting objects. (PSs 2.B)
Students search information in internet, books, and so on.			
Second, Third, and Fourth Lesson			
Students design wastewater treatment system. Students determine what they need to clean	Influence of science, engineering, and technology	Asking questions and defining problems. (SEPs 1) Developing and using	Defining and delimiting engineering problems. (ETSs 1.A) Developing possible solutions.

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wastewater. Student check water clarity by their eyes. (**Science, Technology, Engineering, and Mathematics**). Students check pH before and after cleaning processes. Students redesign the wastewater treatment system. (**Science, Technology, Engineering, and Mathematics**).	on society and the natural world. (CCs 7)	models. (SEPs 2) Planning and carrying out investigations. (SEPs 3) Analyzing and interpreting data. (SEPs 4) Using mathematics and computational thinking. (SEPs 5) Constructing explanation and designing solutions. (SEPs 6) Engaging in argument from evidence. (SEPs 7)	(ETSs 1.B) Optimizing the design solution. (ETSs 1.C)
Fifth Lesson			
Students watch video about wastewater treatment plant. Students redesign wastewater treatment by drawing or if the time is available, students can redesign their prototype. (**Science, Technology, Engineering, and Mathematics**).	Influence of science, engineering, and technology on society and the natural world. (CCs 7)	Developing and using models. (SEPs 2) Planning and carrying out investigations. (SEPs 3) Analyzing and interpreting data. (SEPs 4) Using mathematics and computational thinking. (SEPs 5) Constructing explanation and designing solutions. (SEPs 6) Engaging in argument from evidence. (SEPs 7)	Defining and delimiting engineering problems. (ETSs 1.A) Developing possible solutions. (ETSs 1.B) Optimizing the design solution. (ETSs 1.C)
Sixth Lesson			

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Students present and explain their prototype of wastewater treatment system. **(Science, Technology, Engineering, and Mathematics**).	Influence of science, engineering, and technology on society and the natural world. (CCs 7)	Obtaining, evaluating, and communicating information. (SEPs 8)	Defining and delimiting engineering problems. (ETSs 1.A) Developing possible solutions. (ETSs 1.B) Optimizing the design solution. (ETSs 1.C)

Collected data from the worksheets involving design solutions, results, and conclusions. The problems were defined by students almost same, which was how to clean wastewater before move to the sea, because if the sea dirty, it would damage the environment. Some examples of students' design solution can see in table 1. Most of students had ideas about distillation and filtering system to clean the wastewater.

According to students` worksheets, some of groups cleaned wastewater using simple distillation system or boiling. However, students realized that boiling consumed more energy and could not be an efficient solution. In this case, students evaluated their solution, it meant that they had critical thinking skills (Elder and Paul, 2003). Furthermore, students use euglena to clean wastewater. Unfortunately, the results did not like their predictions, wastewater were still dirty. Based on their experiment results, they thought that distillation method could clean wastewater and using Euglena would not contaminate environment. Finally, students concluded that the combination of distillation and euglena would be an effective, efficient, and environmental friendly solution. According to these statements, students were still lack of logical thinking and made conclusion from the data. Distillation used heating for boiling the water, so it could not be an efficient solution.

Another one of sample of students' solution was evaporation. They provide 3 samples of wastewater and each sample was boiled in different length time. Their thinking was similar researcher and they tried to investigate the result based on length time of boiling. However, they did the experiments in opened condition. So, the clean water would go to atmosphere. Even though 15 minutes boiling showed the cleanest result than others and pH of wastewater were most acidic than others. According to this, 15 minutes boiled sample was not fresh water, because range of pH was too large. If this acid water go to the sea, it would make the sea be acidic. They did not analysis and evaluate the data, it means they lack in critical thinking skill.

7. Conclusion and Limitation

The results showed that STEM learning through Project Based Learning suitable with NGSS framework consist of *Crosscutting Concept, Scientific and Engineering Practices, and Disciplinary Core Ideas*. Their ideas and strategies changed after they develop and try their product. The result of students` design were various of wastewater treatment; biological system, physical system, chemical system, or combination of systems. Therefore, we concluded that these lessons provide students to improve their 21st century skills

The present study has some limitations that need to be taken into account when considering the study and its contributions. The participants in this study were self selected based on random distribution, there was no arrangement in division of the groups. The division of group should consist of higher thinker who can be a leader to guide lower thinker.

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Effectiveness Of Learning With Collaborative Problem Solving (Cps) Model To Improve Science Literacy Skill In Unipdu Jombang

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Abstract. This study aimed to produce valid, practical CPS (Collaborative Problem Solving) model science learning materials to enhance science literacy skill of prospective MI teachers. The tryout of the materials was implemented to students of MI teacher education of Unipdu Jombang at an academic year of 2016/2017 semesters six since March-May 2017 using One Group Pre test Posttest Design. The data collections were done using observation, testing, and questionnaires. Data were analyzed using descriptive analysis of quantitative, qualitative and non-parametric statistical tests. The findings of the research were: 1) the learning materials were valid; 2) Practicality of the materials was tested through the implementation of lesson plans, while the learners' activity was appropriate to the CPS (Collaborative Problem-Solving) model; and 3) The effectiveness of the learning materials in terms of improvement of learning outcomes of students was seen from the n gain with high category and increasing mastery of science literacy skills of learners also scored n gain and the response of students to the device and the implementation of learning is very positive. It was concluded that the materials were valid, practical to enhance science literacy skills of prospective MI teachers.
Keywords*:* Learning Material, Collaborative Problem Solving, Science literacy Skill

1.Introduction

The low literacy of science learners in Indonesia can be one of the illustrations that science learning in Indonesia still needs improvement. Science literacy of teacher candidate students in Turkey is also low [1]. The interpretation that can be concluded from the results of PISA study, only one that is what we teach differently from the demands of the times. When we look at the facts in the field the learners we are very good at memorizing but less skilled in applying the knowledge that is owned in problem-solving. This may be related to the propensity to use rote as a vehicle for mastering science, not thinking ability. Therefore scientific literacy is a must for everyone. Scientific literacy is very important for a person because of the development level of a nation is determined by the quality of human resources that possess science and technology awareness [2] [3] [4] [5] [6] [7] [8]. Science education is expected to be able to implant scientific literacy, which in turn support Indonesia development. Science literacy has now become the widespread concern for scientists, professors and politic's stakeholders [2] [9].

The development of literacy is needed to help prospective teachers understand the science literacy material and its elements, and be able to use appropriate learning methods to develop science literacy in the classroom [2] [10] [11]. In the development of science literacy it should be noted that prospective teachers should be given innovative learning so that the taught material can be understood meaningfully for everyday life [2].

The results of research [12] [13] [14] [15] [16] [17] [18] [19] [20] states that learning and assessment of collaborative problem-solving skills are indispensable and driven by the need for students at school and career levels that require the ability to work in groups and apply their problem-solving skills have in a real social situation. The function and advantages of collaborative problem-solving skills are 1) as the provision of learners in the face of globalization competition in the world of work, 2) as an alternative solution to individual problem-solving difficulties in learning, and 3) improving social skills in solving problems in life everyday [21] [22] [23] [24] [25] [26] [27] [28] [29] [30]

The results of the TIMSS and PISA study of Indonesian student problem-solving skills are listed below [31] [32] [33] [34] Indonesia gets lower level does not mean students do not have the intelligence

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to compete with other countries, but the learning process is not by the standard tests used by PISA and TIMSS. It needs to be a joint evaluation material in the process of improving learning in the field of education comprehensively.

The CPS learning model as an alternative is developed to improve science literacy skills. The CPS learning model consists of six phases: (a) sharing perspectives, (b) defining problems, (c) identifying interests, (d) making choices, (e) determining objective criteria, and (f) evaluating options, choice and reach agreement [35] [36].

Based on the above explanations, the CPS model is selected to improve science literacy skills of MI teacher candidates. Researchers will design and conduct research entitled "Development of learning tools of IPA CPS model to improve science literacy skills of MI teacher candidates."

2. Method

This study was developing science teaching materials with CPS model to develop science literacy skill to prospective MI teachers. The research was carried during March-May 2017. Subjects were 35 learners of PGMI (MI Teacher Education) 6th semester who took science subject in the academic year of 2016/2017.

The design of the research is One–Group Pretest Postest design. [37]

Table 1. One–Group Pretest Postest design

Pre - test	Treatment	Post - test
O1	X	O2

The variables associated with this study are as follows:

a. CPS learning model
b. The Validity of teaching materials
c. Variables related to the practicality of learning tools, including:
   1). Learning implementation
   2). Students' activity
d. Variables related to the effectiveness of learning tools, including:
   1). Science literacy skill
   2). Students' response

3. Result and Discussion

The Collaborative Problem Solving (CPS) was developed by the Department of Psychiatry at Massachusetts General Hospital (MGH) staff in Boston, Massachusetts and the first book describing the CPS approach was published in 1998 [38]. The CPS model is conceptualized from behavioral externalization as a product of cognitive skills stored in the problem-solving domain, flexibility, and tolerance of frustration [38]. The results provide evidence that the use of CPS by challenging children is successful in decreasing oppositional and stressful behavior, reducing the use of restraint, and improvements in individual skills, including social functioning [31] [38]. Collaborative Problem Solving (CPS) model developed by [36] [38] [39] with general goals for collaborative problem solving.

Table 2. Phases Collaborative Learning

Phases	Define
1. Share perspective	Learners use communication skills to understand other perceptions of the situation, their needs, and desires.
2. Define the problem	Learners clarify topics and issues for discussion.
3. Identify interest	Learners identify common agreements and shared interests between all parties.
4. Make choices	Learners brainstorm and generate ideas, look at problems from all angles and consider as many different ideas as possible in problem-solving.
5. Define objective criteria	Learners solve problems using agreed criteria, combining and reducing options. Students make agreement.
6. Evaluate options and reach agreement	a complete list of shared opinion ideas and objective criteria mutually agreed, Learners evaluate choices and move toward creating agreements, collective needs and

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Phases	Define
	possible interests on problem-solving.

(Source: [35] [36])

Learning is basically an educator's effort to help learners learn to gain knowledge [40] [41] [42] [43] [44] [45] Educators as innovative change agents are required to have the ability to guide learners in scientific investigation activities [46] [47].

Collaborative Problem Solving (CPS) learning has some of the following empirical studies. The results of research [15] with a sample of 179 students (88 men and 91 women all aged 14 years), ie 1) the chances of conflict in CPS activities in human-to-human CPS (CPS activities emphasized on interaction between students with other students) are higher when compared to human-to-agent CPS (interaction between students with existing agents in the computer (software) in CPS activities, namely: to propose solutions, confirm solutions, solve solutions, and disagree with solutions proposed people etc.), 2) assessment tasks should be designed in such a way that to achieve success in performance on task completion requires cooperation and interdependence between participants [15]. The results of research [16] study provide recommendations for further research on Collaborative Problem Solving (CPS), namely: 1) advanced research may consider exploring communication methods, and 2) further research may consider exploring differences in student achievement in various problems and collaborative methods [16]

Table 3. Difference Cooperative and Collaborative Learning

No	Cooperative learning	Collaborative learning
I	Equality	Equality
	1. Learners assess individual and group performance. 2. Learners work together in groups with emphasis on social skills	1. Learners assess individual and group performance. 2. Learners are required to work together in groups with emphasis on social skills.
II	Difference	Difference
	1. Learners receive social skills training in small groups. 2. Structured problem-solving activities with each Learner have a particular role. 3. Educators observe, listen and intervene in groups when needed. 4. Cooperative learning is described as an "order" in a community process that helps each other and is interconnected to meet achieve a goal with closed-ended tasks. 5. Cooperative learning is more directive and more controlled by educators. 6. Cooperative learning of many team analysis mechanisms and introspection centered on Educators while in collaborative learning more centered on Learners	1. There is a belief that students already have the necessary social skills and they will build on existing skills to achieve their goals. 2. Students in groups (at least two people) jointly organize and negotiate in solving problems that are more open and complex. 3.Collaborative activities should not always be monitored by instructors/ teachers. When the question is directed toward the educator, the educator-only guides Learners for the information they need. 4. student collaboration learning is emphasized to build knowledge where it is distributed throughout the group and is open-ended in solving problems. 5. Collaborative learning is more open and more controlled by learners.

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No	Cooperative learning	Collaborative learning
		6. Collaborative learning of many team analysis mechanisms and introspection is more centered on Learners.

(Source: [14] [22] [48] [49] [50] [51] [52] [53] [54] [55] [56] [57] [58]

Scientific collaboration is a scientific activity carried out by more than one individual using interdependence, including scientific activities conducted by small teams and larger groups [59]. Social interaction in collaboration skills is an important component. Collaborative skills can be assessed on individual, and group contributions [53] [60] [61] and the advantages of collaborative activities show better problem-solving skills compared to individuals [53].

Table 3. Level Science Literacy Skill (Rubrics)

No	Science literacy skill	Level
1	Learners can describe and apply the inquiry inquiry scientific method in investiga- tion, questioning, and solving problems.	**Beginner** a. Students cannot identify scientific problem. b. Students do not understand the problem solving. c. Students cannot identify hypothesis. **Middle** a. Students can identify scientific problem. b. Students choose a solution for problem. c. Students can define a hypothesis. **Advanced** a. Students can repeat research questions. b. Students can predict one or more solutions. c. Students can construct hypothesis. **Expert** a. Students can develop research questions. b. Students can evaluate various alternative solutions. c. Students can propose how to evaluate hypothesis correctly.

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No	Science literacy skill	Level
2	Learners can describe procedures and experiment steps	**Beginner** a. Students cannot understand research purpose. b. Students cannot decide the materials for experiment. c. Students cannot interpret experiment variables. **Middle** a. Students cannot rephrase the research purposes with their words. b. Students can designate the materials for experiment. c. Students can differentiate free and bound variables. **Advance** a. Students can rephrase the research purposes with their words. b. Students can designate the materials for experiment. c. Students can differentiate control and free variables. d. Students can explain the relation between steps in experiment. **Expert** a. Students can rephrase the research purposes with their words. b. Students can designate the materials for experiment. c. Students can filter free and control variables. d. Students can manipulate free and control variables. e. Students can modify the research design.
3	Students can present experiment assignment correctly and accurately	**Beginner** a. Students cannot obey safety rules and use lab tools safely and carefully. b. Students cannot follow the writing procedure c. Students cannot identify scientific tools accurately d. Students cannot work independently. **Middle** a. Students obey safety rules and use lab tools safely and carefully. b. Students follow the writing procedure accurately. c. Students can use scientific tools with accurate techniques. d. Students can measure and write the data. **Advance** a. Students obey safety rules and use lab tools safely and carefully. b. Students follow the writing procedure accurately c. Students can use scientific tools with accurate techniques. d. Students can measure and write the data with minimum mistakes. **Expert** a. Students take initiative to follow research procedures accurately.

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No	Science literacy skill	Level
		b. Students take initiative to follow writing procedures accurately. c. Students take initiative to use scientific tools with accurate techniques. d. Students take initiative to measure and write the data accurately.
4	Students can interpret and communicate scientific information using writing, verbal and graphic data	**Beginner** a. Students cannot interpret information quantitatively from the table and graphic using simple vocabularies. **Middle** a. Students can interpret information quantitatively from the table and graphic using simple vocabularies. b. Students can construct table data and present information in graphic. **Advance** a. Students can interpret information quantitatively from the table and graphic using simple vocabularies. b. Students can construct table data and present information in graphic independently. c. Students can communicate experiment and investigation results. **Expert** a. Students can accurately interpret information quantitatively from the table and graphic using sophisticated diction, and make accurate inferences. b. Students can construct table data and present the information in graphic independently. c. Students csn communicate experiment and investigation results clearly. d. Students can draw logic conclusions based on the accumulated data
5	Learners can de- scribe and analyze one or more rela- tionship issues of science technology and society as well as demonstrating a scientific under- standing of the application in daily life.	**Beginner** a. Students cannot identify technology breakthrough and its relationship with science. **Middle** a. Students can identify technology breakthrough and its relationship with science. b. Students can put the technology breakthrough in historical context. c. Students can mention some effects of technology toward society. **Advance** a. Students can identify technology breakthrough and its relationship with science. b. Students can put the technology breakthrough in historical context.

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No	Science literacy skill	Level
		c. Students can mention some effects of technology toward society. d. Students can explain one or more scientific technology principals. **Expert** a. Students can identify technology breakthrough and its relationship with science. b. Students can put the technology breakthrough in historical context. c. Students can mention some effects of technology toward society. d. Students can explain one or more scientific technology principals. e. Students can describe some examples or future development of scientific technology in society
6	Learners can show the explanation of natural phenomena with a logical understanding, experiment steps or applying the concept of science and technology	**Beginner** a. Students can hardly identify logical explanation based on observation toward science phenomena. **Middle** a. Students can identify logical explanation based on observation toward science phenomena. b. Students can identify mindset error or illogical explanation based on observation. **Advance** a. Students can identify several alternative logical explanations based on observation toward science phenomena. b. Students can identify mindset error or illogical explanation based on observation. **Expert** a. Students can identify several alternative logical explanations based on observation toward science phenomena. b. Students can identify mindset error or illogical explanation based on observation. c. Students can evaluate some statements based on observation, experiment, or accumulated data.

(Source: [2] [18] [19])

Table 3 shows that there are 6 skills of scientific literacy which have multiple levels that have been developed by the researchers based on [18] [19] that the skills of scientific literacy will be owned by a person in different levels after varied learning process depending on the previous understanding, the current understanding of the learning process and the ability of learners in associating their understanding with the concept or other situations.

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Student activity in Teaching and Learning process was observed by using a percentage of agreement technique and observation was done by 2 observers.

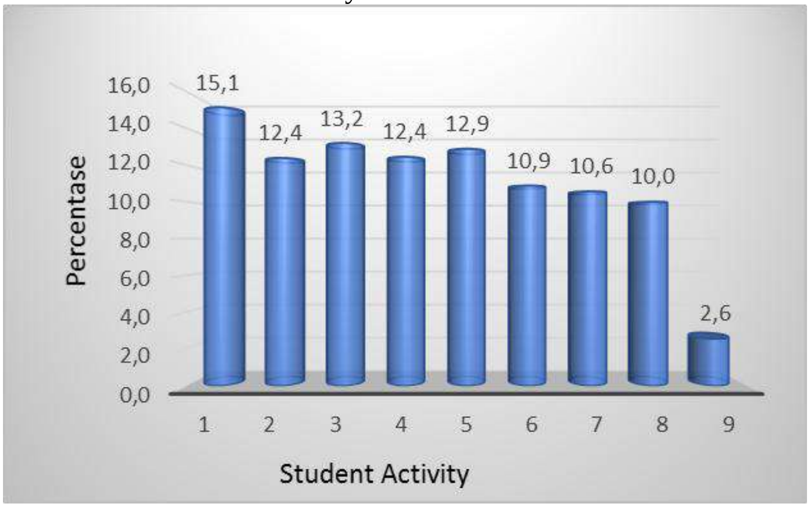

Figure 1. Student Activity

1.Bring out opinions/ideas 15.1 %
2.Pay attention to the demonstration by lecturers 12.4%
3.Doing the exercises 13.2 %
4.Discuss with group mates in doing the exercises 12.4%
5.Taking into account groups doing joyful learning modeling 12.9 %
6.Responding to questions given by other groups 10.9%
7.Discussion between students and lecturers 10.6%
8.Summing up the work or learning materials 10.0 %
9.Irrelevant behavior: (2.6 %)

- Irrelevant conversations,
- Do something irrelevant,
- Interfere with friends,
- Daydreaming, and
- Seeking attention.

Data about student responses to learning are categorized into 4 components that include attention is student's attention to learning, the relevance that is the relation of the material studied to the needs of students, confidence that is student self-confidence during follow learning and satisfaction that is student's satisfaction in following learning.

Tabel 1.3 Student Response

No	**Component**	**Student response**	
		average	Criteria
1	*Attention*	3.96	Good
2	*Relevance*	3.61	Good
3	*Convidence*	3.79	Good
4	*Satisfaction*	3.82	Good

Collaborative is the process of participation of multiple people or groups who coordinate and cooperate collectively to plan, implement and evaluate programs to achieve goals and solve together with high positive dependence [18] [19] [21] [22] [25] [53] [62] [63] [64] [65] [66] [67] [68] [69].

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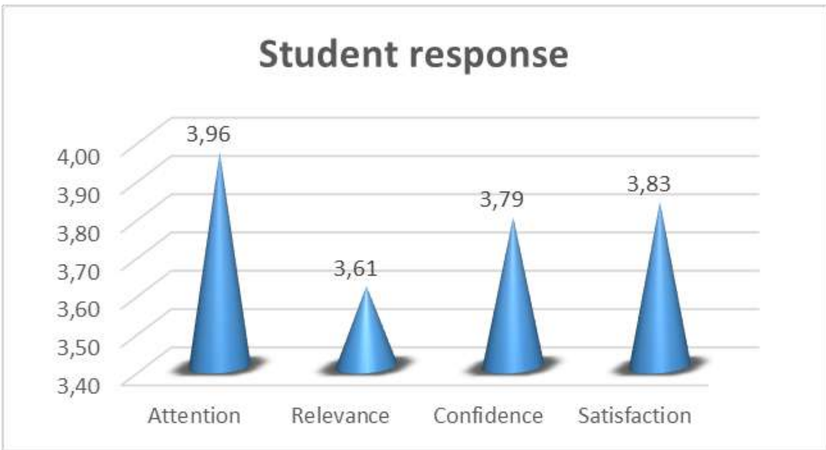

Figure 2. Student Response

Figure 2. shows the average score of student responses that include the components: Students' attention to learning each 3.96 with good category, the relevance of the material studied with the needs of students have 3.61 each with good category, confident students during learning 3.79 with categories good, and student satisfaction in following learning 3,83 with good category.

Some of the findings in this study were based on results and strengthened by facts during the learning. The findings in this study are as follows:

1. The validity of the developed learning tools can be seen from the results of the validity of the RPP, Student Worksheet, teaching materials, assessment instruments of students' learning outcomes (student attitude assessment instruments, test instruments of knowledge aspect, the performance test instrument), and scientific literacy skill test instrument. The CPS model of science learning for enhancing science literacy skill was declared valid.
2. The Practicality of science teaching materials developed through the implementation in tryout one:
   a. The implementation of lesson plan in MI teacher education semester six Unipdu Jombang in the learning process with two replicates in overall average scored 3.82 categorized in good.
   b. Student activities at tryout stage were appropriate with CPS model. In observations, the prominent activity were to design, conduct experiments, and analyze experimental results.
3. The effectiveness of the science materials through the implementation of tryout one:
   a. Application of the developed CPS model of science material could improve students' learning outcomes: 1) the average n-gain of knowledge aspect of 0.87 belonged to high category, 2) the average n-gain of scientific processing skill of 0.75 belonged to high category and the average n-gain of psychomotor skill of 0.82 belonged to high category and 3) achievement of attitude aspect reached good category.
   b. Implementation of the developed physics learning materials with CPS model can improve science literacy skill of prospective MI teachers. The increase of science literacy skills of prospective MI teachers could be seen from n-gain of the semester three obtained score of 0.85 with the high category.
   c. Students' responses were very positive toward the implementation of science learning with CPS model. The analysis of students' response data was: Attention 3.96, Relevance 3.61, Confidence 3.79, Satisfaction 3.83 and all belonged to good categorized.
4. The obstacles were: some students who had low academic plus low literacy skills and students were still not yet familiar with CPS learning model that mainly uses scientific processing skill and psychomotor in a lab.

4. Conclusion

The results of this study indicated that the CPS (Collaborative Problem Solving) learning materials were valid, practical, and effective to enhance science literacy skills of prospective MI teachers.

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Development of Game Based Learning in STEM Education: Validation Case Study

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Abstract. Nowadays, the computer is significant for our lives to support in daily activities. Even of in education, the using of a computer becomes an issue to assist in a learning process. One of the using the computer is a video game. Video games for education level usually are called Game-Based Learning. This studies concern to Game-based learning to STEM activities in junior high school. The Methodology to develop this game is ADDIE. This video game stills in a process to get a suitable device to implement in the secondary level students. Four experts in the video game had conducted validation test in this game. Some suggestions were given to constructs that video game becomes compatible in STEM activities.
Keywords*: Game Based Learning, STEM, Validation Test*

1. Introduction

The development of technology in the 21st century is running continuously. This technology also affects the study of education. The school that runs began unlimited with space and time. Through science learning at the school level students are starting to introduce the underlying science of technology. Science at the junior level is taught in an integrated manner between chemistry, biology, and physics. Through science lessons at the junior high school level in the 2013 curriculum given the necessary competence subjects "students can present data and reports on the application of biotechnology in support of human survival through food production" ("CURRICULUM 2013 BASIC COMPETENCY Junior High School / Madrasah Tsanawiyah (MTs) "2013). This curriculum requires a learning process that must involve students in conducting contextual learning activities in the field of biotechnology studies.

Biotechnology is one of the major science field studies in the area of science and engineering. Biotechnology is a synergy of science, technology, engineering, and mathematics. Biotechnology is taught at the junior level because biotechnology is concentrated in two areas of study: traditional biotechnology and modern biotechnology. This rapid development in modern biotechnology creates a large gap between the understanding of the scientific community and the understanding that occurs in society, especially in the areas of risk and profit (1). For example, based on the results of the initial survey of teachers at the junior high school level in Jember district that science teachers only teach biotechnology as a traditional study material such as making a "tape," bread or "Tempe." This traditional biotechnology is due to the low level of teacher knowledge on biotechnology studies. By following technological developments that biotechnology is now more on DNA manipulation, genetic transformation in organisms and applications in environments that can maintain sustainability regarding agricultural and food industries (2); (3); (4). Transgenic sugarcane and savvy rice are examples of modern biotechnology applications.

Some issues of biotechnology application have a potential impact on the social and economic scope. In other words, that biotechnology still has a form of public controversy (5). Though the extent of modern biotechnology can revolutionize the big profits and be able to improve culture more dignified (6).

Modern technology is not taught by teachers because the knowledge level of science teachers themselves on this information is low. Their low level of education creates difficulties in designing their learning. Based on the challenges gained by some teachers in a junior high school district of Jember, then the transfer process will be limited to students. Student acceptance is limited to theoretical aspects and only traditional learning about biotechnology. Based on teachers 'attitudes toward biotechnology that teachers influence students' behavior in applying day-to-day practices (1). As the example given that the students know that biotechnology only interacts with the manufacture of

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tape and tempeh only. As a controller in the field of education, this concern will affect the formation of society (students) are literate to science (science literacy). Science literacy is a complex idea that includes an understanding of the process and nature of science, the ability to negotiate everyday situations involving science and technology, and taking an active and critical role in social issues of science and IT (7). If the Literacy of this science is not well constructed to the students, then they will give a proper response to modern biotechnology. So it is suspected that there is a proper relation to the stability of science literacy on the attitude of students receiving biotechnology (1).

2. Methodology

A methodology used in this research was Research and Development, which was developed by ADDIE (Analysis, Design, Develop, Implementation and Evaluation). Hire, the research study only focused in development study about the Game Based Learning in STEM education. The central of research was validation developed Game-Based Learning. This video game is still in process to construct the perfect game based learning in STEM education. The steps of the development research in this study were:

1. Analysis

The study had been conducted as pre-elementary research to get information on the lack of a video game implementation of learning activities. This event focused on observation about science material so that this step could get the requirement in an experimental study in the science subject.

2. Design

The design was visualization from the analysis research. Based on the lack of the observation in science material, video game based learning began to plan. Particular, this step developed a video game script, and it converted in software for the video game.

3. Develop

This move synergized a design shape, which was a scenario to transmit in the video game. In this step, the product developed a support system such as music, character and setting template. After getting the form of a video game, the video game was conducted an expert validation by three validators. They were expert in game and science education. This final step was a revision the video game based on the reviewed from the validator.

3. Result and Discusion

The study only focused on developing a video game in biotechnology material in secondary school. In the analysis, the study provided some of the indicators to suit the video game in the user. Table 1 showed five indicators to determine how the video game is comparable to use in the learning.

Table 1. The measurument indicators a video game based on the users

Indicators	Fungsion
Learningbility	Measure the seccurity the video game to complite a basic task when the user first used a the video game.
Efficiency	Measure the speed of the task after the user finished a basic video game.
Memorability	Measures fundamental knowledge after the user does not reuse for a particular time interval.
Error	Measure errors of use by video game users and measure how fast users are to re-start.
Satisfaction	Measures the level of user satisfaction in running video games

The five indicators are suitable to measure the video game in the learning activities (8). Before the video game based-learning tasted in the users, it conducted a design by the curriculum. The video game was developed by theme, which was seeking a gap in the biotechnology material in the secondary school. In reality, that material included in the uneasy material because it needs complete laboratory tools.

The video game named cross green, which described the modern experimental in biotechnology. This video game gives information about how to make the transgenic plant in the laboratory. This experiment is uncommon to show the students. The result of the pictures show in figure 1.

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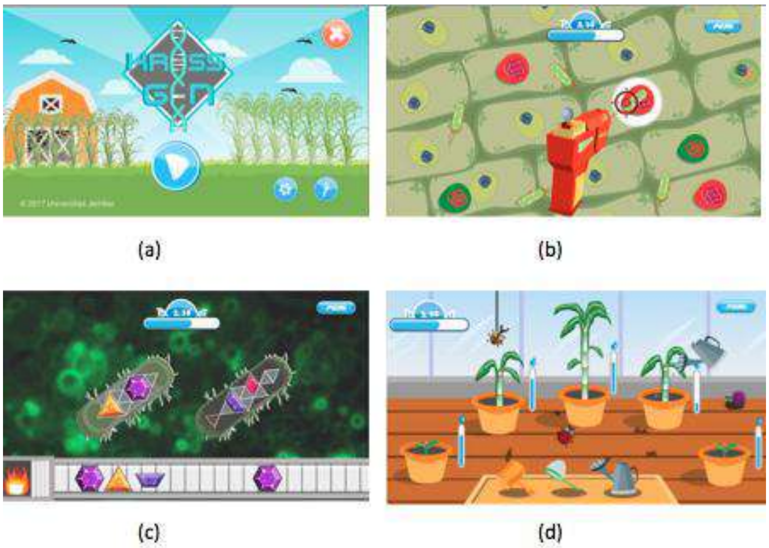

Figure 1. (a) the display of the Kress Gen; (b) the video game control a bacteria growht; (c) the model of the sell plant; (d) the result from transgenic plant

Picture 1 shows some pictures a bacteria growth. In this case, a bacteria is necessary to make a new varietal in biotechnology. As in the picture, the video game will give information about a biotechnological process to students. This game based on the lab experience that will supply a new experience to the students to explore the laboratory types of equipment. This video game is only supplemental instructional media in learning activities. The experimental video game is not often developed by the developer because it is not a commercial video game (9).

Before this video game tested in the users, it would be conducted a validation test. A validation test was used four experts in the vidio game and science education field. The result of validation test is presented in table 2.

Table 2. The result of expert validation

No	**Criteria**	**Result**				
		X1	X2	X3	X4	Mean
1	Science Integrated	3	4	4	3	3.50
2	Using mathematic for thinking	3	4	3	5	3.75
3	Create engineering design	4	4	4	3	3.75
4	Suitable for technology in learning activities	4	3	1	4	3.00
5	Embaded STEM perspective	5	4	5	5	4.75
6	Build prototype	5	5	1	5	4.00
7	Build science concept	5	5	1	5	4.00
8	Verbal comunication in video game	5	5	1	5	4.00
9	Needed identification	5	5	1	5	4.00
10	Inquiry process	5	5	1	5	4.00
Total						**3.75**

Based on table 2, the total result showed 3.75 (10). When it compared with the judging criteria, that value included in reasonable standards. Some of the values got the weakness such as criteria number 4,6,7,8,9 and 10. For future, Those items must review and revise to obtain the video game that is suitable for learning activities.

4. Conclusion

This study began to develop a video game focused on biotechnology material. The methodology used only to the development step. The result of developing the video game need to improve until suitable in a learning activity. This video game got the reasonable standard to the point of 3.75.

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Use of Lesson Study During Microteaching Student Prospective Teachers: Effects on Planning and Teaching of Science

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Abstract. This study, reveals the effects of using lesson study to improve the planning and implementation skills of teaching to students, as prospective teachers of science. Participants of the study are students who follow the microteaching course in Science Education Program at Lambung Mangkurat University in Banjarmasin. Student involvement in this lesson study program aims to create together the classroom atmosphere and situation, test the implementation of teaching, use feedback to revise lesson planning and re-teach from the revised Learning Plan. Students who become teacher candidates work through several cyclical processes in the classroom, then receive feedback from fellow students and instructors before re-teach. This research method, using a mixed method applied to investigate the ability of preservice teachers in planning and implementation of teaching. Data collection through surveys, video analysis, student reflections, and semi-structured interviews. The findings from this study indicate that lesson study is an effective way to improve the planning skills of the lessons plan and implementation of teaching.
Keywords*:* lesson study, preservice teacher, planning and implementing.

1. Introduction

Development of education is an important part and serious efforts to improve the dignity of the nation. Undang-Undang Republik Indonesia Nomor 20 Tahun 2003, about Sistem Pendidikan mandates "sistem pendidikan nasional harus mampu menjamin pemerataan kesempatan pendidikan, peningkatan mutu serta relevansi dan efisiensi manajemen pendidikan untuk menghadapi tantangan sesuai dengan tuntutan perubahan kehidupan lokal, nasional, dan global sehingga perlu dilakukan pembaharuan pendidikan secara terencana, terarah, dan berkesinambungan" [1], its mean the national education system must be able to ensure equal distribution of educational opportunities, quality improvement and relevance and efficiency of education management to face challenges in accordance with the changing demands of local, national, and global life so it is necessary renewal of education in a planned, directed, and sustainable.

To achieve the objectives of the legislation above, so need product or graduates of the Lembaga Pendidikan Tenaga Kependidikan (LPTK) quality regarding the competence of a teacher, as an educational component that will determine the implementation process of education is a teacher. According to [2], the teacher is the main factor that sustains the superior education program implementation, thus continuing the professional development of teachers is becoming a strategic step for educational institutions in providing a superior education for learners. Also, the role of teachers to develop the potential of learners so that they will know about knowledge and being able to do something.

Students who get into LPTK, especially science education courses, in particular, will be prepared to become a science teacher. Based on Undang-Undang Nomor 14 Tahun 2005 about Guru dan Dosen, teachers are required to have pedagogic competence, personal competence, social competence, and professional competence. In shaping the character of student teachers are highly competent, it is equipped with early-subject courses that are relevant, one Micro Teaching courses.

In microteaching, students are given theoretical and given the opportunity to practice and develop the skills that the result obtained by prospective teachers who are competent in the field of science. Science education students in FKIP Lambung Mangkurat University is a science teacher candidates that need to equip the students to be able to deliver the materials and science concepts well. These briefing inserted into one of the compulsory subjects they should take in semester sixth courses namely micro teaching science. Microteaching science is the initial briefing to the students to be able

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to perform in front of the class should be a teacher. Also, preservice teachers are expected to dominate in the face of various obstacles in the field. Both constraints in making lesson plans, class domination, as well as difficulties in understanding the character of the students. By [3] which states that in its traditional form, microteaching is used to teach prospective teachers to master specific teaching skills. Nowadays in many teacher education programs, the use of microteaching has expanded from its original focus of helping preservice teachers to master discrete teaching skills, to giving them the complete teaching experience and orienting them to teach in the natural classroom during the field experience.

To enhance the quality of student mastery in competence development prospective teachers, particularly in the planning and implementation of the teaching of science, so in this study will be applied lesson study activities. Lesson study is a model of guidance to people who work as educators both teachers and lecturers through collaborative learning assessment and sustainable in building a learning community. [4] stated that lesson study is a complex process, supported by collaborative goal setting, careful data collection on student learning, and protocols that enable productive discussion of difficult issues. [5] found that Japanese lesson study provides opportunities for teacher candidates to build professional learning communities, to deepen understanding of curriculum and pedagogy, and to develop habits of critical observation, analysis, and reflection.

Implementation of lesson study in microteaching starting from planning lessons based objectives collaborative learning, observing lessons aim to collect data learning implementation, data resulting from observation to reflect the learning is broad and deep, based on the results of such reflections compile learning next to reteaching session.

2. Method

2.1 Types of Research

Mixed research methods are applied to investigate the ability of prospective teachers in the planning and successful implementation of teaching in the course of microteaching. Microteaching activities carried out by implementing Lesson Study (LS) in each of its activities. LS circuit is done there are three, namely plan, do (implementation), and see (reflection). The stages are carried out in this study as follows:

- Divide the large micro groups into two small groups
- Create a micro-schedule with a supervisor lecturer
- Direction of supervisors related to the process of micro activities to be implemented
- Before implementing micro, each small group must implement a learning plan that consists of preparing RPP, materials, and media to be used. Every time you execute do (implementation of learning) must go through a stage plan in advance
- After implementing the plan, students do. Students are carrying out teaching activities in class and observed using the observation sheet planning. Another student became students in participating in micro activities.
- After carrying out the activities of do, each small group performs a see (reflection) activity with the supervisor lecturer. See activity aimed to evaluate the advantages and disadvantages that occur during micro activities take place. Each observer put forward its observations regarding the condition that occurs during the process of micro-progress. Supervisor criticizes and suggest improvements to prospective teachers, to improve teaching skills in upcoming micro activities.

Measurement skills of prospective teachers are seen from the improvement or development of the ability of prospective teachers to create lesson plans is good and right, choose the model of learning, making learning media, and the ability to master classes. The data is derived from the observation sheet on the planning and implementation of teacher candidates who will then persentated on any progress assessed.

2.2 Subject and Research Time

The subjects were students of Science Education FKIP ULM 2014 microteaching taking courses in the second semester of the academic year 2016/2017, amounting to 27 students.

2.3 Data Analysis

Collecting data in this study with a survey, video analysis, reflection students, and semi-structured interviews. Data were analyzed using quantitative descriptive analysis techniques. Data obtained in the

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form of quantitative data from surveys, observation planning sheet made by prospective teachers and observation of the implementation of teaching prospective teachers that will be analyzed in percentage.

3. Discussion

In the first session (plan) of microteaching with lesson study approach in the planning stage showed that learning tools such as lesson plan, LKPD, teaching materials, and learning media made by students are still much to be improved. Based on the observation data obtained planning skills are shown in Table 1.

Table 1. Preservice Teachers Planning Skills

No	Sub Aspects	First session /plan (%)	Second session/reteach (%)
A.	Completing the lesson plan identity	90,40	95,45
B.	Mapping the basic competence and indicator	71,33	75,73
C.	Learning Materials		
	1. Organizing Materials	77,00	85,00
	2. Components of material feasibility	75,00	75,00
D.	Planning approach/strategy/metod/learning models	72,33	77,46
E.	Scenarios Learning		
	1. Preliminary activities	79,82	83,33
	2. Planning Kegiatan Inti	76,15	80,52
	3. Planning scientific scenarios	81,00	82,25
	4. Closing activities	69,55	76,12
F.	Organizing time allocation	80,20	85,00
G.	Organizing learning resources	76,75	85,00
H.	Organizing instructional Media	79,13	82,20
I.	Displaying lesson plan document	87,50	89,30
J.	LKPD document	71,00	79,55
K.	Materials document	73,34	76,12
L.	Assesment document	70,66	77,11
	Average	76,94	81,57

The average preservice teachers planning skills on stage plan is 76.94. Activities planned student teachers still do not show the activities of inquiry and encourage students to discover concepts through learning according to the subject matter. LKPD designed many students are still not by the learning model used and is not contextual.

Lesson plan, LKPD, teaching materials, and marking sheet approved by the supervisor can be used in further activities, namely teaching practices, at this stage in accordance with a plan designed student, are not student-centered, prospective teachers are still dominating the learning activities, most prospective teachers still explain the subject matter although some of the models used in the form of learning cycle, problem-based learning, and inquiry model. Prospective teachers are yet skillfully asking investigation to the students so that students can not find the concept itself. Based on the observation of teaching practices that the data obtained are shown in Table 2. The average value of the implementation of the teaching in this first session was 74.66.

Table 2. Teaching Practice of Preservice Teacher

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No	Sub Aspects	Sesi Pertama/plan (%)	Sesi Kedua/reteach (%)
A.	Managing student for study	90,40	95,45
B.	Start learning activities	71,33	80,73
C.	Mastery of learning materials	74,92	78,81
D.	Approach/learning strategy	62,41	77,10
E.	Utilization of learning resources/learning media	79,92	82,85
F.	Learning triggering and maintaining student engagement	62,50	80,30
G.	Assessing the scientific learning	68,18	76,35
H.	Using of language	75,57	84,20
I.	Doing reflection	87,50	89,30
J.	Carry out follow-up by giving directions, or activities, or tasks as part of remedies/add-ons	73,88	75,25
	Average	74,66	82,03

After the implementation of the teaching of the first session, then the supervisor lecturer review the lesson plans used by the student and teaching practices in the first session. Supervisor lecturer delivers comments on the advantages and disadvantages, suggestions, and questions related to the implementation of learning and learning tools used. In this reflection, analysis and feedback from the lecturer in applied learning models, active students, as well as the media and LKPD used. There are still some preservice teachers who make LKPD which is not by the model used, the media used have not been up to the observation, during learning, the students still have not found the concept itself. Additionally, peers prospective teachers to give feedback, namely the concept found students.

At this stage of reteaching, lesson plans have been improved and revised used on reteaching. Results showed that student teachers planning skills increased to 81.57%, the students were able to adjust the RPP with a predetermined format. The result of reteaching observation also shows that teaching practice has increased to 82,03%. Preservice teacher is trained in the investigation of preservice teachers so that students can find their concept, also, learning steps are by the learning model designed, prospective teachers had not used the lecture method.

Based on the unstructured interviews of two prospective teachers who are representatives in each small group, that is, the prospective teacher can know the shortcomings during microteaching, know how to investigate the students so that students can find their concepts, and understand the learning steps according to the learning model designed. As stated by [6], lesson study has changed the way we talk about teaching and learning. We are in that place where we are comfortable enough to ask and explore the hard questions that come up in our lives as teachers. Lesson study has changed the way we think about, interact with, and teach our students and each other.

4. Conclusion

The use of lesson study on the teaching of student teachers science education program in FKIP Lambung Mangkurat University shows that this approach is an effective way to improve teaching planning skills and apply them in the implementation of the teaching. Micro teaching with lesson study approach needs to be applied maximally to produce prospective teachers who have good teaching skills, and the role of lecturers in this process needs more effective approach. This is in line with the statement [7] that by applying lesson study, school-based or teachers' union-based one, teachers and students can get the benefit from a Lesson Study for the betterment of a subject teaching and learning.

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Student's Response to The Virtual Science Laboratory Learning Media-based Website (LAB SITE) on Physical Education in High School

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Abstract. The virtual science laboratory learning media-based website (LABSITE) is a learning medium that simulates a practicum packaged in such a way by utilizing the *website* as the basis for managing programs that are accessed offline. This study aims to describe student's responses to the use of LABSITE learning media on physics learning in high school. This research is descriptive qualitative research. Student's response data obtained by using questionnaire. Results of student's responses obtained among other aspects of attractiveness of the component of 86.6% happy, aspects of the renewal of the new 77.6% *component*, 72.4% of the learners are interested in the learning process, the language is 83.6% easy to understand, and 93.4% are happy with the illustrations shown. From the results of the study concluded that the use of LABSITE learning media on physical education in high school has a positive response from learners.
Keywords: student's responses, learning media, labsite, qualitative research, virtual laboratory.

1. Introduction

Physics is one study of science that studies events in the universe, which includes four main elements of attitude, processes, products, and applications [1]-[3]. Therefore, it takes a learning activity that involves the four elements. One of the learning activities that can be used to show physics events or phenomena involving the four elements above is practicum [4]-[6]. By practicing the students will be actively involved to gain experience that enables them to deepen the concepts and principles for themselves [7]. Also, according to Woolnough and Allsop [8] the best way to learn science is by practicing, and there are at least four reasons for the importance of practicum. Practicum evokes the motivation to learn science, the practicum develops the basic skills of conducting experiments, the practicum becomes a vehicle for learning a scientific approach, and the practicum supports the understanding of the subject matter.

Sutarto [9] said that the unit of physical activity required in practicum activities is at least a quarter of the number of students in one class. When practicum activities are carried out in groups, with group members of four students. So, if in a class there are forty students, then there are at least ten units of equipment. While conditions that occur many schools that do not have a unit of facilities physics activities are adequate both in quantity and quality [10], [11]. Also, issues such as time constraints to prepare and implement practicum activities, limited school funds, and not all physics concepts can be practiced, as well as other issues that prevent teachers from practicing.

The new alternative to the existing learning technology is the creation of various instructional approaches that are packaged in the form of computer-aided instruction program. The choice of computers due to many schools that have an adequate computer equipment than physics equipment. One form of computer-aided instruction program is a simulation. This simulation is designed according to the actual conditions. Equipment that appears in a virtual lab is operated by pressing a button, either a computer keyboard or mouse [12]. Nevertheless, it must be admitted that the development of field and profession of learning technology in Indonesia up to now may not be optimal [13]. Thus, it takes a serious effort from all parties related to learning technology, both from academics, researchers, and practitioners.

Abidin [14] develops instructional media by all the problems above. Learning media developed is a virtual science lab based on a website called LABSITE. In this learning media students can carry out practicum activities, preparing practical reports, and teachers can assess and announce student work in

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each student's account. The result of this research is the development of a valid learning media, able to generate the practicum ability are quite good, and able to provide high physics learning outcomes. Jaya [15] adds that virtual labs can support interactive, dynamic, animated and virtual work practices that are not boring, and can support the user's desire to understand the subject matter.

With the application of interactive, dynamic, and animated learning media LABSITE is expected to foster the interest of learners in learning so that later will create an atmosphere of learning that is not boring. Negative student responses to learning will definitely affect the process and learning outcomes [16], [17]. According to Riyana and Susilana [18] students 'responses to the use of learning media can be seen from expressions, direct opinions about the interest of the media, easy or difficult to understand the learning messages in the media, and how the students' motivation after listening to learning by using media.

Based on the above description, it is important to know the response of students to the use of learning media in the classroom. Therefore, the purpose of this study is to describe the response of learners to the use of learning media of virtual science lab based website (LABSITE) on physics learning in high school.

2. Method

The research method used in this research is qualitative descriptive. According to Subana and Sudrajat [19], descriptive qualitative research is to describe and interpret data relating to facts, circumstances, variables, and phenomena that occur when research takes place and present it as it is. The subjects of this study were students of class XI IPA SMAN 1 Depok, with a total of 96 students. Student’s response is known by giving questionnaire. Questionnaires used to measure student’s responses consist of 5 aspects of Fadilah's opinion [20], including: component attractiveness, component componentization, learning process, language, and illustration. Next, the questionnaire is calculated and analyzed. Data analysis techniques used are as follows [21]:

$$percentage\ of\ student's\ responses = \frac{A}{B} \times 100\%$$

Information:
A: the proportion of students choosing
B: number of students (respondents)

3. Result and Discussion

The purpose of this research is to describe student’s responses to LABSITE learning media. As an overview of learning media LABSITE in question is as follows:

Figure 1. Home View of LABSITE

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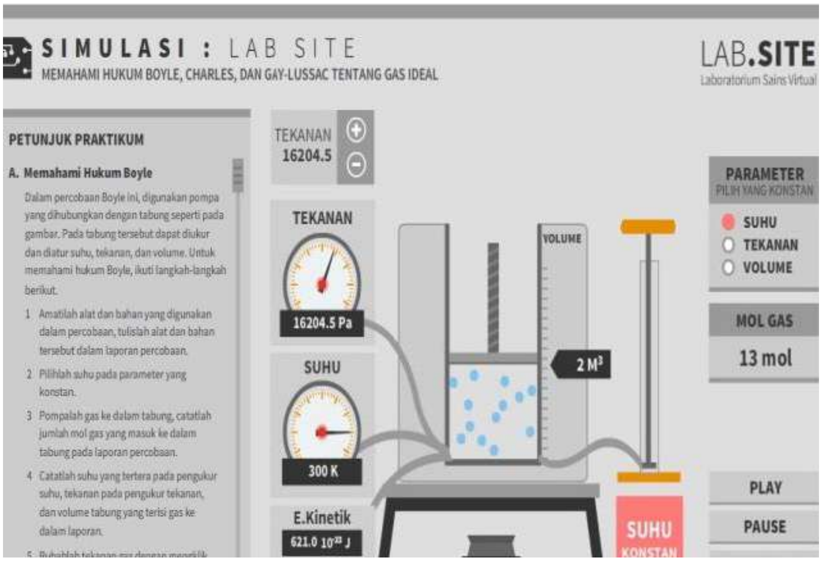

Figure 2. Simulation of LABSITE

In this website there are three types of users (admins, teachers, and students). The contents structure of LABSITE for each user is illustrated through the image as follows.

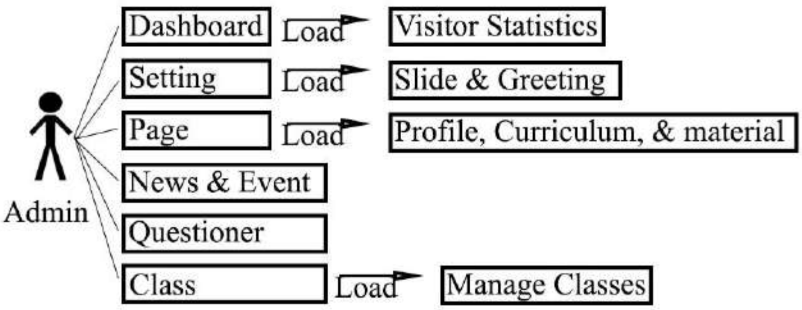

Figure 3. User Admin Design

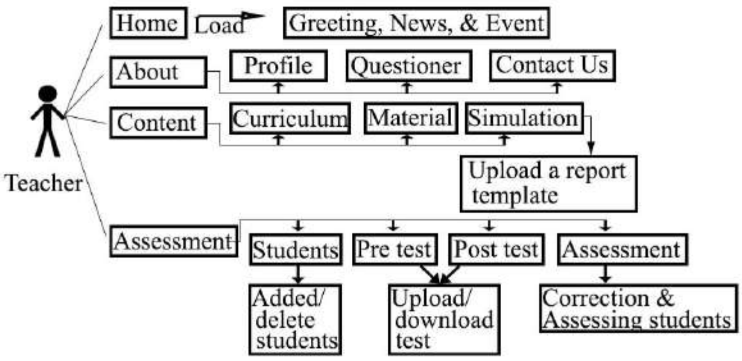

Figure 4. User Teacher Design

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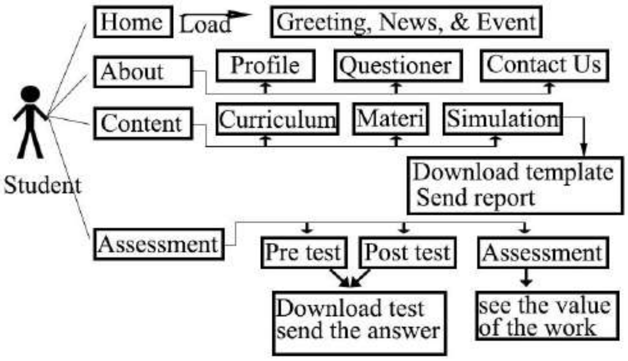

Figure 5. User Student Design

Based on the user design above, the admin user is responsible for managing all display and content functions available on LABSITE in both the teacher and student user interface. User teachers function to prepare learning activities by using LABSITE such as uploading a report template, do pre test and post test lab, and make corrections and assessment of the work of students who have been sent on LABSITE. While on the user students, where students can learn the learning materials that accompanied the video on the material content menu, answering the problem of pre-test and post test that has been sent teachers, doing virtual practicum activities and create practical reports in accordance with the steps and templates available on the menu simulation content, and see the results of the assessment of the teacher on the work of students.

LABSITE has several advantages and disadvantages as follows.

a. Teachers can create a practical class by entering as an admin and adding a class by clicking on the "Class" menu.
b. Students can enter into classes made by teachers and carry out practicum activities including pre-test and post-test lab work, preparing practical reports, by filling out the previously practiced lab report template. This template is a Microsoft Word file so it's easy to fill in, editing, and storing student work.
c. Teachers can announce student work in their student accounts.

The weakness of LABSITE is the class of practicum that is made only as a description and can not be separated between one class with another class. However, this does not affect the function of this learning media.

According to Zulhelmi [22] student's responses is an opinion or student responses to the implementation of learning that uses a learning device. Student response data is obtained by distributing questionnaires to students. In the questionnaire, the researchers measured five aspects of Fadilah's opinion [20]. The results of student response analysis can be seen in table 1.

Table 1. Student's Response Data

No.	Aspect	Percentage	Category
1	The Attractiveness of The Components	86,6%	happy
2	Component Update	77,6%	new
3	Learning process	72,4%	interested
4	Language	83,6%	easy
5	Illustration	93,4%	happy
Average		82,7%	good

Based on Table 1, the results of the research indicated that the attractiveness of the component shows that the students are interested in this is indicated by the percentage acquisition of 86.6%, as from the observation at the time of learning by using LABSITE media shown by the appearance of more student curiosity about the subject matter. This picture is in line with Sadiman's opinion [23],

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that the use of media can attract students 'attention, stimulate, or motivate students' activities in learning. With attention, students are interested in learning. Furthermore, from the aspect of component renewal is obtained a percentage of 77.6% is in a new category so it can be said that the existing components in the learning media LABSITE is new. Similarly, on the aspects of the learning process, in this aspect can be seen that the learning media LABSITE can make students interested in following the learning with the percentage obtained more than 50% of 72.4%. The language aspect also shows that the language used in LABSITE learning media is easy to understand with the acquisition of 83.6% percentage. Viewed from the aspect of illustration which gets the biggest percentage from all aspect that is 93,4% can be said that student feel happy in illustration contained in LABSITE learning media. The results of this questionnaire show that the overall learning is good because more than 50% of students give a positive response.

4. Conclusion

The result of the questionnaire of student response obtained by value 82,7% with the good category can be concluded that student response to learning media LABSITE quite happy. This is because more than 50% of students give positive response after learning using learning media LABSITE.

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The Impact of E-Modules Assisted by Scaffolding Based Android by Using Plickers on The Achievement of Understanding Concepts and Student Independency

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Abstract. This research aims to know impact the of E-Module assisted scaffolding on the achievement of understanding the concept and students' independence in physics learning at class X Senior High School 6 Yogyakarta. Type of research is a case study on momentum and impulse learning. In the learning process, students use E-Module and Plickers as a media assessment. The sample used was 48 students consist of 2 classes, namely X IPA 6 and X IPA 7 Senior High School 6 Yogyakarta. The research instruments used on this research in the form of comprehension true-false with reason test by using Plickers media and independence questionnaire. Results of this research is that average value of achieving an understanding of concepts and students' independence. The results of achieving concept understanding obtained an average value of 76.16, and for the results of learning, independence obtained a value of 75.11%. Based on these results it can be concluded that understanding the concept of students using E Module assisted of scaffolding based android classified into good category and students' independence are also classified into a good category.
Keywords: *Android, E-Module, Independency of students, Plickers, Scaffolding,Understanding Concepts.*

1. Introduction

Education is one way to increase the quality of human resources. Quality human resources are the ones having the skills 1 century. The skills needed in 21 century is creative, problem-solving, teamwork, innovation can support the success in their job of life (Pacific Policy Research Center 2010). So can having good human resources compete globally later.

Efforts the government and educational experts one of them is to make changes to the curriculum and claim the use of STEM approach in the learning process. A small part of the educational process is the learning process at school. The learning process by the 2013 curriculum is learning that can develop soft skills and hard skills of students. While the learning process using the STEM approach is a learning process that integrates four areas of science namely science, technology, engineering, and mathematics.

The learning process using STEM also aims to develop hard skills and soft skills of students. By the results of Brown & Ahmadian research (2014) conducted on scholarship recipients from the National Science Foundation STEM program which is focused on group work. The result of applying group work to the program can improve communication skills, and a positive attitude that leads to group work projects. So the learning process according to the 2013 curriculum is in line with the learning process using the STEM approach.

But the reality based on data and observations made at SMA N 6 Yogyakarta the results of physics learning are low, and teachers still have not implemented the learning process by the demands of the curriculum 2013. Physical learning outcomes seen from the average value of UTS obtained by class X IPA 6 and X IPA 7, with the value for each class is 60 and 62. As for the learning process is still using the lecture method, has not used the learning media, it resources used are lacking, and still on teacher centered method. So when the learning process takes place, some students are busy with their activities, do not pay attention to teachers explain materials. So that students less understand the subject matter submitted by the teacher.

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Therefore it takes innovation to the process of learning physics class X in SMA N 6 Yogyakarta to solve the problem. By the needs of the 21st century, the recommended learning process is learning that uses technology. The technology that is developing nowadays is an android smartphone. The use of an android smartphone as a learning medium is still lacking. Though it potentially as a medium of learning. Based on several research results, the use of an android application can improve the academic achievement of students (Ulfa, et al., 2017), and increase the thinking skill of diverging and high level of physics of learners (Mardiana & Kuswanto, 2017). So it can be concluded that the use of android in the learning process can improve students understanding of the material physics.

Also, attractive learning resources can motivate students in learning. One learning resource is the module. 21st-century, technology has been integrated by module, so-called as e-module. So it has been used anytime and anywhere. In addition to easy to use, e-module has been assisted by scaffolding for students in using it. The results of the research have also proved that the use of scaffolding in learning can improve students' physics learning outcomes (Rahmatiah, Koes H, Kusairi, 2016).

Not only the learning process have been made attractive by e-module, when testing the ability of students at the end of learning can also be made attractive. The goal is that who carry out post-test do not feel burdened so they can finish it well. Implementation of an attractive post-test can be done premises using media plickers. Based on the results of research Naresta & Lestari (2016) plickers have a positive influence on the students' learning activities. So it can achieve students' independence in the physics's learning process.

The implementation of e-modules assisted by scaffolding based android by using plickers has been described by the theory and facts. It is necessary to be done to improve the understanding concept and students' independence.

2. Method

The method used in this research is an experimental with a pre-experimental design. This design is not an actual experiment, because there are other variables can not be controlled. So the results obtained from the dependent variable still influence from outside variables. The pre-experimental design model used in this study is one-shot case study. Here's an overview of this model:

X	O

Information :

X: treatment given (independent variable)

O: observation (dependent variable)

Treatment given in this research is E-Module based on android scaffolding and appraisal using Plickers media while for the dependent variable is understanding the concept and independence learners. The treatment group consisted of 48 students divided into two classes, namely class X IPA 6 and X IPA 7. Learners measured understanding of the concept and the independence of physics learning after being treated.

The learners were given treatments in the measure of the ability to understand the concept and independence of physics learning. Post-test given to learners using Plickers media is used to measure concept comprehension. The independence of physics learning, learners are measured by using questionnaires.

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3. Result and Discussion

This research is using e-module based on scaffolding. These media make use of android smartphone. The e-module is made by *electronic publication* (e-pub) with Sigil application. E-module is developed by researcher. The content of physics in e-module about impulse and momentum, discuss student worksheet and exercises. Discuss student worksheet is facilitated by scaffolding to help the difficulties of student. This medium is 12 MB size, not so heavy if we use in smartphone. The design of e-module is:

Figure 1. E-Modul's Display

The aim of this research is to know the conceptual understanding and self-regulated learning of student. In this research, the average of 22 high school student's conceptual understanding in modeling class is 69, the average of 27 high school student's conceptual understanding in implementation class is 83,33 so that included into the excellent category (Arikunto, 2012). Based on research, student's conceptual understanding implementation class is higher than modeling class. The graphic gain of conceptual understanding using PLICKERS in modeling and implementation class contained in Figure 2

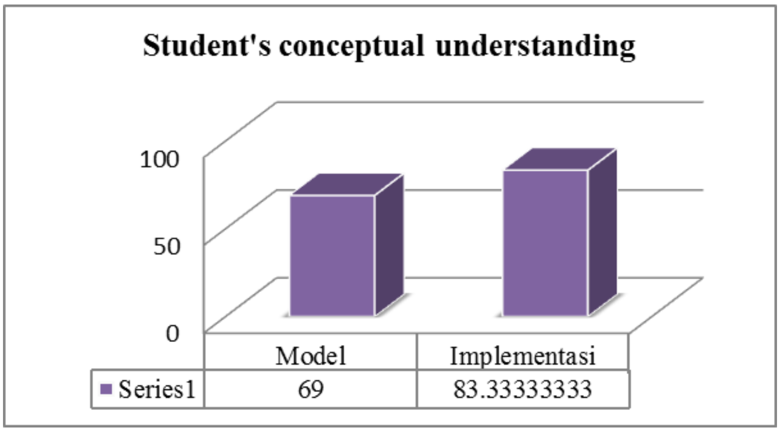

Figure 2. Result of student's conceptual understanding

One of reason student's conceptual understanding in modeling class is low because of the ability of student in modeling class is different with implementation class. The student ability was seen from the result of examination before in both of the class. From the data, we can get the information that the average of student's examination in modeling class is 60, and implementation class is 62 although

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the average of examination is 33-83 and implementation class is 37-77. It means modeling class have student who get the lowest and the highest. Besides that, student's motivation of learning in implementation class is higher than modeling class. It was seen in the learning process. Students in implementation class are more focus when teacher was talking in front of the class and calmer when they were discussing. Inversely in modeling class is more crowded when learning.

Besides that, the data is supported by the result of student's discussion with the average in modeling class is 74,4 and implementation class is 77,3. From the result, we know over all the student in modeling or implementation class have the average of conceptual understanding not much different. If we compare with the result of student's conceptual understanding, we conclude that learning with e-module, PLICKERS application have influence against student's conceptual understanding. The biggest influence in implementation class may caused the teacher in that class so they were used to being taught from their teacher. In modeling class, the students may be unfamiliar with modeling teacher the new known so it was adapt to difficult.

In modeling class, learners have an average percentage of physics learning independence that is 75% with good category, while the implementation class has average percentage of 74.44% with good category (Arikunto, 2012). The result of student independency is shown in figure 3.

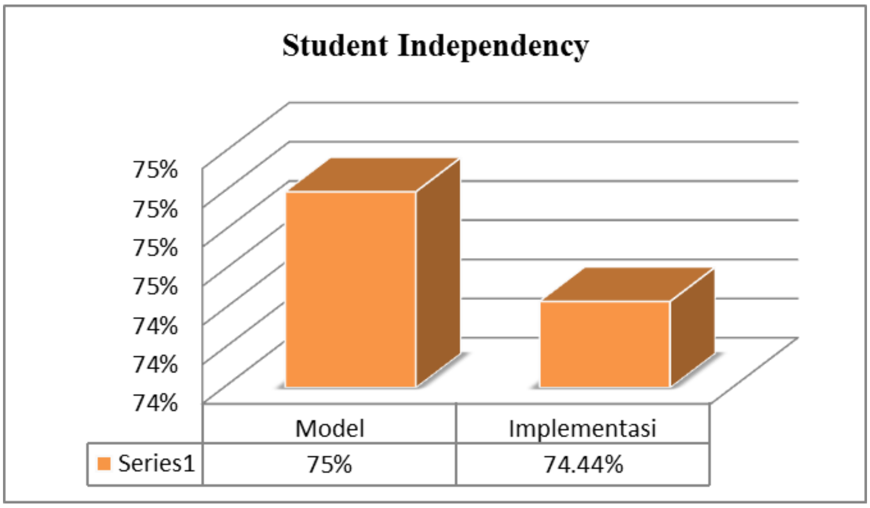

Figure 3. Result of Student Independency

Qualitatively, students in modeling and implementation class almost the same student independence. It was shown from the process in the class was learning required independently when finished the problem of physics although the student still asks to the teacher about the problem was given. It may cause the habitual of students with their physics teacher which often spoil the learners to explain all concepts without guiding learners to learn independently.

Even though, learning with e-module, PLICKERS application can increase student's enthusiasm when learning physic if compare with common class they have.

4. Conclusion

In general implementation of learning in SMA Negeri 6 Yogyakarta run very well. Based on the results of learning innovation, so the conclusion is: Learners in the implementation class have a higher level of conceptual understanding ability than the model class. However, the independence of learning implementation classes is lower compared to the model class. Learners are very interested in new learning activities by utilizing smartphones. Students very happy when doing postest problems with the help of Plickers application. Activities by using self-developed teaching media can help learners to improve the ability to understand the concept. Learning by emphasizing the awareness of learners to be more independent in learning, was quite influential.

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The Implementation of Digital Learning to Increase Higher Order Thinking Skills (HOTS) in Physics Learning

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Abstract. *Higher Order Thinking Skill* (HOTS) become one of the skills that must be developed in the 21st century. HOTS includes a person's ability to think critically, logically, reflectively, metacognitively, and creatively. Based on Bloom's taxonomy, HOTS includes of analyzing, evaluating, and creating. The development of technology in the era of globalization, impact on education. The technology developed in this era of globalization is the utilization of digital learning. The use of digital learning both in the form of computers and smartphones continue to be well, especially in physics. Physics became the fundamental science in technological development. This article aims to find out the extent to which the implementation of digital learning to improve HOTS learners in physics lessons. Information related to digital learning and HOTS, obtained by review of HOTS research articles, which have been implemented in various countries. Digital learning helps in explaining abstract physics concepts, and give affects the understanding of the concepts of learners so that its ability to solve problems is also better. The results of the problem-solving indicate how the HOTS level the learners have.
Keywords: digital learning, HOTS, physics learning

1. Introduction

The flow of globalization brings a fundamental influence on technological developments. Since the 21st century, known as the millennial era, where technology is developing rapidly (Trilling & Fadel, 2009). People can reach technological developments both macro and micro. Furthermore, the development of technology is characterized by the emergence of laptops, netbooks, and ultrabook, sized thin and people can take it anywhere. But it is still so big, so now the smartphone appears, the design is small but multifunctional, and high accessibility (Pegrum, 2013).

Digital development is widely used (Ding, 2014). Starting from the world of work, not even a few schools that take advantage of digital developments in learning (Ding, 2014). In the world of education, has developed a learning model that utilizes digital learning, such as Computer Based Instruction (CBI) (Hobbs & Tuzel, 2015). The development of the assessment also uses the Computer Adaptive Test (CAT) (Cavanaugh, 2015). The next development has been a lot of research from various countries that develop android smartphone-assisted learning media at the high school level (Poore, 2009). However, starting from elementary school, students have also been trained how to use the computer. The development in education is an important lance in instilling knowledge, so teacher must train soft skills should also be honed start from scratch, not just hard skills (Camilleri, 2016).

Seeing the rapid development of 21st century, technology and globalize in various aspects of the general field of life, and especially in education (Mehta & Downs, 2016). It is necessary skill that can balance the development of these technologies. When we look at the aspect of education, teachers still lack in knowledge and skills to integrate technology in learning (Yanga & Yenb, 2016). Technology integration requires teachers to design and facilitate students learning experiences so that students' thinking patterns can evolve according to the demands of the times (Hobbs & Tuzel, 2015).

Moreno et al. (2007), argues that the correct use of technology in education should be supported by pedagogical, and computer-based practical procedures supported by collaborative and constructive

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learning, so that a skill that is capable of upholding students' thinking to think analytically, critically and creatively.

Based on Bloom's taxonomy, higher order thinking skill consists of the level of analyzing, evaluating and creating. From these three levels, HOTS is expected to be able to upload the mindset of students to be able to think more analytically, critically and creatively according to the demands of the times. Because it is growing students' ability to think at a higher level becomes an important point for redesigning and reforming the learning system (Kim, 2005). Higher Order Thinking Skill is a skill that is appropriate and necessary in the development of the 21st century, considering how important the ability to analyze, critical and creative in solving a problem in the era of globalization as it is today.

One of the subjects which material abstract is physics (Mundilarto, 2010). Teacher teach and introduce physics from elementary school, it is integrated into science subjects. To be able to master the concept of physics, it must be trained HOTS. As in Kemendikbud (2015) also explained that a broad understanding of the material and thought could be improved if learners have HOTS. Efforts to increase HOTS can be implemented using teaching material support such as learning media (Ramli, 2015). Learning media can be print or technology. Implementation of technology in learning, known as digital learning.

Digital learning in the learning of physics, able to increase understanding of student concepts (Camilleri, 2016). Physics have the abstract concept, which cannot be shown in the class directly, but it can be demonstrated by simulation with digital learning. Good understanding of concepts will improve students' ability to analyze, evaluate and create (Ozan, 2013). This article aims to find out how the implementation of digital learning to increase HOTS in the study of physics, based on research on digital learning and HOTS from various countries.

2. Review Literature

2.1 Digital Learning

Digital learning is learning that utilizes technology (Belichenko, 2017). The technology has been developed, planned, and created by educators, researchers and education development teams (Cavanaugh, 2015). The technology used can be either material content or instruction. In learning, the teacher as a facilitator. Digital learning is for learners to be able to utilize technology both software and hardware, online and offline (Ding, 2014). Digital learning improves the soft skills of the learners. Digital learning is packaged in an interesting and interactive way (Ozan, 2013). The materials are organized based on the applicable curriculum. Digital learning can display media in the form of text, audio and visual, still or moving images. The application of digital learning makes the students more independent to learn and deepen the materials, because students can learn anytime and anywhere, both online and offline (Ding, 2014).

The use of digital learning provides benefits to students and teachers (Hobbs & Tuzel, 2015). For learners, digital assessment gives students quick feedback, this allows both students and instructors to focus their efforts on further understanding is urgently needed. Adaptive review, which guides incorrect responses, corrects perception errors immediately and helps students to spot problems in real-time (Tabor, 2016).

A complete learning process in digital learning, like quick assessment, simulation, visualization, games, annotation technology, and video with multiple instructors provide a more learning environment towards a complete understanding of concepts (Mehta & Downs, 2016). Annotation technology, discussion boards, and online support provide additional forums for discussion, debate, guesswork, and coaching (Cavanaugh, 2015). Also, the ability to accelerate learning as one wishes, to review the material, and to be assessed in the passage before moving on to another leads to learning conceptual mastery (Yanga & Yenb, 2016). In this case, learners make it possible to be actively involved, gain hands-on experience, and discussions.

Digital learning becomes a high accessibility learning. Learners can learn anywhere and anytime. It allows lifelong learners to continue to pursue education, while fulfilling work and family

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commitments. Digital learning makes education more accessible and affordable for learning at schools, colleges and around the world (Ding, 2014).

For the teacher, digital learning is related to the use of time (Camilleri, 2016). Digital learning provides rapid feedback to instructors about where students are struggling, enabling teachers to provide additional instructions and answers to common questions, both online and offline. Automatically simplify or eliminate regular assessments, free up team courses to spend more face-to-face time with students (Ding, 2014). Digital reach allows the instructor to reach more students. Instructors can spread new ideas faster, touch more people and influence more lives. Digital learning empowers instructors to create courses using the best content previously developed by instructors and other colleagues, whether in the same department, or even in other institutions (Camilleri, 2016).

By utilizing the media of information technology in the form of digital learning, it was hoped that the effort to increase the knowledge and understanding of the students to the material in school can continue to develop continuously toward the independence of local education (Mehta & Downs, 2016). Of course, people need awareness to improve the spirit of learning that has been supported by adequate facilities. And teachers should still be able to maintain justice in the classroom, develop student potential, provide student the best education, support for families, respect diversity, and use of technology.

2.2 Higher Order Thinking Skills

Higher Order Thinking Skills (HOTS) is a process thinking, which consists of complex procedures and needs to had based on various skills such as analysis, synthesis, comparison, inference, interpretation, assessment inductive and deductive reasoning useful for solving unusual problems (Smith, 1992; Zohar and Dori, 2003). Crawford and Brown (2002) define HOTS as consisting of three categories: "content thinking, critical thinking, and creative thinking." Others argue that HOTS is the ability to apply knowledge or creative problem-solving methods, innovative and consequently capable of creating new dimensions based on knowledge which had been studied (Abdul Halim Abdullah et al., 2016). By using Bloom's Taxonomy, we can identify HOTS working at level analysis, evaluation, and create. This analysis had been done by applying a meta-analytic structural equation. Characteristics of HOTS can be developed with curiosity, interested in finding facts, planning and showing the most appropriate method, and having a rational system of thought processes (Prayoonsri Budsankom et al., 2015). Based on the results of high-level thinking skills of students, providing evidence that almost all students need to improve skills capability in high levels are primarily synthesis and evaluation skills needed to enhance students creativity in science (Gulistan Mohammed Saido, 2015). HOTS can create continuous learning and instill creativity among individuals. This fact shows that pedagogical knowledge is closely related to the ability of teachers to apply HOTS with students effectively. Knowledge of HOTS assessment is very important because it aims to help teachers improve teaching methods and improve student learning (Serdyukova, 2015). In science lessons, it is very important to develop and cultivate high-level thinking skills (HOTS) of students in each age group. The inquiry, method is one of the methods capable of growing HOTS students, compared to traditional teaching. The inquiri method, which in its learning process requires students to find their answers to the problems found (Muhamad Hugerat & Naji Kortam, 2014).

Already many studies conducted by researchers on Higher Order Thinking Sikll (HOTS), which shows how important HOTS to be developed in the 21st century, especially in the world of education and associated with the technology that has been growing. Many factors that influence the development of a person's high level of ability are, the classroom environment, family characteristics, psychological characteristics, and intelligence. The results of research conducted by Prayoonsri Budsankom et al., (2015) in Thailand by using meta-analysis method is very high (MASEM) using comprehensive meta-analysis computer program to perform data analysis hence obtained conclusion, family characteristic influence the increase of psychological characteristics and will increase HOTS students. Family characteristics have an insignificant indirect effect on intellectual characteristics. Studies show that the contribution of family characteristics affects the development of intellectual characteristics but will not increase HOTS students. The classroom environment indirectly affects

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HOTS through students psychological characteristics. This concludes that classroom environments positively affect psychological characteristics and also improve student HOTS. The classroom environment indirectly influences HOTS through intellectual characteristics. In conclusion, studies show that classroom environments positively influence intellectual characteristics and improve student HOTS.

In addition to the above-mentioned factors other ways that can be used to improve high-order thinking skills higher order thinking skill students are to take advantage of the emerging technologies today. The rapid development of technology where the use of the internet in the digital world can give a positive impact in improving the ability of higher order thinking skill someone. As the research that has been done by Drew Polly and Leigh Ausband (2009), which examines the increase of HOTS using WebQuest. WebQuest as a vehicle for exploiting extensive information about the Internet in a regular and meaningful way. WebQuests is a demand-oriented activity, dependent on Internet resources, centered on group work, and focuses on high-level thinking skills (HOTS). WebQuests can help students in more understanding and move through an important phase of transition to a more autonomous and learning-centered education process.

Research by Anthony W. Palmer (2016), states that by using digital games able to increase Higher Order Thinking Skill (HOTS), because in playing games someone will be required to think critically and creatively in completing game play s such as Minecraft, Dragon Box, and Bad Piggies are often played by children. Participants experience high-level thinking skills in learning games, social games, challenges, complexity-rich environments, and through fun. Investigations are conducted to show that the iPad game is a powerful intervention that can facilitate the development of high-level thinking skills. This study will focus on high-level thinking skills in digital education games. A special focus will be being given to games developed for iPad tablets. What stands out the difference between digital educational games and more conventional games is the capacity of digital games to instantly assess individual student learning, and then immediately change the experience to meet the needs of learners.

2.3. How digital learning can improve HOTS in physics learning

Physics is a science that studies the physical phenomena of the world, not derived from experiments (Tippler, 2008). Experiments become a way to prove the phenomena that occur in the world. The object of physics studies consists of interrelated and complex objects and events (Mundilarto, 2010). The scope of physics is limited to the reach of the human senses. Therefore, the science of genetic engineering and technological development, can be made with physics as its basic knowledge (Young & Freedman, 2012).

As basic knowledge, learners are required to have HOTS. So this will be easier for learners in developing and applying the concept of being mastered. HOTS can have been trained by teachers at school (Belichenko, 2017). In this case, relates to how the learning process applied by the teacher, what media was used, and how the classroom management by the teacher. Technological developments are increasingly advanced, demanding teachers should be able to create blended learning, students not only learn the class, interact with the environment, but also able to use technology (Trilling & Fadel, 2009).

There have been many types of research that utilize and develop digital learning in the classroom. Especially for subjects of science, especially physics. Where not all the material can be shown in the classroom, so with the technology is very helpful in explaining the teacher and understanding the concept of students. With the implementation of digital learning, students more easily understand the phenomenon of physics, because not only hear the story of the teacher, but can observe directly, can take information from various sources. Such learning will open up learners thinking, motivate learners to find out how such physical phenomena can occur. High motivation will increase curiosity, so the level of curiosity and high learning, will improve the ability to analyze, evaluate and create.

3. Conclusion

Technological developments have an impact on learning in schools. This led to the implementation of digital learning. Digital learning has been widely applied in and researched its effectiveness in

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learning. This is related to HOTS students. Digital learning can improve students conceptual understanding, which directly affects the ability of analysis, evaluation, and creation. Its application in physics learning is very usefulyl, not only help teachers in learning, but also students can learn anywhere and anytime.

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Effectiveness of SSP on PBL Assisted by E-Learning Based on Physics Learning Completeness and Learning Outcomes

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Abstract. This research aimed to know the effectiveness of Subject Specific Pedagogy (SSP) on Problem-Based Learning (PBL) assisted by *e-learning* based on learning completeness and the effectiveness based on student's learning outcomes. The method of this research was quasi-experimental with *one group posttest-only* design. The population was entire students of 11th grade of science students of MAN I Yogyakarta with 66 students as the samples. The samples determined with purposive sampling technique. The questioner of learning scenario completeness is used to know the learning completeness. The posttest questions is used to know student's learning outcomes. The analysis of this research used one sample t-test technique and compared with the standard score. The result of this research showed that learning completeness reached 95% in outstanding criteria and SSP on PBL was effective to use based on student's learning outcomes.
Keywords*:* *e-learning, Learning Completeness, Learning Outcomes, Problem-Based Learning (PBL), SSP (Subject Specific Pedagogic).*

1. Introduction

Education is an effort for students to prepare themselves to be a mature individual so that they're ready to face the real world. The Indonesian government says that education is a conscious and structured effort to create a lively environment for studying to develop student's potential so that they have brightness in thinking, emotional, and skill for life in the society [1]. Based on UU Sisdiknas, the goal of education is to prepare the student so they can live and compete in the global society. Through education, the student can change not only their knowledge but also their attitude, cognitive and process skill.

Indonesian government develop Kurikulum 2013 to adapt with many skills that student has to master it in the 21st century. Inside of Kurikulum 2013, instruction use scientific approach, where the student is trained to observe the problem, to analyze and to solve, then to communicate by written or spoken. Also the student has the skill to think with reason, to process, and to present it communicatively, collaboratively, effectively, and selectively [2].

Physics is one of a subject that can help students to develop their skills according to the curriculum. This instruction is a process to develop skills and ability to understand the concept, principle, and the laws of physics. The students would be able to comprehend that concept and its relation. Besides, students can also use the scientific method based on scientific attitude to identify and solve the problems related to daily life.

Based on the result of school observation, it is known that there is a lack of time to study using the scientific approach. A solution to this problem is by integrating e-learning in the process of instruction. E-learning stated here is basically about the use of Edmodo to increase the interaction between teachers and students inside or outside the class.

The model used here is Problem-Based Learning (PBL). PBL include the problem inside the scenario in the instruction process so that it can engage student's learning process. The use of PBL can make the students directly face the problem [3]. With this, students will use their knowledge and

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skills they have to solve it. Tantri [4] suggest the use of PBL in instruction process to prepare the students to face the 21st century. According to Tan [5], the syntax of PBL are meeting the problem; problem analysis and learning issues; discovery and reporting; solution presentation and reflection; overview, integration, and evaluation.

The integration of e-learning in PBL needs a relevant tool so that it can bear a maximum result. Instruction tool here must be able to educate students to maximize the process of PBL. That tool called SSP (Subject Specific Pedagogic). SSP unites the contents of subject matters into one comprehensive and educative tool. The instruction written in SSP focused on the topic and the process [6]. SSP has to be developed so that it can be a match to PBL based on e-learning.

The development of SSP is based on *Pedagogy Content Knowledge* (PCK). PCK explain challenges faced by the teachers while teaching and also explain the strategy used by the teachers in the learning situation. PCK is a concept about how to teach physics; teachers must understand the content of physics matter (knowing science) and how to teach [7]. It is important for teachers to take a note about their students beforehand, how to teach, and the most important one is they must have the skill to develop PCK itself [8].

The development of SSP would result from a product of SSP. SSP is as a product unites the contents of subject matters into a comprehensive instruction tool. This unity includes the core of competencies, subject matters, strategy, method, media, and assessment. SSP, as a product consist of syllabus, lesson plan, student worksheet, and assessment instrument [9].

The effectiveness of developed SSP can be seen from learning completeness and learning outcomes. Learning completeness can be seen from the compatibility between instruction and lesson plan. Besides, the effectiveness of this SSP can also be seen from learning outcomes. Learning outcomes can be seen from the assessment which usually used with evaluation.

Suparwoto [10] says that evaluation process is teacher's way to obtain information as a feedback of the instruction for evaluation about learning completeness. By this way, it will always involve information about the process and product altogether.

The evaluation of learning outcomes can be done by test and non-test. Suparwoto [10] explains that evaluation using test usually used to assess student's ability about their understanding in the subject matter. So it can be concluded that test's technique can be used to be a learning process's measurement. This research based on student's cognitive learning outcomes. The success of learning outcomes based on student's achievement on the minimum score criteria. The minimum score criteria in this research are 75. This criterion defines the student's comprehension on the subject.

2. Methods

This research is one-shot case study research. The objective is to know the effectiveness of physics SSP on PBL model assisted by e-learning based on learning completeness and learning outcomes. This study took place at MAN 1 Yogyakarta on March-May 2017. The population in this research is the entire student in 11th grade at MAN 1 Yogyakarta. Sampling technique used in this research is cluster random sampling technique with class sample XI Science 2 and XI Science 3. This research held in diffraction and interference subject matter.

Data collecting process of learning completeness used questioner of learning scenario and data process of learning outcome obtained by the score of student's worksheet. The fulfilling of questioner of learning held by two observers during the learning in the class. The questioner of instruction scenario and student's worksheet model PBL assisted by e-learning validated using judgment expert by the expert and the practitioner. In this case, the expert is the lecturer, and the practitioner is the teacher in MAN 1 Yogyakarta. The integration of e-learning in syntax PBL are listed below.

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Table 1. The integration of e-learning in syntax PBL

Syntax	Activity
meeting the problem;	Online
problem analysis and learning issues;	Interface
discovery and reporting,;	Interface
solution presentation and reflection;	Interface
overview, integration, and evaluation	Interface

Data analysis technique consists of descriptive and statistical analysis. In the descriptive analysis, the data explained based on average, standard deviation, maximum score, and minimum score. Meanwhile, in the statistical analysis, data elaborated based on *one-sample t-test* using SPSS 22. The data in statistical analysis is the result from student's worksheet. Effectivity test of SPP model PBL assisted by Edmodo against learning outcomes based on student's achievement on the minimum score criteria. The minimum score criteria in this research are 75. This criterion defines the student's attaintment on understanding the subject. Lesson plan completeness analyzes by IJA (Interjudge Agreement). An eligible lesson plan that can be used in the instruction has to reach 75% in the IJA score [11].

3. Results

Learning outcome from the modeling class (XI Science 2) shows in **Table 1** below.

Table 1. Learning Outcome from the Modeling Class

	Assignment Score	**Student's Worksheet Score**	**Final Score**
Maximum Score	10,00	9,40	9,70
Minimum Score	7,50	7,50	7,50
Deviation Standard	1,24	0,71	0,78
Average	8,80	8,0	8,40

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Learning outcome from the implementation class (XI Science 3) shows in **Table 2** below.

Table 2. Learning Outcome from the Implementation Class

	Assignment Score	Student's Worksheet Score	Final Score
Maximum Score	10,00	8,90	9,50
Minimum Score	7,50	7,50	7,50
Deviation Standard	1,09	0,46	0,58
Average	9,40	8,1	8,70

Analysis on the effectivity of SSP on PBL assisted by Edmodo is observed from the student's learning outcomes based on the minimum score criteria. This calculation uses *one sample t-test* technique with SPSS 22. The significance degree in this analysis is $\alpha = 0{,}05$.

As the reference, the minimum score criteria used here is 75 (which in this case, it becomes 7,5 since the maximum score is 10). Minimum score criteria are the minimum score each student should achieve after the instruction process which uses SSP on PBL assisted by Edmodo. This score will be used to observe the effectiveness of SSP on PBL assisted by Edmodo in the instruction process. The effectiveness itself is determined from the learning outcome shown by the minimum score criteria achieved by each student. From the analysis using *one sample t-test,* it is shown that the score of the sig. is 0,000 which means SSP on PBL assisted by Edmodo is effective to be used both in the modeling and implementation class.

The analysis result of the completeness of lesson plan using IJA shows that both in the modeling and the implementation class reach IJA score above 75%. The score of IJA in both classes reaches 95% which means that the SSP is eligible to use in instruction based on the learning completeness.

4. Discussions

This research used 2 experiment group. The class XI Science 2 as a modeling group and XI Science 3 as an implementation group. In the modeling class, the teaching teacher is master physics student. In the implementation class, the teaching teacher is the senior teacher with more than 20 years experiences. Every class has the same treatment in the instruction process. Assessment of this instruction is authentic assessment which includes scientific processes. The scientific processes here are observing, questioning, experimenting, associatting and communicatting.

The beginning syntax of PBL is meeting the problem via online before the interface instruction. Students are given many assignments such as to watch videos, do the assignment and other worksheets. The videos are about diffraction, interference, and broken specter ghost phenomenon. Those videos are given in the Edmodo to motivate and lead students to the problems. The knowledge visualisation including videos will be easier and more entertaining for students [12]. In the assignment, students must make questions and outlines based on videos. Those activities include observing activity and questioning activity from the scientific learning. Students must also answer five questions about the definition of diffraction and interference, the condition required for diffraction and interference to happen, also about the phenomenon when waves pass through the barrier. Each aspect in the online instruction force the students to focus on the subject matter also on the Broken specter ghost problem. This activity helps students in the observing phase because they already have understood the diffraction and interference definition from the videos. The assignment score is the result of the observing and questioning stage. Assignment score was collected when the interface instruction in the class held. Meanwhile, the student's worksheets which already done by each student are used as sources for discussion in class.

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In the modeling and implementation group, there are students who didn't open the Edmodo which means they didn't watch the videos, didn't do the initial assignment and didn't do the student's worksheet. The reasons are the students didn't have internet connection in their home and are not used to the using of Edmodo compared to *Line* or *Whatsapp*. Overall, modeling class did respond the teacher's posts in Edmodo which means Edmodo is used as a media to share assignment, ideas to discuss, and also to interact in the virtual class. This results show that those activities make the students easier to discuss and solve the problems. By that, Panlumlersa [13] says that online instruction can improve student's ability to cooperate with others.

Meanwhile, the different result found in the implementation class. The students in implementation class were very passive in responding teacher's posts in Edmodo. Thus, there was no interaction between students and teachers in Edmodo. The Edmodo facilities only used as a media to watch the videos and to download the assignments, not for interaction. This might because the students tend to reluctant to the teachers so that they became passive.

In the student's worksheet, students are given the broken specter ghost phenomenon. This broken specter ghost is a phenomenon about the creation of a rainbow behind the human shadow which located in a hazed mountain. This phenomenon is happened because of the diffraction and interference of the sunlight. Students were asked to explain, draw, and make a physics situation model from that case. After that, students were requested to present their result in front of the class and to evaluate other group's explanation. Assessment aspects in this activity were experimenting, associatting and communicatting.

At the beginning of interface instruction in the modeling class, the teacher asked the students to collect the initial assignment that given through Edmodo. The first observer suggested that collecting assignment would be easier and better if done when students present their problem-solving result. The presentations itself were done one by one if the collecting assignment done in this activity would be easier to look if there are students who didn't do their assignment. The first observer also suggested marking the group which successful in solving the problem and also the group which needs revision in their problem-solving result [14].

The presentation of discussion result was interest because each group presented many various results in explaining the broken specter ghost phenomenon. Each group shows the understanding of diffraction and interference concept and also the misconception with many variations. Overall, the students tried to explain the broken specter phenomenon with their experiences in daily life. This activity can benefit if the student's prior knowledge about this concept is right. But, it can be a disadvantage if the student's prior knowledge contain the misconception.

The situation of modeling class is different with implementation class. The students from modeling class were very crowded, enthusiastic, and lack of focus in the discussion to solve the problem. In the other hand, the implementation class did the discussion with orderly and quietly. The difference of time when the instruction held became one of the factors. The learning in the modeling class was held in the afternoon which makes student's concentration decrease [14]. Meanwhile, the instruction in the implementation class was held in the third period when the students could concentrate better. Despite that, all the students should be appreciated because their presentation and their self-confidence to perform as best as they could.

The overall result from student's worksheet and the initial assignment can be considered as good for both the modeling and implementation class because both achieved the minimum score criteria which are equal to or more than 7,5 or 75%. This shows that the implementation of SSP on PBL model assisted by e-learning (in this case Edmodo) were effectively observed from the observing, questioning, experimenting, associating, and communicating. The result of observation questioner held by two observers shows that 95% of those steps in the lesson plan are well applied in both

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modelling and implementation class. This finding also means PBL can be used orderly using e-learning.

5. Conclusion

Based on the analysis on the things that found during the implementation process, it can be concluded that SSP on PBL assisted by e-learning is eligible to use in the instruction process. That is proved by the learning completeness and the learning outcomes of the students. The learning completeness is proved by learning completeness result that reaches 95% in Outstanding criteria. And then the learning outcomes are shown by the concrete proves of student's achievement both in the modeling class and implementation class that reach above the minimum score criteria.

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Blended Learning Based on Edmodo Assistance to Optimize Achievement of Student Learning Outcomes Class XI IPA MAN 1 Yogyakarta

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Abstract. This research is intended to know the result of student physics learning through the implementation of online based learning on guided inquiry with Edmodo. The research conducted in MAN 1 Yogyakarta involving 35 students of class XI IPA as sample. Samples with purposive sampling technique are selection based on certain. The method used is pre-experimental with one posttest group design only. The research instrument used is written test essay data analysis technique using program SPSS version 16. Based on test result t-test = 0,05 = 0.00. Can be concluded online instruction-based instructions. Edmodo-assisted is effectively used in student learning outcomes.

Keywords: Online, Guided Inquiry, Learning Outcomes, Edmodo

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1. Introduction

The rapid development of Science and Technology (IPTEK) in the XXI Century in addition to providing many benefits in the provision of diverse human needs also provide new challenges that require a breakthrough thinking to produce quality output in order to compete globally. Quality human resources are key factors in global competition. Competent human resources will bring the nation of Indonesia into a world economic power to be reckoned with. The HR factor becomes important because ultimately the competitive advantage of a country will be determined by the quality of human resources owned by the country. The quality of human resources is influenced by the level of education.

The 2013 curriculum is the first step in improving the quality of education in Indonesia. Through this recurrence is expected to reduce shortcomings in the previous curriculum and improve the quality of education. There are three basic concepts embedded in the Curriculum 2013, 21st century skills, scientific approach, and authentic assessment (Murti, 2013). In this scientific approach more emphasis on the aspect of achieving 5M (Observing, Asking, Trying, Reasoning and Communicating) in learning. Implementation of the 2013 curriculum related to scientific approach is implemented in all subjects, as well as on physics subjects.

Physics is a branch of science that contributes greatly to the development of Science and Technology (Science and Technology). Giancoli (2005) states that physics plays an important role especially related to the field of technology that is as the basis of engineering science and technology. Therefore, physics is an important subject to be taught to students. Mundilarto (2010: 4) explains that physics subjects are developed with reference to physics characteristics, that is to educate and train learners in order to develop the competence of observation, experimentation, thinking ability, and being scientific. Through the learning of physics, students should be able to gain experience and increase the ability to construct, understand, and apply the concepts that have been studied. In this case, physics learning is not just a transfer of knowledge from teacher to student, but if learners are faced with problems, they are expected to solve the problem by using scientific approach starting from observing, asking, trying, reasoning and communicating so that learners can apply it in everyday life If this can be fulfilled then later on will have an impact on the students' knowledge change the mind set or the way of thinking of students especially on understanding the concept that will also impact on student learning outcomes.

Learning outcomes are a culmination of the learning process. Learning outcomes can be the impact of teaching and appearances of companions. Both effects are beneficial for teachers and students. Learning outcomes are the abilities possessed by learners after following the learning process (Sudjana, 2013: 22). the quality of good learning will certainly produce good learning results as well. Suprihtiningrum (2013: 81) states that in order for the learning process to take place properly teachers need to prepare learning scenarios carefully and clearly. To fulfill this, we need a proper learning model in teaching so that the learning objectives will be more easily achieved so that the value of KKM achievement will increase. In this study the learning outcomes were measured by Bloom's taxonomies revised by Anderson and Krathwohl. Learning outcomes in this study is the level of success of cognitive aspects that can be achieved by learners based on experience gained after the test. Learning outcomes are cognitive aspects that include: (1) remember (knowledge), (2) understand, apply, analyze analyze, evaluate and) create (creations / create).

Based on the results of observation in the field shows that many teachers get problems to achieve 5M activities in learning, this is due to many things one of them is the lack of time available to teach physics so that teachers can only reach on the activities of reasoning and difficult to mengkomuikasikan because the learning time is up, this makes the learning activities are not optimal which affects the low motivation of students in learning physics. Therefore, the need for innovation to overcome the lack of learning time that can motivate learners to learn physics. One way to overcome these problems is through the use of blended learning methods.

Blended Learning Learning is a blend of learning face to face (traditional) with e-learning. Through this blended learning, the advantages of each method can be further optimized. A face-to-face meeting in the classroom is used to discuss the material in e-learning. This will encourage students to be able to manage the learning rhythm not only in the classroom, but also outside the classroom. Blended learning development in educational institutions requires a system (application) called Learning Management System (LMS). LMS is a software used to create online learning materials based on the web. In the LMS there are features that can meet all the learning needs. Currently there are various types of LMS offered where each type of LMS has its own advantages. Edmodo is one of the most commonly used LMS types today. According to Balasubramanian & Jaykumar (2014: 416), edmodo is a social

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network-based learning that allows teachers to create and manage virtual classes so students can connect with classmates and teachers anytime and anywhere. Edmodo comes with some learning activities, such as quizzes, assignments, polls, grade books, libraries, award badges, and parent code. For teaching materials, edmodo supports teaching materials in the form of files and links (Kamarga, 2011: 267). Edmodo was developed based on the principles of group-based management and social media.

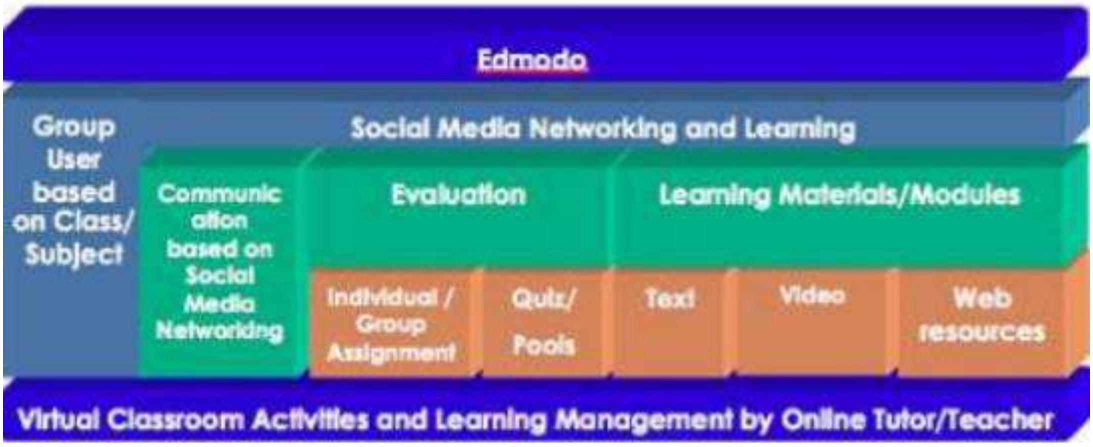

Figure 1. Social media Edmodo (Source: Seamolec, 2013)

To apply online learning in achieving 5M activities of course required a suitable model that can be used in the physics lesson and can be applied with online spin. One of the learning models recommended in the 2013 curriculum in physics learning is guided inquiry (guided inquiry).

Guided Inquiry

The guided inquiry model is considered in accordance with the nature of physics science lesson. The suitability is due to the fact that the students face the problem, collect data, collect data, process, formulate an explanation, and analyze the research process (Joyce and Weil, 2011). The advantage of guided inquiry is that teachers still provide direction or guidance in learning activities. In this case students who think slowly or have a low intelligence can still follow the learning that is being implemented and students who have high intelligence does not monopolize learning. Based on the facts encountered in the field, we will make a learning innovation by combining blended learning method with edmodo following syntax of guided inquiry learning by (Kuhlthau, 2010), Joyce (2000), (Hanson, 2015) presented in the following table.

Table 1. Guided inquiry syntax learning

No	Syntax	Learning Description	Applicatio n
1	The question poses a problem	Students develop and review questions assisted by the teacher	online
2	Investigation	Students identify variables, build a procedure and be guided by teachers conducted online with the help of edmodo	Online
3	Data collection	Students observe experimenting and record data based on teacher guidance	Face to face
4	Draw a conclusion	Students communicate and make conclusions after the stage of discussing the data that has been solidified to the group	Face to face
5	Communication results	Each group representative presents the results of the experiment, the other group to ask and respond. The teacher commented on the discussion and	Face to face

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	straightened out the wrong things to get a better concept

2. Method

The method used in this research is pre-experimental with one group posttest only design. With this design, the subjects were first treated (treatment) in the form of learning based online Guided Inquiry with Edmodo help, then performed posttest to measure student learning outcomes after the learning process is completed. Posttest results are then analyzed to get answers from research questions. In the chart, the research design used is described as in the table below.

Table 2. Research Design

	Pre-test	Treatment	Post-test
Subject	-	Online based learning on Guided Inquiry with Edmodo	T

The online based learning on guided Inquiry with Edmodo's help in the refraction and reflection materials of light waves encompasses the 5M achievement in learning that is observing, asking, trying, analyzing and communicating. in Table The subject of this research is all students of Science MAN 1 Yogyakarta year 2017/2018. The number of research subjects was 35 students. For the purposes of data collection, has been constructed research instruments in the form of achievement test results of learning (5M) in the LKPD students.

To examine the learning outcomes using Guided Inquiry-based online learning with Edmodo's help was done by using t independent sample t-test with the help of SPSS 16. To test the significant effect was done by using the following test criteria:

Ho : Edmodo-based online learning Guided Inquiry is not effective in terms of student achievement.

Ha : online learning based on Guided Inquiry with Edmodo's help is effectively reviewed from the achievement of student learning outcomes.

Mathematically, both hypotheses can be written as follows.

$$Ho : \mu \leq 75$$
$$Ha : \mu > 75$$

3. Results and Discussion

The ability of students' learning outcomes is obtained from the post test score of students after conducting online learning activities based on Guided Inquiry with Edmodo.

Tabel 3. Analysis results *One-Sample t-Test*

One-Sample Test

	Test Value = 75					
	T	Df	Sig. (2-tailed)	Mean Difference	95% Confidence Interval of the Difference	
					Lower	Upper
mia1	4.477	31	.000	3.37906	1.8399	4.9183

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The above table shows the results of the online learning-based Guided Inquiry's effectiveness test by Edmodo in learning with one-sample t-test on the achievement of student learning outcomes with KKM reference. Result of analysis by using t test obtained value of significance (2 tailed) 0,00 <0,05, then H0 rejected and Ha accepted. This shows that online learning based on Guided Inquiry with Edmodo is effective towards the achievement of student learning outcomes.

Tabel 4. student learning outcomes

	M1	M2	M3	M4	M5	NA
The highest score	93,33	100	92,31	100,00	100,00	87,76
Lowest Value	60,00	42,86	69,23	50,00	25,00	69,39
Standard deviation	1,57	6,71	2,16	6,37	7,85	1,26
Average	80,00	75,44	80,77	77,81	77,09	78,37

Description :

- M1 : Observe
- M2 : Ask
- M3 : Try
- M4 : Reasoning
- M5 : Communicate
- NA : Final score

Based on the table it can be seen that the average of student achievement class XI IPA 1 can be said that has reached the Minimum Exhaustiveness Criteria (KKM) is 75. If we see in **Table 4** the bottom row in the Average, the initial assignment of students M1 and M2), the value of LKPD (M3, M4, M5) and student's final score have all reached the KKM score. This means that online learning based on Guided Inquiry with Edmodo has an effect on students' physics learning result.

The test results show that the instructional model of guided inquiry with edmodo edu- cation is effectively used in the achievement of physics learning outcomes. In the learning of inquiry students are involved in learning by asking and answering questions, information search can be done with discussion activities, and conduct an inquiry to obtain information or find answers from questionable problems through experimental activities. This learning strategy is very well implemented in Physics learning to cultivate the ability to think, work and be scientific and communicate it as an important aspect in life skills (Wenning, 2011). The experimental classroom learning atmosphere whose learning using guided inquiry learning model becomes alive and active. This learning makes students gain a better understanding and students are more interested to know it (Partono, 2015). Interest from the students themselves will certainly encourage students to learn and dig information. The more information students gain then it will certainly affect the level of student understanding. This is in line with research conducted by Rahmatsyah & Simamora (2011) which states that the guided inquiry learning model has a learning stage that generates students' activity so that in addition to increased activity, learning outcomes also increase.

Learning with Guided inquiry with edmodo can also make learning time effective in school. Edmodo is one of the applications of e-learning based learning. Based on the results of research in addition to improving learning outcomes, learning with these methods can also streamline the learning time. Through edmodo syntax of early learning of edmodo namely presentation of problem and collecting and verification of data can be done by teacher a few days before learning can be done through edmodo so that when face to face learning student can directly conduct experiment to melkukan peyelidikan and search for answer yag question in problem formulation. so the 5M aspect in the learning activity that has been designed in the RPP can be fulfilled and done well.

4. Conclusions

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The online learning based on Guided Inquiry with Edmodo is effectively reviewed from the achievement of student learning result of XI MAN 1 Yogyakarta.

5. Suggestions

Based on the research that has been done, the researcher proposed some suggestions for the improvement of subsequent research that is (1) applying guided inquiry learning with edmodo as one of alternative learning method to optimize the achievement of student learning result. (2) before conducting the lesson, it is necessary to prepare in advance the completeness of the teaching especially if you want to do the experimental activities (3) pay attention to the time during the learning so that the 5M aspect in the 2013 curriculum can be fulfilled.

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Profile of Students' Level of Understanding and Model Mental on Hydrostatic Pressure Concept

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Abstract. This study was conducted to determine the students' level of understanding on Hydrostatic pressure concept and relating these levels to identify students' model mental. An achievement test composed of two parts comprising eight open-ended questions was constructed and given to 19 students the senior high school. The first part of the test included two open-ended questions for each concept asking students to explain a case, determine the physics concepts related to the case and write a case suitable for the related concepts. The second part contains the question about what the explanation and other examples of Hydrostatic pressure concept. The result of data research was analyzed with two stages. The first stage, was analyzed level of understanding showed that students were relatively successful at explaining a case about Hydrostatic pressure concept. However, their achievement in defining these concepts is very weak. In the second stage, the analysis of model mental was classified into three levels i.e. scientific, synthetic, and initial. The result showed that the students have significant weaknesses in understanding the terms of fundamental knowledge of Hydrostatic pressure concept. It is maybe stem from the lack of students to relate scientific knowledge with real-life phenomena and experiences. Furthermore, that the result of this study about level of understanding and student of model mental in helping educator making learning activities more innovative and effectively.
Keywords: ***l***evel of understanding, model mental, Hydrostatic pressure concept

1. Introduction

In accordance with the expectations of *PERMENDIKBUD* (Regulation of the Minister of Education and Culture) Number 69, in 2013 which say "curriculum in 2013 to prepare high school students to be a person of faith, productive, creative, innovative, affective, and ready to contribute to the life of society, nation, state, and civilization of the world. Referring to the objectives designed by the 2013 curriculum document, that learning should be concerned with the opportunity given to the learner to construct knowledge in the cognitive process. For realize this goal one of them by implementing physics learning.

Physics is a part of science which have supported technological progress and basic concepts in running a horizontal survival with nature. Physics is built on facts obtained from the study of a natural phenomenon from accurate research. Physics is an experimental science, which is a physicist must to observe natural phenomena to find the patterns and principles that connect phenomena occurring in everyday life [1]. It can be realized if students can understand physics widely. The ability of students to understand physics widely has started with the ability of students to understand the basic of concepts in the physics lesson. So that students not only have an alternative perception of a physics concept, but students can explain and understand the concept of physics as a whole correctly accepted opinions from experts.

Since childhood, the early framework of theoretical physics has been formed in students, and becomes the basic capital for students to explain the phenomena already occur[2]. When getting new concepts from the surrounding environment, the initial framework of theoretical physics became the limiting factor in interpreting more specific theories of the physical world. The specific theory has continued to blow dynamically when accepting other concepts according to the original framework, learning science should move and focus on a solid understanding, so other cognitive abilities will develop correctly [3]. Cognitive abilities that must be possessed by students to master the concept of physics one of them is the ability to understand.

But in fact, the state of the field is different from ideal conditions that should be reached. Many students still find it difficult to be master the concept of physics and understand it completely. Most of them only understand some students have the wrong understanding. Most students explain the concept of

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physics based on self-perception. An incomplete understanding and abstract concepts make students feel difficult to understand. The experience that students have in daily life also has an impact on students. Each student has an internal representation which acts as a structural analog of the process situation [4]. In explaining the reasoning, every student as he tries to understand, explain and predict the final state of a phenomenon, students use mental models [5]. This has issued several questions in this study, what the level of understanding of students related to the mental model of students in understanding the concept of physics.

2. Methodology

The sample for this study consisted on 19 students of senior high schools in Jakarta. The sample was randomly selected from a class of XII MIA. All students have already studied Hydrostatic pressure concept. An achievement test, about Hydrostatic pressure concept composed of 8 open-ended questions or items, we used as a data-gathering instrument. In the first part of the test, an everyday example or sample case was presented to students. They were asked questions related to the sample case in daily-life to be given an explanation of the concept. Then they were invited to provide other examples related to the concept of physics in the case, and a detailed explanation of the physics concept used in the case. Overall, three questions were asked about Hydrostatic pressure concept, totaling six questions in all. In the second part of the test, participants were asked two questions about defining Hydrostatic pressure concept.

Students were given 40 minutes to complete the test, and they were encouraged to freely express their thoughts. Student responses were analyzed in two ways. The first stage, we identified the level of students understanding, then the second stage identified the student mental model. The analysis by the method of matching understanding levels to rubrics in order to reveal students mental models [6] to used in this study. In that way, we can find a link between students level of understanding and mental model. Because mental models are used to construct new knowledge [7] it is important to reach some understanding about them. Data obtained from the instrument was analyzed to understand levels of understanding [7], (see Table 1).

Table 1. Rubric for Level of Understanding

Level of Understanding	Score	Categories
Sound Understanding (SU)	4	Responses containing all components of the scientifically accepted response
Partial Understanding (PU)	3	Responses containing some components of the scientifically accepted response
Partial Understanding with Alternative Conception (PU-AC)	2	Responses showing that the concept is understood but also containing alternative conceptions
Alternative Conception (AC)	1	Scientifically incorrect responses containing illogical or incorrect information
No Understanding (NU)	0	Blank, irrelevant or unclear responses

In the second stage of study, student answers were analyzed according to the mental models shown below inn Table 2. [12]

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Table 2. Rubric for Mental Models

Mental Models	Content	Level of Understanding
Scientific	Perceptions which coincide with scientific knowledge: answers at level 3 (PU or PCD) or 4 (SU or CD).	$\begin{bmatrix} 3 & 3 & 3 & 3 \\ 4 & 4 & 4 & 4 \end{bmatrix}$
Synthetic	Perceptions which partially coincide or do not coincide with scientific knowledge.	$[All\ other\ possibilities]$
Initial	Perceptions which do not coincide with scientific knowledge: answers at level 0 (NU or ND), 1 (AC or ID) or 2 (PU-AC or CD-ND).	$\begin{bmatrix} 0 & 0 & 0 & 0 \\ 1 & 1 & 1 & 1 \\ 2 & 2 & 2 & 2 \end{bmatrix}$

To understand the rubric given in Table 2. For example, the level of understanding for student A for each of four question about hydrostatic pressure concept was as follows: level 1 for item A, level 0 for item B, level 1 for item C, and level 2 for item D, using the last column of the Initial model.

3. Result and Discussion

The results showed that the students' level of understanding on the concept of hydrostatic pressure is in alternative conception (AC). This shows that students' understanding is very weak. Students tend to answer and explain the concept of hydrostatic pressure with unscientific alternative answers. This result is in line with research conducted by Marlis [8] on understanding the concept and consistency of student conception on the static fluid material, that the concept of hydrostatic pressure in students' understanding is still low. Then in the category of mental models of students are in the initial mental model which means that students' perceptions are not scientific. The following percentage of students' answers to the level of understanding and mental models is presented in Table 3 and Table 4 below:

Table 3. Percentages of Responses to Question – Level of Understanding

	Cases 1				Cases 2			
Levels	A	B	C	D	A	B	C	D
SU	-	-	-	-	-	26%	5%	-
PU	10%	26%	5%	16%	68%	16%	-	16%
PU-AC	11%	-	53%	47%	16%	-	37%	26%
AC	68%	63%	21%	11%	16%	53%	58%	58%
NU	11%	11%	21%	26%	-	5%	-	-

We can see the results of the students 'answers in Table 3 above that stated that the highest level of students' understanding is in the category of alternative conception (AC) and partial understanding with alternative conception (PU-AC).

Table 4. Percentages of Mental Models

Mental Model	Students	Percentage
Scientific	-	-
Synthetic	4	21%
Initial	15	79%
Total	19	100%

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The result of mental percentage of student model shows that 79% of students are in the category of initial mental model. And the synthetic mental model only revolves around 21% only. These results illustrate that students in understanding and explaining the concept of hydrostatic pressure are still very low. In line with Maria Chandra's study [11] in her journal which aims to identify students' difficulties in static fluid materials, students are difficult to interpret mathematical equations and tend to think native intuitions in explaining physical phenomena. Then in research Pipit Yogantari [9] which identifies students 'difficulties in learning physics, reveals that students' difficulties in learning physics due to lessons experienced by students less than the maximum in hands-on activity.

Knowing the mental model of the student can be a teacher's reference in improving learning so that students' understanding can be absorbed maximally. The mental model is an overview of the concepts that exist in each individual student in explaining a phenomenon or process that is happening [12]. Each student has a different mental model, depending on how the student forms his mental model [13]. Understanding students who tend to be low and unscientific mental models can be improved by improving the quality of learning by innovating in learning activities that promote students to explore their knowledge and provide freedom to students to find their information more deeply with teacher mentoring that leads to scientific perception. Student engagement and activeness in learning activities can encourage students to be more interested in deepening scientific concepts and principles in physics learning [13].

4. Conclusion

Based on the results of research and discussion above, it can be concluded that the level of understanding and mental models of students on the concept of hydrostatic pressure is far from expected, which is still low. Student responses also indicate a significant relationship between the level of understanding and the mental model of the student. Where students who have a low level of understanding, mental models are also located in the category of initial mental models. And overall students have not understood the concept of hydrostatic pressure scientifically in explaining and answering questions. However, the above conclusions are limited only to the samples used given the number of samples used are small.

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The Implementation Of Problem Based Learning Model Toward Conceptual Understanding At Senior High School

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Abstract. This research was experiment using posttest-only control group design. The study was conducted at SMA Negeri 3 Makassar with students of X MIA 3 as experiment class and X MIA 8 as control class. The implementation problem based learning model of this research was used at experiment class and conventional model at the control class. After finishing this learning, the students was given posttest based on conceptual understanding test with form of multiple choice. The result showed that the average score of conceptual understanding experiment class and control class are relatively 10,25 and 4,81. Based on inferential statistic using t-test, it is clearly shown that $t_{calculation} > t_{table}$ that means H_0 rejected and H_1 accepted. Therefore, it was concluded that there are significant differences on variables of conceptual understanding between students who studied through problem based learning model and their counterparts model who studied through conventional model at class X MIA SMA Negeri 3 Makassar in 2016/2017 academic year.
Keywords: conceptual understanding, problem based learning

1. Introduction

The development of educational system maintains the balance of global flow and human learning quality. Based on the improvement of technology students should become more communicative, mastery of high material with an adequate of information access. This is in according with 21st century education that focuses on developing of integrated intelligence in the real world. Therefore, learning requires not only understanding skills and being able to practice, but also emphasizing how students produce findings from the process of adaptation to the environment [1].

In order to support 21st century learning, transformation of learning method is necessary, from teacher-centered to student-centered learning. Student have an opportunity to build concepts during learning activities actively. Teachers also should create a learning environment, provide creative surrounding, and build their students' talents. This learning can be done by scientific approach. This approach includes of systematic scientific steps that are suitable to apply in science learning. Physics is part of science , that requires the ability to think and investigate with certain methods. Hence, the information or explanations that can be tested and verifiable.

Based on observations in class X MIA SMA Negeri 3 Makassar 2016/2017 academic year the researcher obtained information as follows: 1) the standard of mastery learning can not be achieved by students, 2) learning was still using conventional method. The completeness of learning can not be completed due to of a low understanding of physics concepts. Therefore, to improve the quality of physics learning, it requires learning model using a scientific approach. The problem based learning model provides a forum that allows students to do inquiry activities for developing essential skills in problem solving. Problem given should be increased students' curiosity, self-directed learning, and inquiry [1,2]. Problem based learning has a several characteristic as follows: 1) learning starts with unstructured real world problems, 2) team work in small groups, 3) critical thinking in solving complex problem, 4) learning issues [2]. Therefore, pbl can be improve thinking ability and mastery of matter. The results showed that applying problem based learning model can improve conceptual understanding [3,4,5,6,7].

Based on these facts the researcher believes that by applying the problem based learning model correctly, the understanding of the physics concept can be better. Thus, the title of this research is **"The Implementation of Problem Based Learning Model Toward Conceptual Understanding at Senior High School"**

2. Method

This research was true experiment research based on posttest only control group design. It was implemented in SMA Negeri 3 Makassar. This research was conducted in even semester of academic year of 2016/2017. The population was all of class X MIA with total 314 students. The sampling technique was selected randomly and class X MIA 3 selected as the experimental class and class X MIA

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8 was selected as the control class. The independent variables were problem-based learning and conventional model, while the dependent variable was conceptual understanding of physics.

The research instrument used a test of the physics conceptual understanding with a set of multiple choice which has been tested for its validity and realibility. Furthermore, the data obtained were analyzed through descriptive statistics and inferential statistics. Inferential analysis includes normality test, homogeneity test, two tail test, and average estimates. t-test formula to test the hypothesis is:

$$t = \frac{\overline{X_1} - \overline{X_2}}{\sqrt{\frac{(n_1 - n_2)s_1^2 + (n_2 - 1)s_2^2}{n_1 + n_2 - 2}\left(\frac{1}{n_1} + \frac{1}{n_2}\right)}} \quad (1)$$

3. Result and Dicussion

The description of physics conceptual understanding of control class and experiment class can be shown in table 1 as follows:

Table 1. Physics Conceptual Understanding Description

Statistic	The statistic value	
	control class	experiment class
total samples	32	33
maximum score	9	14
minimum score	2	7
Mean	4,87	10,67
Deviation standar	1,84	2,06
Varians	3,40	4,23

Based on the table 1, it was clearly seen that the experiment class has an average score of 10.67 higher which was then control class of 4,87. Furthermore, physics conceptual understanding scores were categorized by frequency distribution in the following table:

Table 2. Score Frequency Distribution of Physics Conceptual Understanding

Interval	Category	control class		experiment class	
		Frequency	percentage(%)	Frequency	percentage(%)
0 - 4	very low	0	0.0	16	50.0
5 - 8	Low	3	9.1	14	43.8
9 - 12	Medium	23	69.7	2	6.3
13 - 16	High	7	21.2	0	0.0
17 - 20	very high	0	0.0	0	0.0
Total		33	100.0	32	100.0

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Table 3. Physics Conceptual Undestanding for Each Indicators

Indicators	control class		Kelas Kontrol	
	Mean	Percentage %	mean	Percentage %
Comparing	1.79	59.60	1.28	42.71
Interpreting	5.0	55.56	2.22	24.65
Summarizing	1.48	37.12	0.44	10.94
Classifying	1.06	53.03	0.91	45.31
Exemplifying	1.33	66.67	0.16	7.81

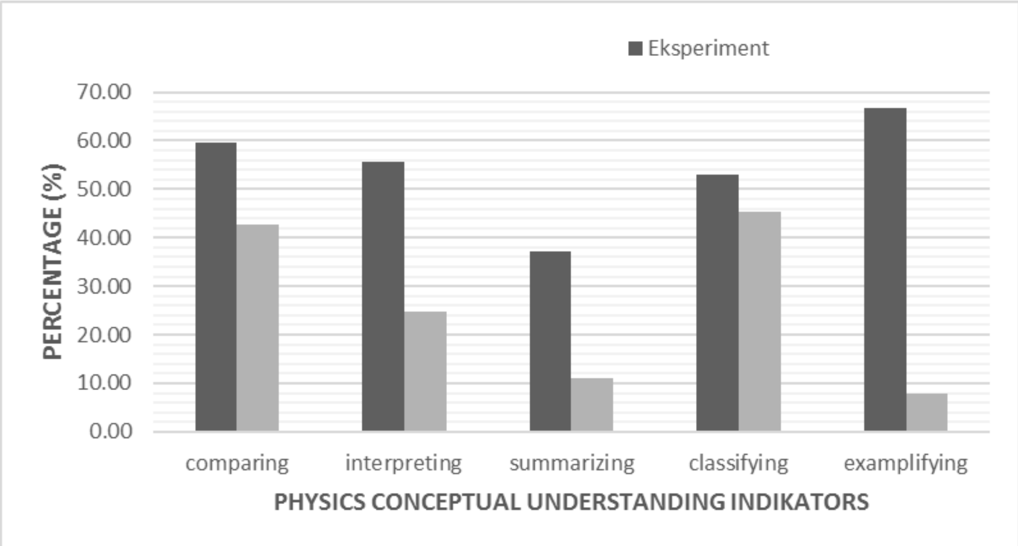

Figure 1. **Percentage Of Students' Score Based On Physics Conceptual Understanding**

Scores of physics conceptual understanding in the experimental class was in the high category (21.1%) while the control class was in medium category (69.7%) Based on table 3, it is found that, the average score relatively increase for each indicator of physics conceptual understanding in experimental class rather than in control class. There was a significant increase in indicators starting examplifying, interpreting, and summarizing. It was cause by pbl model that trained students for identifying, analyzing, solving, communicating problems [9]. Learning using the pbl model encourages students to find much information related to the issues studied. students become active and be able to self-direction learning in accordance with the demands of the 21st century.

Students solved the problems presented in the worksheet. The following steps are firstly, students were given an authentic problem to enhance their curiosity and to motivate. Furthermore, students conduct investigations process through experimental activities or literature review. After that, students should answer the questions available in worksheet. These questions led them to resolve the issues presented at the beginning of the assessment. This activity can improve the ability of critical thinking and mastery of the content of knowledge. In addition, cooperatively students do inquiry to solve problems so that learning becomes more meaningful.

The result of inferential analysis indicate that the sample from normally distribution and homogeneous population so that requirements for t test were met. The results of hypothesis testing using t-test is $t_{calculation}$ = 9.52967 and t_{table} = 1.999, due to $t_{calculation} > t_{table}$ so H_1 was accepted and H_0 was rejected. H_1 hypothesis is there was a difference understanding of physics concepts between learners who were taught by using a model of problem-based learning with the control class which has taught by conventional model in students of class X MIA SMA Negeri 3 Makassar. Furthermore, the average estimated value

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was estimated value of 9.78 <11.21 It means that if the problem based learning model applied to the population will get a score that is in the range of 9.78 to 11.21.

4. Conclution

4.1 The average score of physics conceptual understanding students of X class MIA SMA Negeri 3 Makassar taught using the problem based learning model was 10.67 which was higher than the students in the control class which was shown as 4.87.

4.2 There was difference of physics conceptual understanding between students' who were taught using problem-based learning model with the conventionally taught students in class X MIA SMA Negeri 3 Makassar 2016/2017 academic year

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Shifting Attitude From Receiving To Characterisation As An Interdisciplinary Learning Toward Ecological Phenomena

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Abstract. Physical learning is an integral part of science education where science and its practices describe the understanding of an interdisciplinary learning. One of the physics studies related to the environment is ecological phenomena that have become a crucial issue today so that the science education play a role in building an environmentally conscious attitude as a character. Ecological attitudes are an integral part of understanding the concepts that link to the environment issue as interdisciplinary learning that have to be developed to prepare future science generation. This article analyzed the shifting attitudes of pre-service physics teacher from receiving toward characterization on ecological phenomena, based on Bloom's affective level as the attitudes. The analysis of data describe a comparing of the students' attitude scores on each level who have not studied yet, are studying, and after two years passed course about climate change, deforestation, and the use of energy resources as a complex environmental damage effect. The results of the study indicate an inconsistent shift in attitude to climate change, deforestation and the use of energy resources phenomena in a row, where the phenomenon of climate change is at the receiving level, deforestation is at the organizing level, and the use of energy sources is at the level of responding. This article provides an argument that attitude change needs interdisciplinary understanding of concepts as a toward a sustainable character

Keywords*:* attitude, character, ecological phenomena

1. Introduction

Education is a continuous process in building and developing the dimensions of each human being so that it has to develop continuously. The development of this education should be in line with the development of science and technology to give a significant effect toward the development of self-dimension. Student self-dimension according to the Indonesian National Qualification Framework (KKNI) to encourage the realization of character through learning that includes cognitive dimension, affective dimension, and psychomotor dimension. These three aspects are competencies as the outcome of learning in the course [1]. One of the three aspects of Education for Sustainable Development (ESD) that Unesco has initiated since 2004 for the future sustainability of future generations is an environment that has emphasized in a philosophical, analytical, and comprehensive environmental ethics. Therefore, intergenerational and intra-generation relationships are needed, including the relationship between humans and living creatures in nature [2] Thus, to achieve its required an education that not only educates students cognitively but produces graduates who are able to present concepts, values, and behaviors.

Dimensions of value and behavior as the affective dimension by Bloom [3] emphasize attitudes with five categories of domains that range from simple to most complex. Unfortunately, until now attitude sphere has not received the attention that has been revised cognitive domain, despite criticism. This argument is probably due to an understanding of "attitude" which is a difficult factor to change during the learning process. Nevertheless, some studies show that learning models such as inquiry, PBL, and PjBL can increase the attitude as affective dimension [4,5,6].

The existence of environmental issues as local and global issues, such as climate change, deforestation, and the use of energy resources that are part of the learning of physics, encourage theinvolvement of all fields to take a position, including the interdisciplinary of education. Therefore, interdisciplinary education should provide insight into the values of ecological awareness and concern for its natural environment as the actualization of attitudes to a harmonious and sustainable life [7].

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2. Research Method

Research purpose

The aim of this study examines the attitude of physics students which shifted from the low-level to the high-level toward ecological phenomena. The ecological phenomena review of mainly environment issues which happen today as global and local issues such climate change, deforestation and the use of energy resources. It is a trend in Sulawesi Tengah specifically.

Research method

A survey has done in this study to find a view of students' attitudes in each level toward three ecological phenomena. The score of each level compared and analyzed its shifting from one level to the next.

Questionnaire design

The instrument of this research used a validated questionnaire given to 22 respondents which consist of 50 statements toward ecological phenomena in accordance with the issues trends in Sulawesi Tengah as shown in Tabel 1. This questionnaire includes five categories refers to Bloom' affective taxonomy as receiving, responding, valuing, organizing, and characterizing [3]. Attitudes ecological questionnaire is formed in favorable and unfavorable statements with six alternative answers as "always experience" to "always not experience." It contains the subject matter that shown the interdisciplinary subject and learning scopes [8].

Tabel 1. The Subjects of Knowledge and Attitude Questionnaire

Ecological Phenomena	Subjects	*Interdisciplinary*	
		Subjects	*Learning*
Climate Change	Global warming and greenhouse effect Extreme Environment Mitigation urgency climate Change	Physics Biology Geography	Ecopedagogy Psychology
Deforestation	Damage to lithosphere Damage to hydrosphere Damage to ecosystems Mitigation urgency deforestation		
Using Energy Resources	Environmental pollution Electrical energy crisis Green alternative energy urgency		

3. Result and Discussion

The comparison of score attitudes toward the course

Based on the research of 22 respondents, the comparison of the percentage of means score described in **Tabel 2**. The results obtained show that means score before (=63.25) and two years passed learning (=69.71) are smaller than ongoing learning (=79.28).

Table 2. The Comparison of The Percentage of Attitude Means Score

Category	The Means Score of Attitude (%)		
	Before l	Ongoing	Passed two years
Receiving	68.28	89.44	98.96
Responding	57.60	80.70	59.65
Valuing	63.13	72.73	62.55
Organizing	65.93	83.76	65.43
Characterizing	61.31	69.79	61.94
Means	63.25	79.28	69.71

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These findings indicate that pre-service physics teachers' attitudes are not sustainable after the completion of the lecture and maybe their attitude did not progress when the course two years ago.

The interaction learning to attitude

Tabel 2 showing the representation of each category that obtained at the three different learning time. The receiving indicated the highest score when the course had passed for two years; for responding category showed the highest at ongoing lecture; for valuing category indicated the means

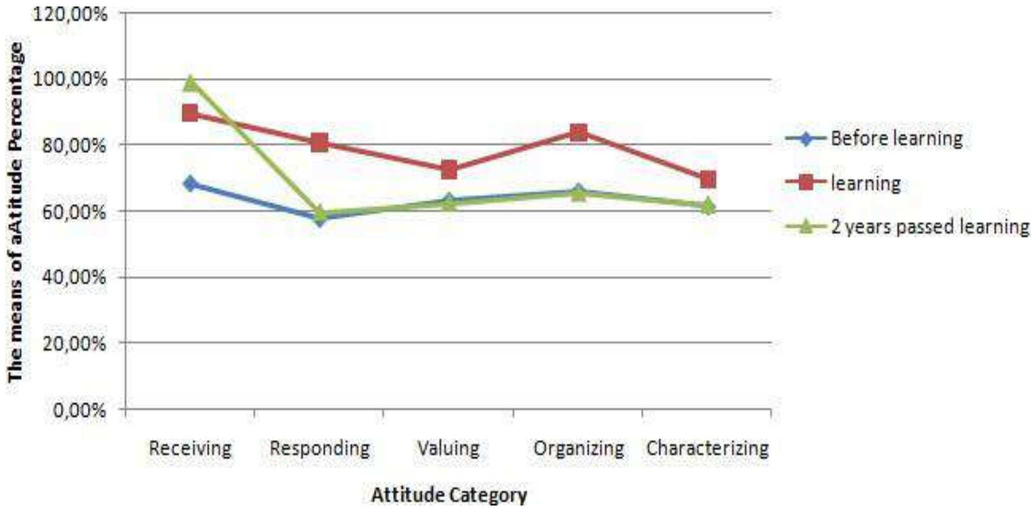

Figure 1. The shifting of the attitude

but not the significantly different; for the organization, the highest percentage score when ongoing learning as the characterizing that not significant. Therefore, based on the Tabel 2 discovered the shifting of the receiving to characterizing category inconsistently as represented in figure 1

The shifting before learning started from responding progressively as two years passed learning but have a different receiving score. However, there is a significant interaction in the shifts at before and after learning. This interaction is seen original pointing on the responding and increased in the responding to organizing. Conversely, in the category of characterizing obtained a decline in the graph. In the ongoing learning and passed two years is seen an interaction to the valuing and responding, and the next shifting no interaction occurs. This finding indicated that students' attitudes have decreased from valuing to responding after two years of learning. On the other hand, the development of attitudes as an outcome of learning is not sustainable yet. Unfortunately, there is no interaction either before learning or while learning takes place in each category.

Overall, Figure 1 shows that the shift in attitudes from the receiving categories to the characterizing categories is not consistent compared to the shift in attitude levels according to Bloom described as "ladder." Bloom explained that education affects the attitude changes from simpler levels to more complex levels that caused psychology factors. Attitudes linked directly to motivation as a psychology factor in education that driven affective responses as a behavior [9,10]. However, the result of research highlight that models of learning have a contribution to effecting students' attitude [4,5,6]. Learning approach appropriated can help the student to gain their outcome competencies. On the other hand, high motivation and learning approach may shift the attitude to the more high category.

The comparison of score attitudes toward ecological phenomena

Based on the study, the percentage of 22 Physics Education students' attitude on each category showed in **Table 3**. The means for global warming phenomena was 53.95, deforestation was 83.89, and deforestation was 54.76 respectively. As can be seen, the score for deforestation greater than to the other aspects of ecological phenomena. This finding shows that students are more able to be friendly to the forest than to the phenomenon of global warming and the phenomenon of the use of energy sources. This

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result may be due to the belief and local cultural wisdom – “*ombo*” [11]. That hypothesis is maintained by the community in which they live, in addition to because the students have been accustomed to living in harmony with the forest environment.

Table 3. Percentage of the attitude in each category

Ecological Phenomena	Attitude categories					Means
	Receiving	Responding	Valuing	Organizing	Creating	
Global warming	78.97	45.34	54.36	67.87	53.16	53.95
Deforestation	78.83	54.05	68.47	82.43	65.24	83.89
Using energy resources	62.17	74.78	64.47	59.46	60.05	54.76
Means	78.73	53.85	62.43	68.72	59.48	

Nevertheless, the average percentage of attitudes by category as can be seen in Table 3 shows that the receiving category (78.73) is the highest compared to the others, while the lowest is the responding (53.85). These results illustrate that students' attitude toward environmental issues in Sulawesi Tengah are in the receiving only. Based on Bloom, receiving category is a category of attitude that illustrates that the students are limited to knowing and have not done anything. This receiving category result linear with the lowest responding category, followed by creating or characterizing (59.48) depicting actions that are characters. Thus, it introduces that the attitude of physics education students to the environmental phenomenon has not reached yet in response to environmental issues surrounding them.

4. Conclusion

Based on the result and discussion of the study, it can be concluded that the shifting of attitude from receiving to characterizing indicate an inconsistent toward ecological phenomena in Sulawesi Tengah, Indonesia. It describes that the attitude of physics education students to the environmental phenomenon has not reached yet in response to environmental issues surrounding them. These results illustrate that students' attitude toward environmental issues in Sulawesi Tengah has not built up a sustainable character as a learning effect. We suggest the interdisciplinary learning approach as a drive to develop an ecological attitude.

Acknowledgment

There was no wasted effort when you wanted to participate in this research. For that, the researchers are grateful to all physics education students who are willing to be respondents in this study. Researchers are also grateful to selected students who willingly involved during data collection.

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DEVELOPMENT MEDIA OF PHYSICS LEARNING BASED ANIMATED FLASH PRO CS6 ON THE SENIOR HIGH SCHOOL, CILINCING, NORTH JAKARTA

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Abstract. This study aims to produce an animated learning media based on *Macromedia Flash* for 10th grade students, as well as to know the quality of learning media products that have been developed so feasible to be used in physics learning activities. The research method used is Research and Development (RnD) method with the development process using ADDIE (Analysis, Design, Development, Implementation, and Evaluation). The research instrument used the assessment sheet with data source of media expert, material expert, and response of 10th grade students SMAN 115 Jakarta and SMAN 92 Jakarta. The feasibility of developed media is assessed based on the results of the assessment. The results of the assessment indicate that the appropriate media developed is 96.18% which means Good (B). The utilization of this media is expected to optimize the understanding of the subject by animated media based on *Macromedia Flash* for the more interesting and innovative for 10th grade students.
Keywords: kinematics, physics, instructional media, macromedia flash

1. Introduction

Instructional media comes from Latin language, medius meaning middle, intermediary or intoduction. The Association for Education and Communication Technology (AECT) defines the media that is all forms used for a process of information distribution.

Instructional media serves as a tool in teaching and learning activities in the form of a means that can provide a visual experience to students in order to encourage motivation to learn, clarify, and simplify complex and abstract concept to be more simple, concrete, and easy to understand. Thus, the media can serve to enhance students absoption of learning materials.

One of the most widely used learning media is Computer Learning Media. One program that is widely used in creating instructional media that contains animation, graphics, text, and sound is Maacromedia Flash. The lack of use Flash-based learning media in SMA Cilincing, North Jakarta in teaching and learning process used by educators, because the methods used is still monotonous and less varied in terms of used of intructional media.

The method of learning is commonly practiced by teacher in high school is the lecture method. In this method, sometimes the concentration of students is split with other things, consequently the students are less understanding of the lesson, as well as the subject of physics. Not a few who feel bored and saturated to learn it, even many students who just memorize and imagine the object without understanding the basic concept. Similarly, the subject of Kinematics which is the contains theories that accompanied the picture, if that is delivered only by the lecture method only, then the students will not be interested to learn it.

Development of intructional media of Macromedia Flash aims to create interaktive learning media in high school. Because the learning media that has been used in the form of books and learning media using Ms. Power Point still not support student achievement. Intructional media using Flash is expected to increase the attractiveness of students in following the lessons at SMA Cilincing, North Jakarta, especially for 10th grade students.

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2. Literature Review

2.1 Kinematics

The object is said to move if its position constantly changes to a particular reference. In this case, kinematics is the study of motion without regard to the cause of motion.

a. Uniform Linear Motion (GLB)

Uniform Linear Motion is the motion of an object on a straight path with a fixed velocity. Mathematically, $v = \frac{\Delta x}{\Delta t}$.

b. Accelerated Linear Motion (GLBB)

Accelerated Linear Motion is the motion of an object on a straight-line path of constant acceleration. Accelaration still shows that the magnitude and direction are the same.

The equations on GLBB:

1. GLBB is Accelerated

$$v_t = v_0 + a \cdot t \tag{1}$$

$$s = v_0 \cdot t + \frac{1}{2} \cdot a \cdot t^2 \tag{2}$$

$$v_t{}^2 = v_0{}^2 + 2 \cdot a \cdot s \tag{3}$$

2. GLBB is Slowed

$$v_t = v_0 - a \cdot t \tag{4}$$

$$s = v_0 \cdot t - \frac{1}{2} \cdot a \cdot t^2 \tag{5}$$

$$v_t{}^2 = v_0{}^2 - 2 \cdot a \cdot s \tag{6}$$

2.2 Macromedia Flash

Macromedia Flash is a combination of learning concept with visual technology capable of producing new features that can be utilized in education. Multimedia-based learning certainly can present subject lesson more interesting, not monotonous, and facilitate the delivery. Teachers can learn certain subject matter independently with computer equipped with multimedia program. (Hidayatullah P, M. dkk., 2011)

Several versions of Macromedia Flash program is used in this research is Macromedia Flash Pro CS6. Here, one of the design we apply in research,

Figure 1. *Macromedia Flash Pro CS*6-based kinematics learning design

3. Research Methods

Research on the development of learning media based on Macromedia Flash Pro CS6 on Physics with the subject of Kinematics is done in Senior High School, Cilincing, North Jakarta. The location of the research we took samples is SMAN 92 Jakarta and SMAN 115 Jakarta.

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Sampling is determined by Slovin techniques as follows, (Riduwan: 2006:49):

$$n = \frac{N}{Nd^2 + 1} \quad (7)$$

with:

N = Population

n = Number of samples

d = Precision, with 10% precision and 95% level confidence

The type of research used is the research and development (*RnD*). This Procedure adapts the development model of ADDIE, a development model consisting of five stages consisting of *Analysis*, *Design*, *Development*, *Implementation*, dan *Evaluating*.

Test the validity of instructional media Macromedia Flash Pro CS6 is done by a competent validator that is expert media and expert subject validators. Furthermore, validators are required to provide general assessment and suggesstions on the learning media developed Macromedia Flash Pro CS6, whether the learning media has been made can be said to be valid or invalid.

Data analysis technique used in this research is descriptive analysis, that is by calculating percentage of validation result value.

$$Persentase = \frac{\text{Skor yang diperoleh}}{\text{Skor Maksimum}} \times 100\% \quad (8)$$

The feasibility level of the product of the development research is identified with the score presentation. The greater the presentation of the results of the data analysis, the better the level of product feasibility research development results. Criteria in making decisions in the validation of learning media based on Macromedia Flash Pro CS6 can be seen in Tabel 1.

Table 1. Eligibility Criteria of Instructional Media

No	Percentage	Explanation
1	80 % - 100 %	Good/Valid
2	60 % – 79,99 %	Quite Good/ Quite Valid
3	50 % - 59,99 %	Less Good / Less Valid
4	0 – 49,99 %	Not Good (replaced)

4. Result Of Research and Discussion

The product resulting from this research is in the form of physics-based learning media application Flash Pro CS6. This instructional media product is created and designed by the researcher, with the aim of being able to be used as a tool of the teacher in delivering the subject and also as self study source which can be used by the students outside the school at any time.

The development of this instructional media used ADDIE models, with 5 stages including *Analysis*, *Design*, *Development*, *Implementation*, and *Evaluation*.

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Research on development of ADDIE model that researchers have done only until Development stage, because one of the purposes of this research is to develop and produce a valid learning media to be implemented based on validator assessment.

The stages of development research that researchers have done include:

a. *Analysis*, the analysis phase of product development consist of material analysis and analysis of instructional media. From the analysis produced material that required the help of media as a tool for teachers in conveying subjects and the subject that research choose is Kinematics, because the subject needs concrete things to facilitate students understand the material. By using the application of learning media of physics animation based on Macromedia Flash Pro CS6, the teacher can deliver subject not abstract again.

b. *Design*, in the design stage undertaken among others are 1) designing the application of animated learning media based on Macromedia Flash Pro CS6, 2) Animation and video appropriate with Kinematics subject, 3) Sheet validation of media expert and material expert.

c. *Development*, the result of development stage is 1) Application of learning media animated physics based Macromedia Flash Pro CS6, this application consist of basic competencies, core competencies, teaching materials, animation in the form of image, video, and exercise questions that refer to UN CBT standard an 2) Media validation scores.

Here, the product of materials produced:

Figure 2. The resulting product in the form of material, animation, and practice about standardized UN CBT

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Table 2. Expert material validation results

No	Aspect	Percentage
1	Language	95,83 %
2	Material Suitability	100 %
3	Ilustration	100 %
Average		98,61 %

Expert material validation results conducted by two validators obtained by 98.61%. aspect assessed by the material expert are linguistic, the suitability of the indicator with the material, the suitability of the animation with the material to be conveyed, the illustration aspect, and the evaluation of the material presented.

Table 3. Expert media validation results

No	Aspect	Percentage
1	Graphics	87,5 %
2	Processing Program	93,75 %
3	Using	100 %
Average		93,75 %

Based on the results of media expert validation analysis on learning media by Macromedia Flash Pro CS6 developed to generate percentage of 93.75%. it includes the slide design, layout, content appearance, image clarity, suitability of flash animation, page content accuracy, background and color suitability, command processing speed, precision of command button, and easy use. Suggestion from validators on this application is quite good and appropriate.

The average validation from media experts and material experts is 96.18% with valid or good category. Then the application of physics-based learning media of Macromedia Flash Pro CS6 feasible used by students in learning.

5. Conclusion

From the results of research that has been done can be concluded that, the media of physics-based learning animation based on Macromedia Flash for 10th grade students has been successfully created. This media is included in both categories as a medium of learning. Based on the validation data collection that has been done by the validator assessment obtained an average percentage of 96.18% with a valid category, then the application of physics-based learning media animation of Macromedia Flash Pro CS6 in Senior High School is valid for use in physics learning.

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Development of Physics Learning Strategies Based on Dynamic Problem Solving

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Abstract. This research aims to develop a strategy of learning in Physics for increasing the critical thinking ability of students. The study was research and development which adapted Wademan dan McKinney's model. The procedure consisted of problem identification, identification of tentative products and design principles, tentative products and theories, prototyping and assessment of preliminary products and theories, problem resolution and advancing theory. This paper focused on preliminary products. The result of preliminary the products is lesson plan, student book, and student worksheet. The main product research was profile Dynamic Problem Solving Strategies (DPSS). DPSS is six steps learning that consisted (1) identification problem, (2) making the qualitative plan, (3) carrying out the plan, (4) proofing the formula and procedure that using, (5) evaluation, and (6) proofing by the teacher and another student. This strategy is using two activity learning in the classroom. The first activity is the teacher teaching the concept and formula of physics and the second one is the student using the worksheet to solve any problem. Both teacher and students, they are using DPSS. The Subject of implementation this strategy is 62 students of SMAN 9 Makassar. The result is normalization gain score of student's critical thinking in the medium category. Accordingly, the next step is to implement the strategy in another school for getting an advance theory.
Keywords: Critical Thinking Skills, DPSS, Physics Learning Strategy, Problem Solving

1. Introduction

Physics is a branch of sciences that studies about natural phenomena through observation, mathematical analysis, and conceptual descriptions to generate facts, concepts, principles, laws. Physics Learning is conducted to enhance the students' ability to think, work, and being a scientific expert as the important life skills aspect. Students' understanding of Physics lessons can be pursued through the implementation strategies which is effectively used to solve problems. In this context, high-order thinking is one of the skills required to construct Physics materials and solving the problems.

High Order Thinking Skills/ (HOTS) is a process of thinking that involves several mental activities to explore persons' experience which was complex, reflective and creatively. It can be done consciously by achieving objectives, acquires knowledge that includes the level of analytical thinking, synthesis, and evaluative [1]. In order to understand a concept particularly the concept of physics, it should needed a meaningful learning where the students construct their knowledge through the scientific activities or investigation activities actively. The importance of mastering high order thinking skills contained within a few points of the standard of secondary school, i.e., Graduates the competencies expected students could develop and implement an information or knowledge in a logical, critical, creative, and innovative decision-making and demonstrate the ability to analyze and solve complex problems [2].

In terms of high order thinking skills, the fact can be observed that the achievements of Physics in the aspect of the reasoning for the Indonesian's students are in the ranking 40 of 42 countries [3]. It means that the notion of an average understanding of the Physics of cognitive aspects of participants (knowing, applying, reasoning) was relatively still very low and declining Physical capabilities so that the improvement of learning strategy through the supply capability higher-order thinking is really needed. One part of the higher-order thinking is critical thinking skills. It has a characteristic activity of thinking include: analysis, synthesis, and problem resolution for introduction, conclusion, and assessment[4].

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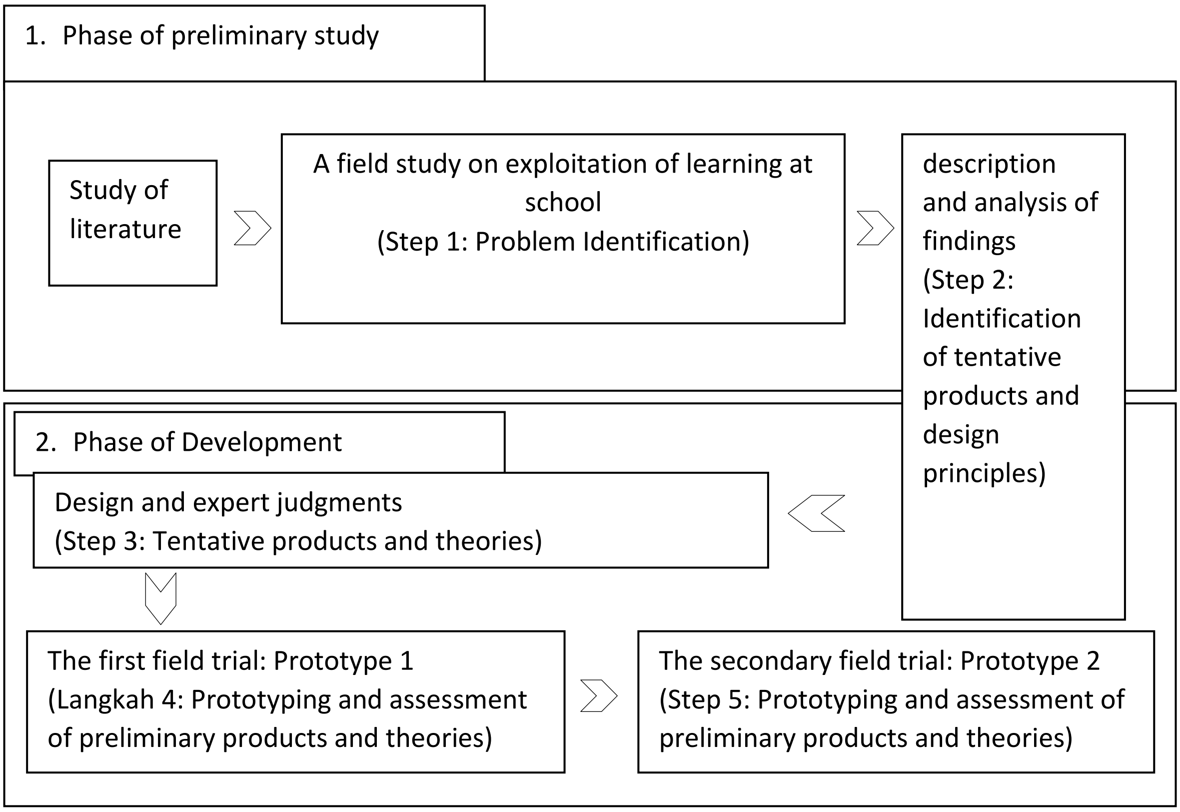
One of the strategies in learning proper viewpoint of the researchers in applying is a Dynamic Problem-Solving Strategies. Students are expected to develop higher-order thinking skills in solving physics. This strategy offers six main steps of completion: 1) knowing and describing the problems; 2) explaining qualitatively; 3) making a planning solutions; 4) executing the planning that has been made; 5) proving the use of the equations and procedures with coherence and consistency; as well as 6) reviewing and evaluating the answers obtained [5]. Through a six-step Dynamic Problem Solving Strategies, this researcher argued that it takes a high order thinking skills to solve them.

Therefore, to develop higher-order thinking skills in all levels of education, the teacher needs a specific learning strategy. Based on the above description, the researchers will examine a research related to the development of learning strategies based Dynamic Problem Solving to improve students' critical thinking skills in Physics in high school.

2. Methods

This research was the Research and Development (R&D) and focused on the development of strategies of learning physics. The development of learning strategies and supporting tools material of learning was aimed to increase critical thinking skills of students in high school. This study consisted of two phases, namely the stage of development of learning strategies and the increasing critical thinking skills of students. The development phase of the strategy refers to the pattern of Sugiyono [6] as follows:



The first stage is the preliminary study by applying descriptive qualitative approach.

The second phase is designing of development strategies which through by developing method and its supporting device refers to the design of the research strategy according to Wademan and McKinney in Nieveen [7] outlined as follows:

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i. Step 1: Problem identification,

ii. Step 2: Identification of tentative products and design principles,

iii. Step 3: Tentative products and theories,

In this article is limited to the third stage, in development carried out Focused Group Discussion (FGD) and validation experts to look at the feasibility of the strategy learning guarantees. In the FGD, the discussions conducted with focusing on several topic such as : (i) the theory of supporting strategies that can foster a higher-order thinking skills, (ii) the syntax, (iii) social system, (iv) the principle of reaction, (v) the support system, and (vi) the impact of instructional and companion model. Then conducted trials limited to one class by applying the experimental method.

The validation sheet and instrument tests critical thinking skills of students were used as the instruments used. Validation sheet have been validated by two experts to assess the resulting learning devices in the form of Learning implementation plan (RPP), Learner Worksheets (LKPD), and textbook physics. While critical thinking skills test instruments was refereed to the instruments developed by Khaeruddin. For indicators of critical thinking skills that are assessed, i.e., the ability of analysis, inference, and interpretation of the learners.

The subject this research was the students of Class X SMA Negeri 9 Makassar 2017/2018 academic year about 33 people. The implementation of this research by the flowchart in Figure 1, but currently still at the development stage

3. Results and Discussion

This research has come to test the validity of the content by the expert. Customized learning material for class X odd semester curriculum is 2013. Learning materials developed includes: linear motion, parabolic motion, and circular motion.

3.1 Development of Learning Tools

Worksheets of the student (LKPD) have been developed with containing of the title of problem (information about the members of group discussion), conceptual information, and the problems & question items. LKPD activities were developed as a tool to solve the physics problem of cognitive aspect or solving the physics problem regarding experiment activities.

Each item of the problem in LKPD was adapted on Dynamic Problem Solving Strategies (DPSS). There were 4 (four) sub-questions on each given problem of cognitive aspect as follows: (a) writing down the variable of the question and the variable being asked, (b) writing down the equation to be used to solve the problem, (c) solving the problem using the equations that have been written, (d) recheck the equation and completion step and evaluate the final answer. The Problems on the experiment LKPD contain: (a) competence achievement, (b) the purpose of the experiment, (c) the equipment, (d) activity plan, (e) making table (experimental result), (f) making graph, (g) data analysis, and (h) the conclusion. The LKPD is also completed with the key answer and assessment rubrics.

Developed learners book contains: headlines, mini lab (experiment early chapter), material, examples of reserved by the completion strategy, the DPSS step question, did you know? (information material benefits in life to develop insights into promoting diversity), let's discuss, the summary of the end of the chapter, and evaluation. Furthermore, the Evaluation of LKPD was conducted by two experts to know the content validity and conformity with strategy DPSS.

Based on the Regulation of the Minister of education and culture Number 22 in 2016 explains that every teacher has an obligation to compose RPP. Therefore, researchers also developed the RPP to support physics learning strategies. Learning implementation plan (RPP) contains: the identity of schools, subjects, themes/sub-themes, meeting, class/semester, subject matter, the allocation of time, core competence, basic competence, achievement indicators, learning objectives, instructional materials, strategies and methods, media and learning resources, learning, and assessment. Learning steps

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developed using DPSS namely: (a) the identification of a problem, (b) make qualitative plans, (c) executing the plan, (d) looking back to the coherence and consistency of formula/equation used, (e) evaluation, and by students or teacher.

3.2 Result of expert judgment

Learning tools validation was used parallel techniques. The script learning tools is given to two experts to assess the feasibility of the product regarding the content quality. The results are then calculated using the contents of the validity coefficient using the Gregory's equation. The content validity coefficients of worksheets, textbook, and study plans is 1.00 so that the tools learning is valid in terms of content. Even so, the researchers obtained the advice of improvement from experts who can be seen in table 1 below.

.**Tabel 1.** improvement assessment from expert

Leaning tools	Expert I	Expert II
LKPD	-	Try to use numbers that are easily calculated
Book	Contextual question must be copiedand add the glossary at the end of the book	The part Navigator, numbers that are used less rational
Leaning plan	We recommend that all learning tools with the aim of learning tailored to the RPP	Allocation of time examined again

Based on the results of the analysis of the validity coefficient is then worth learning tools to use. The next step, namely conducting trials limited to the subject of the trial.

3.3 Field trial study

The Field trial in limited testing has done at SMA Negeri 9 Makassar with one-time trial. The experimental design used, i.e., One-Groups design with Pre-test and Post-test.

$$O_1 \ X \ O_2$$

This limited testing begins with the measurement of the critical thinking skills that would later be called the first observations (O1). Then conducted trials at the DPSS learning strategies classes a test called the grant of preferential treatment (X). After further study, conducted post test called the second observation (O2).

The data of descriptive analysis is showed in Table 2. The average score of critical thinking skills on pre test is 7,606 and post-test is 11,091.

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Tabel 2. Pre test and post test result

Statistics	Pre test	Post test
minimum score	5	8
maximum score	11,5	16
the average score	**7,606**	**11,091**

The result has been determined normalization gain (N-gain). The result is normalization gain score of student's critical thinking in the medium category. Thus, dynamic problem solving strategies (DPSS) is effective to increase the critical thinking skills of students.

Introduces strategies at universities and high schools provide opportunities to encourage and strengthen the ability of the argumentative reasoning and the ability to think. The process of solving scientific problems requires creative thought, the use of available resources (computers, books, articles, etc.) and personal interaction with peers and colleges[8]. Also, this strategy can enhance critical thinking skills learners because they are trained to be able to analyze, interpret, or inference on the learning process. It is appropriate that the ability to think is the process of skill that can be trained, meaning that by creating a conducive-learning atmosphere will stimulate learners to improve critical thinking ability [9].

In addition, a problem solving strategies is important for using to increase awareness and creativity of learners that includes of: defining, investigating, review reviewing, and processing information concerning the problem [10] [11]. The Critical thinking skills of learners could increase due to condition of learners to find concepts and accustomed to resolving questions systematically. This is due to the more frequent learners working on problems, it will be dynamically formed the mindset and the memory about the physics concept in a long period [12]. The next step is the implementation of this strategy in another school.

4. Conclusion

Development of Dynamic Problem Solving Strategies (DPSS) has supported effort to increase students' critical thinking skills. The result of preliminary products is the lesson plan, student book, and student worksheet. The main product research was profile Dynamic Problem Solving Strategies (DPSS). DPSS is six steps learning that consisted (1) identification problem, (2) making the qualitative plan, (3) carrying out the plan, (4) proofing the formula and procedure that using, (5) evaluation, and (6) proofing by the teacher and another student. In the next research, this strategy needs to be implementation at another school in Makassar.

Acknowledgment

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Developing PhyCCTM Android Application on Work and Energy Material for Improving Higher Order Thinking Skills (HOTS) of Senior High School

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Abstract. This This study aims to produce PhyCCTM (Physic Contextual Comprehensive Teaching Material) android applications to improve students' HOTS. In addition to improving HOTS students, the development of this application can also provide convenience for students in accessing and understanding the concept contextually and direct students to find their own concepts. This research was research and developement. The developement procedure refered to the developement model adapted from 4D model that includes four stages namely the defining, designing, developing and disseminating phases. The content product was done by four lecturers and seven physics teachers. The result of this research are as follows PhyCCTM assisted by android application is worthy of use for improving students' HOTS and attitude responsibility in the category of "good". So it can be concluded that PhyCCTM-assisted devices android applications developed already meet the eligibility requirements to be applied in student learning to improve HOTS high school students.
Keywords*:* PhyCCTM, android application and higher order thinking skills.

1. Introduction

Achievement of student learning outcomes in the field of science in Indonesia is still below the international average. The results of the Program for International Student Assessment (PISA) survey show that Indonesia's education quality lags far behind other countries. Of the 100 students sent to the international competition organized by PISA, 73 of the 100 students sent were below the lowest level (level -2) [1]. Indonesia is ranked 64th in Mathematics and Science, 75.7% of students' ability in Indonesia is low. This data illustrates that Indonesian students in working on issues that require high-order thinking or Higher Order Thinking Skills (HOTS) are still low. This HOT capability consists of the ability to analyze, evaluate, synthesize, and create. Academic achievement in physics learning is strongly influenced by the ability of HOT [2]. Therefore, in improving student learning achievement needed effort to improve student's HOT ability and developed for the better.

Low student ability is also caused by the lack of application of learning media that is konstektual. Most students find it difficult to imagine physical phenomena if learning is only theoretical without relating it to everyday life. Learning like this causes students to understand the concept of physics to be not comprehensive and will certainly result in weakening the of students in understanding the phenomena of physics. This leads to an understanding of the concept of physics is not intact and lead to misconception, so that when solving different physics problems are not optimal levels.

Understanding the concept in depth in physics learning achieved one of them by referring to learning resources in the form of teaching materials. The learning process can be implemented with teaching materials containing conceptual questions that are contextual in nature to generate activity and high-level thinking skills (HOTS). This conceptual and contextual teaching material provides opportunities for students to broaden the application and understanding of meaningful and varied in solving physics problems in everyday life. is reinforced with constexual opinions as a way of introducing active learning and is designed to help students connect the old knowledge with the expected learning [3].Therefore, it is needed a teaching materials that are contextual and packed in such a way that so students can generate HOTS ability will phenomena-phenomena of physics that usually occur in daily life as a provision to face the challenges of globalisai era.

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The era of globalization is marked by the rapid development of science and technology (IPTEK) is increasingly sophisticated, such as Smart phones. One of the popular types of smartphones today is android. Android should be used as well as possible in the field of education, especially physics. One way is to implement teaching materials into android applications. Android application will facilitate students in accessing teaching materials because it can be accessed anywhere is good whether or not there is an internet connection. In accordance with expert opinion Chu [4] states that the development of technology has been offered a profit advantage that provides the impetus to learn whenever and wherever. And supported by Amry's [5] opinion that accessing learning resources wherever, whenever, and in various formats potentially improves students' learning capabilities and allows students to build their own knowledge. The breadth of physics information gained will provide broad insights for the students and furthermore provide a positive influence on the learning outcomes.

Based on the description that has been described, one solution that can be implemented in overcoming various problems above is to provide a source of learning that can lead students to become an expert in solving physics problems. Learning resources in question is the android application PhyCCTM (Physic Contextual Comprehensive Teaching Material) to improve HOTS students. Therefore, these teaching materials not only improve the ability of HOTS as aspects of the cognitive domain of students, but it is also expected to give positive influence on the scientific attitude in the affective aspect to the achievement of high school student learning outcomes. This article aims to examine the effect of PhyCCTM and Physic Contextual Comprehensive Teaching Material application to improve students' HOTS on HOTS capability in work and energy materials at senior high scool student.

2. Method

The research method used is R & D (research and development). With 4-D development procedure. Aims to produce PhyCCTM android Physic Contextual Comprehensive Teaching Material applications to enhance HOTS high school students on work and energy issues. Stages of product development are definition, design, development, and dissemination.

The research flow is structured to facilitate the research process that contains the research stages. Regarding the research flow can be seen in the following chart.

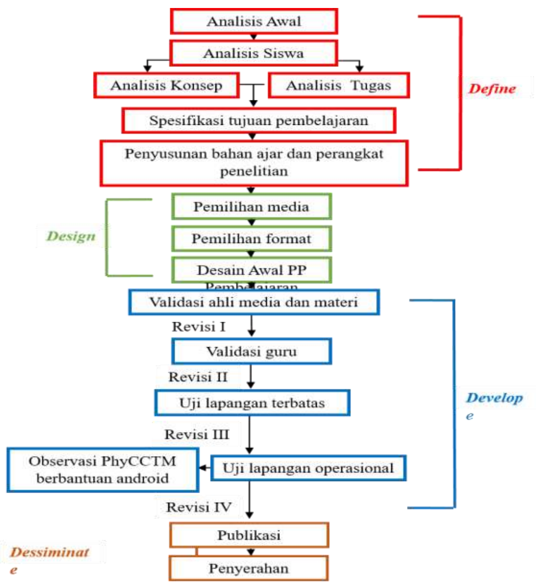

Figure 1. Diagram of the research flow

The test is used to measure HOTS. Implementation of the test is divided into two namely, the initial test of learning (Pre-test), and the final test of learning (Post-test) on work material and energy. Before the tests are given to the students, the test instrument is assessed first by an expert lecturer. Analytical techniques in this study using descriptive qualitative analysis, which describes the technique and interpret data that is qualitative.

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3. Result and Discussion

In this section presented the results of research that is in the form of product description, and description of research data. The product created is PhyCCTM android application (Physic Contextual Comprehensive Teaching Material) as supporting the learning process in school. PhyCCTM is a teaching material presented in the application program on the gadget / mobile phone operating system android. The application program has several features that make it easier for students to learn the material and energy. In addition, with this android application allows students to learn anywhere without having to bring a printed book.

The process of making a learning application begins with the selection of materials in accordance with the Curriculum 2013 applied to SMA Malang. By selection of basic competencies and indicators as follows:

3.1 Login screen and registration

Figure 2. Login screen and Registration on PhyCCTM android app.

3.2 Main menu screen

Figure 3. Main screen on PhyCCTM android app.

3.3. Content content

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Figure 4. Contents of Materials Work and Energy on PhyCCTM android applications.

3.4 Test Hots

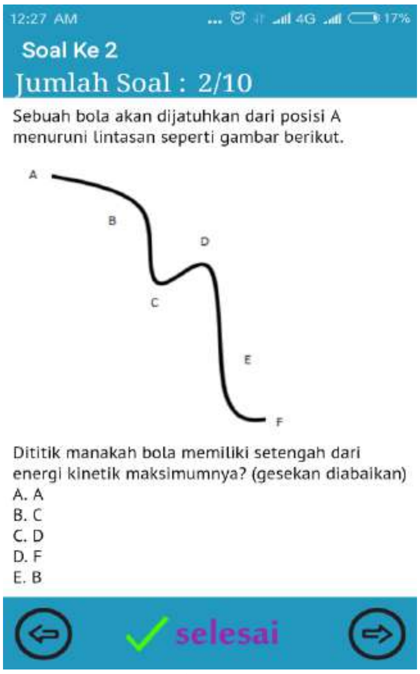

Figure 5. One example of the HOTS matter of Work and Energy on PhyCCTM android application

Description of the data of this study is a translation of media validation results from material experts, media experts, teachers SMAN 1 Malang. HOTS Test Results (pretest and postest) questionnaire results.

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Results Improvement Ability HOTS Students SMAN 1 Malang.

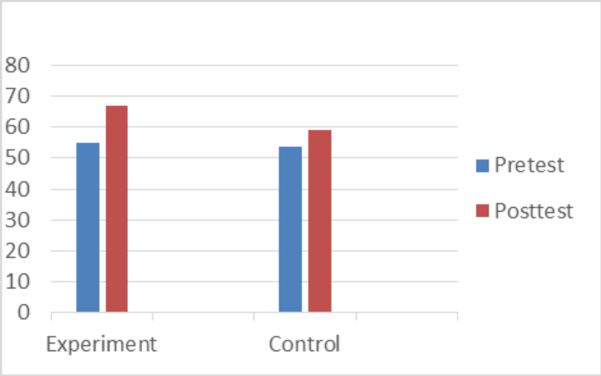

Figure 6. The Student Hots Upgrade Chart on PhyCCTM android apps

Results of Differences in HOTS Ability Improvement in Experiment and Control Group

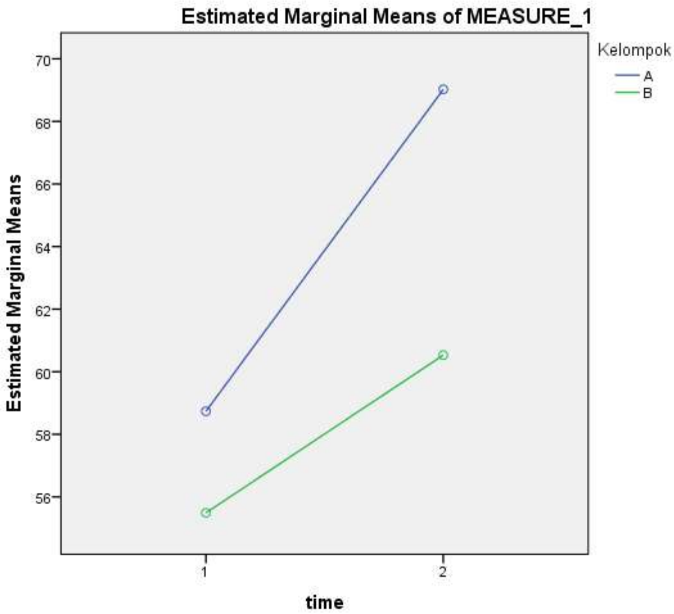

Figure 7. Differences in HOTS Capacity Improvement in Experiment and Control Group

Based on the data results, it can be seen that the average value for HOTS Test is almost perfect for Android Applications. This is supported by the results of a significant comparison between the Experiment class and the Control Class. HOTS test in the experimental class has a pretest average of 51.5% and Posttest 66.9%. HOTS test for control class 46,7% and Posttest 63,3%. From Figure 25 Proves that significant influence by PhyCCTM teaching materials is supported by android application.

4 Conclusions

Based on the research results obtained, it can be concluded that PhyCCTM android applications can be developed for learning mobile learning on the subject of work and energy. The android application PhyCCTM supports learning tools so that they are easy to use and attract students. PhyCCTM android application in developed learning is suitable for use as a supporting media of learning process.

Suggested in physics learning should use PhyCCTM and Physic Contextual Comprehensive Teaching Material application to improve HOTS In addition, with PhyCCTM android application (Physic Contextual Comprehensive Teaching Material) make physics learning process more interesting and is an appropriate innovation as the development of science and technology.

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The preferred spelling of the word "acknowledgment" in America is without an "e" after the "g". Avoid the stilted expression, "One of us (R. B. G.) thanks . . ." Instead, try "R. B. G. thanks".

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Effectiveness of Snake Ladder Game on Physics Instruction: Student's Response View

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Abstract. Despite the using of Snake Ladder Game (SLG) in such instructions is common to be used, but the effectiveness based on student's response view is among important issue for teachers. This study examines the SLG effectiveness in getting new knowledge (A1), learning motivation (A2), active learning (A3), enjoyable learning (A4), good team work (A5), learning understanding (A6), student interest (A7), and stating opinion in group (A8). This survey study used four scales questionnaire and analyzed through descriptive analysis. About 18 students of SMAN 1 Kalasan participated as the subject study. Cooperative Learning (CL) model was applied on the Physics instruction of Simple Harmonic Motion (SHM). The finding showed that students agreed to the effectiveness in getting A1 38.9%, A2 50.0%, A3 38.9%, A4 33.3%, A5 66.7%, A6 55.6%, A7 50.0%, and A8 61.1%. This study highlighted that SLG gave valuable effect based on the student's response view. Further study is necessary to analyze the effectiveness of SLG in other aspects and other topics.
Keywords: game, physics instruction, response view

1. Introduction

Playing game is an enjoyable activity among people, particularly for children. The usage of game in some instructions have been implemented for so long. Empirically, there are various superiorities of applying game in some instructions, such as getting learning motivation, active and enjoyable learning, increasing concept understanding and student interest [1–8]. The example of game which have been implemented in some studies is Snake Ladder Game (SLG). SLG is a familiar game which easily modify as a media in any instructions. Previous studies explain that SLG isn't only applied for helping students with learning difficulties in math but also helping students to learn vocabularies [1, 6–8]. Nevertheless, despite the popularity of SLG as a learning device, the effectiveness based on student's response view haven't examined yet.

Most game applied in instructions is appropriated with the flow of roles, consequently just a view of main aspects is measured, motivation, active and enjoyable learning, concept understanding and student interest. In this study, other effectiveness of game will be explored by combining the instruction with learning model. Cooperative Learning (CL) is a suitable model to be used because it creates active learning as same as the aim of game instruction. Moreover, CL also build up peer social interaction, group work, group discussion, and social responsibilities among students [9–11]. Earlier studies have implemented CL in game instructions and the results show that each member in group are working together in the game while achieving the learning aims. In other words, it enhance student's motivation and learning outcome [12, 13]. Whereas the effectiveness of combining CL with SLG based on student's response view haven't examined yet and are interesting to be explored.

Majority students assume that Physics is a difficult subject. So, an innovation is needed to create meaningful learning in Physics. Combination between CL and SLG can be used as a stimulus to attract student interest and other positive aspects. In this study, the combination is applied and Simple Harmonic Motion (SHM) is used as a learning subject. SHM is chosen because there're many examples in daily life and isn't part of an abstract topic. Students are expected to discuss in group and find some literature for solving problems rather than asking the answer to their teacher. Therefore, student's response view after the implementation is important. This aims to determine the effectiveness in getting 1) new knowledge, 2)

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learning motivation, 3) active learning, 4) enjoyable learning, 5) good team work, 6) learning understanding, 7) student interest, and 8) stating opinion in group.

2. Materials and Methods

This study was conducted at SMAN 1 Kalasan on April 2017. About 8 male and 10 female students in Grade X participated. The students divided into 6 groups for playing SLG. CL model was applied on Physics instruction of SHM as long as 155 minutes. The model consisted of 6 steps: opening, giving information, dividing into groups, guiding the groups, evaluation, and conclusion. This study was supported by learning instruments that consisted of lesson plan and some sets of SLG with SHM question cards. While collecting data instruments involved of video recorded when SLG was going and questionnaire after the game ended. The survey was carried out to get in depth understanding of student's response view about the instruction. Those consisted of the effectiveness in getting 1) new knowledge, 2) learning motivation, 3) active learning, 4) enjoyable learning, 5) good team work, 6) learning understanding, 7) student interest, and 8) stating opinion in group. The distribution of items can be seen at Table 1.

Table 1. Questionnaire Items Distribution

	Aspects	I	Statements
A1	new knowledge	5	(+) using SLG in Physics instruction improve new knowledge
		1	(–) using SLG doesn't has correlation to get new knowledge
A2	learning motivation	9	(+) SLG in the instruction motivate students to learn
		1	(–) students don't be motivated to learn although using SLG media
A3	active learning	8	(+) students more active in this instruction because of SLG media
		1	(–) students don't do anything or passive in this instruction
A4	enjoyable learning	1	(+) instruction using SLG makes Physics lesson more fun
		4	(–) SLG activities are bored and not appropriate with Physics lesson
A5	good team work	2	(+) SLG activities create a good interaction in group
		1	(–) there isn't meaningful student interaction in SLG activities
A6	learning understanding	1	(+) students more understand to learn Physics using SLG media
		6	(–) SLG media doesn't help student to understand Physics concepts
A7	student interest	1	(+) SLG creates learning activities more interesting
		7	(–) students aren't interested to learn Physics using SLG media
A8	stating opinion in group	3	(+) this instruction treats students to state their opinion
		1	(–) students can't state their own opinion in this instruction

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This survey study used four scales questionnaire: Strongly Agree (SA), Agree (A), Disagree (D), and Strongly Disagree (SD). There were 16 items consisted of positive and negative sentences. Those developed from 8 aspects of the effectiveness. Each scale had different score in both sentences (positive: SA=4, A=3, D=2, SD=1, and negative: SA=1, A=2, D=3, SD=4). Those items were examined by: 1) changing the qualitative scale into quantitative score, 2) ignoring inconstant score, and 3) deciding total and percentage of students in each score (1–4). Then, the results were analyzed through descriptive analysis.

3. Results and Discussion

SLG is a traditional game which consisted of 10×10 boxes in a board and involved various size of snake and ladder pictures. Snake tail make the player move backward to the snake head and ladder cause the player to move forward to the ladder peak. It needs a dice and some tokens for representing the players. Someone who win this game is someone who reach the highest number box. SLG was combined with CL model to create an innovative learning in studying SHM. Those steps consisted of opening, giving information, dividing into groups, guiding the groups, evaluation, and conclusion. All the steps were doing as long as 155 minutes. About 18 students of Grade X participated. They were divided into 6 groups for playing and studying together. After the implementation, survey study was carried out. There were 16 questionnaire items to identify the effectiveness of this instruction. The results can be shown at **Table 2**.

Table 2. Student Questionnaire Results

Aspects	SA	A	D	SD	Others
A1	3 (16.7)	7 (38.9)	1 (5.6)	0 (0)	7(38.9)
A2	2 (11.1)	9 (50.0)	2 (11.1)	0 (0)	5 (27.8)
A3	1 (5.6)	7 (38.9)	2 (11.1)	0 (0)	8 (44.4)
A4	1 (5.6)	10 (55.6)	2 (11.1)	0 (0)	5 (27.8)
A5	1 (5.6)	12 (66.7)	0 (0)	0 (0)	5 (27.8)
A6	0 (0)	11 (61.1)	0 (0)	0 (0)	7 (38.9)
A7	2 (11.1)	9 (50.0)	1 (5.6)	0 (0)	6 (33.3)
A8	2 (11.1)	6 (33.3)	3 (16.7)	0 (0)	7 (38.9)

Note: SA = Strongly Agree, A = Agree, D = Disagree, SD = Strongly Disagree (percentages in parentheses)

CL model can be implemented with SLG in Physics instruction. The effectiveness concluded of getting new knowledge, learning motivation, active learning, enjoyable learning, good team work, learning understanding, student interest, and stating opinion in group. Not only main aspects which measured, such as motivation, active and enjoyable learning, concept understanding and student interest, but also any addition aspects, such as getting new knowledge, good team work, and stating opinion in group. **Table 2** shows that 38.9% students agree to this instruction for improving new knowledge (Aspect 1). Some 50.0% of them express the view that SLG motivate students to learn (Aspect 2). However, 38.9% students believe that SLG creates an active learning environment (Aspect 3). 55.6% students agree SLG makes this instruction more fun (Aspect 4). The highest result shows 66.7% students believe the activities grow up a good interaction in group (Aspect 5). Earlier studies of [5,6], mention that implementation of game in instruction enhance cognitive development and understanding. In this study, about 61.1% students clearly understand to learn Physics using SLG media (Aspect 6). 50.0% students feel that SLG creates the learning activities more interesting (Aspect 7). 33.3% students agree that the instruction treats students to state their own opinion (Aspect 8). The diagram of student questionnaire results can be seen at **Fig. 1**.

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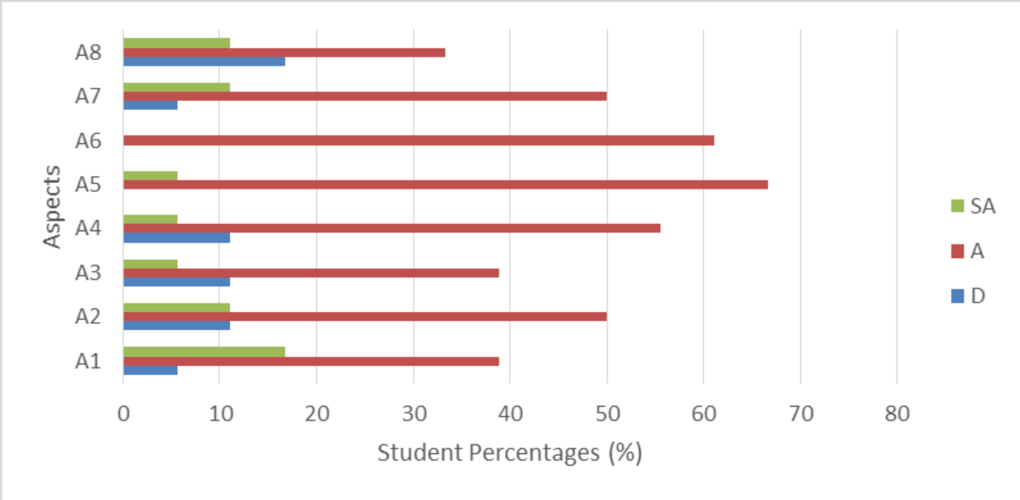

Figure 1. Student Questionnaire Diagram

4. Conclusion

This study highlighted that students agreed to this instruction for giving valuable effects in: 1) new knowledge 38.9%, 2) learning motivation 50.0%, 3) active learning 38.9%, 4) enjoyable learning 33.3%, 5) good team work 66.7%, 6) learning understanding 55.6%, 7) student interest 50.0%, and 8) stating opinion in group 61.1%. Further study is necessary to analyze the effectiveness of using game in other models, aspects, and topics.

Acknowledgment

We would like to extend our deepest acknowledgment to all members of SMAN 1 Kalasan for the supports and facilities during this study.

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The Electricity and Magnetism Phenomenon Modelling with Visual Studio for Senior High School Students

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Abstract. This paper aims to describe the electricity and magnetism phenomenon modelling with visual basic for senior high school. The content coverage in electricity modelling are electric charges, coulombs law, electric field, line of force, potential difference, particle motion in electric field. The content coverage in magnetism modelling are magnetic field, particle motion in magnetic field and particle accelerator. The phenomenon modelling is compiled and created with visual basic so the students can input the variable value with themselves and observe the phenomenon. The conclusion of this paper is a set of interactive electricity and magnetism phenomenon modelling that can be used by senior high school students.
Keywords: electricity, magnetism, modeling, visual basic

1. Introduction

Electricity and magnetism is two big chapter in senior high school physic. In physic syllabi for senior high school, electricity chapter and magnetism chapter are put side to side because both of them have a concept that cannot be separated from each other.

The electricity discussion started by the motion of electric charges review. In the very beginning, students introduced with the type of electric charges and then with the interaction between the electric charges as well as in magnetism chapter. In the very beginning in magnetism chapter, students introduced by the connection between the electricity and magnetism and then with the interaction between both of them.

In class, students can't see the real version about the motion of the electric charges. Therefore, the simulation based on visual basic made for assist the students for understanding the electricity and magnetism concept more detail, not just by consider the mathematics but also the physic.

2. Literature Review

From Greek Philosopher we know that there is electric force and known as the interaction between two different types of electric charges. This two type of electric charges named by Benjamin Franklin as Positive charge and Negative charge. The Greek philosophers also discovered that if a certain type of stone (a naturally occurring magnet) is brought near bits of iron, the iron will jump to the stone. We know that the interaction between iron and stone caused by magnetic force.

Particles with the same sign of electrical charge repel each other, and particles with opposite signs attract each other.[1] The force between two electric charges defined by Coulomb as,

$$F = \frac{1}{4\pi\varepsilon_0}\frac{q_1q_2}{r^2} \tag{1}$$

From the concept of electric force, we know that there is an electric field. The electric charge can get an electric forces when it affected with electric field from another electric charge. The magnitude of electric field can be calculated with,

$$E = \frac{1}{4\pi\varepsilon_0}\frac{q_1q_2}{r} \tag{2}$$

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Electric field visualized with electric field lines. Electric field lines extend away from positive charge (where they originate) and toward negative charge (where they terminate).[1]Gauss law for the electric field is,

$$\Phi_E = \oint \vec{E}.d\vec{A} = \frac{q_{enc}}{\varepsilon_0} \tag{3}$$

To determine whether a force is conservative that is, whether a potential energy can be associated with it. Due to the electric force is one of the conservative force, the electric potential energy defined with,

$$U = k\frac{q}{r^2} \tag{4}$$

With,

$$W = -\Delta U \tag{5}$$

Adjacent points that have the same electric potential energy form an equipotential surface, which can be either an imaginary surface or a real, physical surface. No net work W is done on a charged particle by an electric field when the particle moves between two points i and f on the same equipotential surface.[1]

The electric potential due to a single charged particle at a distance r from that charged particle is derived from,

$$V_f - V_i = -\int_R^{\sim} E dr \tag{6}$$

By set $V_f = 0$ (at ~) and $V_i = V$ (at R), then gives us

$$0 - V = -\frac{q}{4\pi\varepsilon_0}\int_R^{\sim}\frac{1}{r^2}dr = \frac{q}{4\pi\varepsilon_0}\left[\frac{1}{r^2}\right]_R^{\sim} = -\frac{1}{4\pi\varepsilon_0}\frac{q}{R} \tag{7}$$

So,

$$V = \frac{1}{4\pi\varepsilon_0}\frac{q}{R} \tag{8}$$

as the electric potential V due to a particle of charge q at any radial distance r from the particle

For magnetism concept, the simplest magnetic structure that can exist is a magnetic dipole.[1] Gauss' law for magnetic fields is a formal way of saying that magnetic monopoles do not exist. The law asserts that the net magnetic flux Φ_B through any closed Gaussian surface is zero,

$$\Phi_B = \oint \vec{B}.d\vec{A} = 0 \tag{9}$$

A changing electric flux induces a magnetic field as stated by Maxwell's Law of Induction,

$$\oint \vec{B}.d\vec{s} = \mu_0\varepsilon_0\frac{d\Phi_E}{dt} \tag{10}$$

And a changing magnetic flux induces an electric field as stated by Faraday's Law of Induction,

$$\oint \vec{E}.d\vec{s} = -\frac{d\Phi_B}{dt} \tag{11}$$

A magnetic field $\vec{B}$ is defined in terms of the force $\overrightarrow{F_B}$ acting on a test particle with charge q moving through the field with velocity $\vec{v}$:

$$\overrightarrow{F_B} = q\vec{v}x\vec{B} \tag{12}$$

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A straight wire carrying a current I in a uniform magnetic field experiences a sideways force,

$$\overrightarrow{F_B} = i\vec{L}x\vec{B} \tag{13}$$

A charged particle with mass m and charge magnitude moving with velocity $\vec{v}$ perpendicular to a uniform magnetic field $\vec{B}$ will travel in a circle. Applying Newton's second law to the circular motion yields,

$$|q|vB = \frac{mv^2}{r} \tag{14}$$

from which we find the radius rof the circle to be,

$$r = \frac{mv}{|q|B} \tag{15}$$

The frequency of revolution f, the angular frequency v, and the period of the motion T are given by,

$$f = \frac{\omega}{2\pi} = \frac{1}{T} = \frac{|q|B}{2\pi m} \tag{16}$$

3. Method

The solution for the electric problem in this simulation use the approximation of this equation,

$$\overrightarrow{F_{12}} = k\frac{q_1q_2}{|\overrightarrow{r_1}-\overrightarrow{r_2}|^2}\frac{(\overrightarrow{r_1}-\overrightarrow{r_2})}{|\overrightarrow{r_1}-\overrightarrow{r_2}|} = k\frac{q_1q_2}{|\overrightarrow{r_1}-\overrightarrow{r_2}|^3}(\overrightarrow{r_1}-\overrightarrow{r_2}) \tag{17}$$

$$\overrightarrow{F_{12}} = kq_1q_2\frac{[(x_1-x_2)i+(y_1-y_2)j]}{[(x_1-x_2)^2+(y_1-y_2)^2]^{\frac{3}{2}}} \tag{18}$$

With $\overrightarrow{F_{12}}$ define as the vector force in particle 1 caused by particle 2, we can get the x component;

$$F_{12,x} = kq_1q_2\frac{(x_1-x_2)}{[(x_1-x_2)^2+(y_1-y_2)^2]^{\frac{3}{2}}} = m_1a_{1,x} \tag{19}$$

$$a_{1,x} = \frac{kq_1q_2}{m_1}\frac{(x_1-x_2)}{[(x_1-x_2)^2+(y_1-y_2)^2]^{\frac{3}{2}}} \tag{20}$$

$$\frac{dV_{1,x}}{dt} = a_{1,x}^t(x_1^t,x_2^t,y_1^t,y_2^t) = f_{2,v_x}(x_1^t,x_2^t,y_1^t,y_2^t) = \frac{kq_1q_2}{m_1}\frac{(x_1^t-x_2^t)}{[(x_1-x_2)^2+(y_1-y_2)^2]^{\frac{3}{2}}} \tag{21}$$

$$\frac{dX_1}{dt} = f_{1,x_1}(V_{1,x}^t) = V_{1,x}^t \tag{22}$$

And we can get y component,

$$F_{12,y} = kq_1q_2\frac{(y_1-y_2)}{[(x_1-x_2)^2+(y_1-y_2)^2]^{\frac{3}{2}}} = m_1a_{1,y} \tag{23}$$

$$a_{1,y} = \frac{kq_1q_2}{m_1}\frac{(y_1-y_2)}{[(x_1-x_2)^2+(y_1-y_2)^2]^{\frac{3}{2}}} \tag{24}$$

$$\frac{dV_{1,y}}{dt} = a_{1,y}^t(x_1^t,x_2^t,y_1^t,y_2^t) = f_{2,v_y}(x_1^t,x_2^t,y_1^t,y_2^t) = \frac{kq_1q_2}{m_1}\frac{(y_1^t-y_2^t)}{[(x_1-x_2)^2+(y_1-y_2)^2]^{\frac{3}{2}}} \tag{25}$$

$$\frac{dy_1}{dt} = f_{1,y_1}(V_{1,y}^t) = V_{1,y}^t \tag{26}$$

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For the $\overrightarrow{F_{21}}$ which define as the vector force in particle 2 caused by particle 1,

$$\overrightarrow{F_{21}} = k\frac{q_1 q_2}{|\overrightarrow{r_2}-\overrightarrow{r_1}|^2}\frac{(\overrightarrow{r_2}-\overrightarrow{r_1})}{|\overrightarrow{r_2}-\overrightarrow{r_1}|} = k\frac{q_1 q_2}{|\overrightarrow{r_2}-\overrightarrow{r_1}|^3}(\overrightarrow{r_2}-\overrightarrow{r_1}) \quad (27)$$

We can get the x and y components with the same procedure as in $\overrightarrow{F_{12}}$.

If there is electric field in the box with magnitude E and angle Θ from +x direction in the box, then for particle inside the box obtain,

$$\sum \vec{F} = \vec{F_c} = m\vec{a} \quad (28)$$

$$q\vec{E} = m\vec{a} \quad (29)$$

$$\vec{a} = \frac{q}{m}\vec{E} \quad (30)$$

Then, substitute $E_x = E\cos\theta$ and $E_y = E\sin\theta$ to the equation (30).

We get for x component

$$a_x = \frac{q}{m}E\cos\theta \quad (31)$$

$$\frac{dv_x}{dt} = f_{2,v_x} = \frac{q}{m}E_x \quad (32)$$

$$\frac{dx}{dt} = f_{1,x} = v_x^t \quad (33)$$

And get for y component

$$a_y = \frac{q}{m}E\sin\theta \quad (34)$$

$$\frac{dv_y}{dt} = f_{1,v_y} = \frac{q}{m}E_y \quad (35)$$

$$\frac{dy}{dt} = f_{1,y} = v_y^t \quad (36)$$

If there is magnetic field with magnitude B that pointed outward x-y plane in the box, then for particle in the box obtain,

$$q\vec{v}\ x\ \vec{B} = m\vec{a} \quad (37)$$

$$q(v_x\hat{\imath} + v_y\hat{\jmath})\ x\ (B\hat{k}) = m\vec{a} \quad (38)$$

$$-qv_xB\hat{\jmath} + qv_yB\hat{\imath} = m(a_x\hat{\imath} + a_y\hat{\jmath}) \quad (39)$$

Then, we get for x component

$$a_x = \frac{qv_yB}{m} \quad (40)$$

$$\frac{dv_x}{dt} = f_{2,v_x}(v_y^t) = \frac{qv_y^tB}{m} \quad (41)$$

And for $\frac{dx}{dt}$ is use equation (33).

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For y component

$$a_y = \frac{qv_xB}{m} \tag{42}$$

$$\frac{dv_y}{dt} = f_{2,v_y}(v_x^t) = \frac{qv_x^tB}{m} \tag{43}$$

And for $\frac{dy}{dt}$ is use equation (36)

The numerical analysis for this simulation use the fourth order Runge-Kutta Method. If we consider the problem

$$\begin{cases} y' = f(t, y) \\ y(t_0) = \alpha \end{cases} \tag{44}$$

Define h to be the time step size and$t_i = t_0 + ih$. Then the following formula [2].

$$w_0 = \alpha \tag{45}$$

$$k_1 = hf(t_i, w_i) \tag{46}$$

$$k_2 = hf(t_i + \frac{h}{2}, w_i + \frac{k_1}{2}) \tag{47}$$

$$k_3 = hf\left(t_i + \frac{h}{2}, w_i + \frac{k_2}{2}\right) \tag{48}$$

$$k_4 = hf(t_i + h, w_i + k_3) \tag{49}$$

$$w_{i+1} = w_i + \frac{1}{6}(k_1 + 2k_2 + 2k_3 + k_4) \tag{50}$$

4. Result

The result of this project is to create windows based application that can play animation about charged particle movement when interact with another particle and is affected by electric and magnetic field. The application is in executable file format. User will be given choice the type of interaction at main window as first appearance of the application that shown by **figure 1**.

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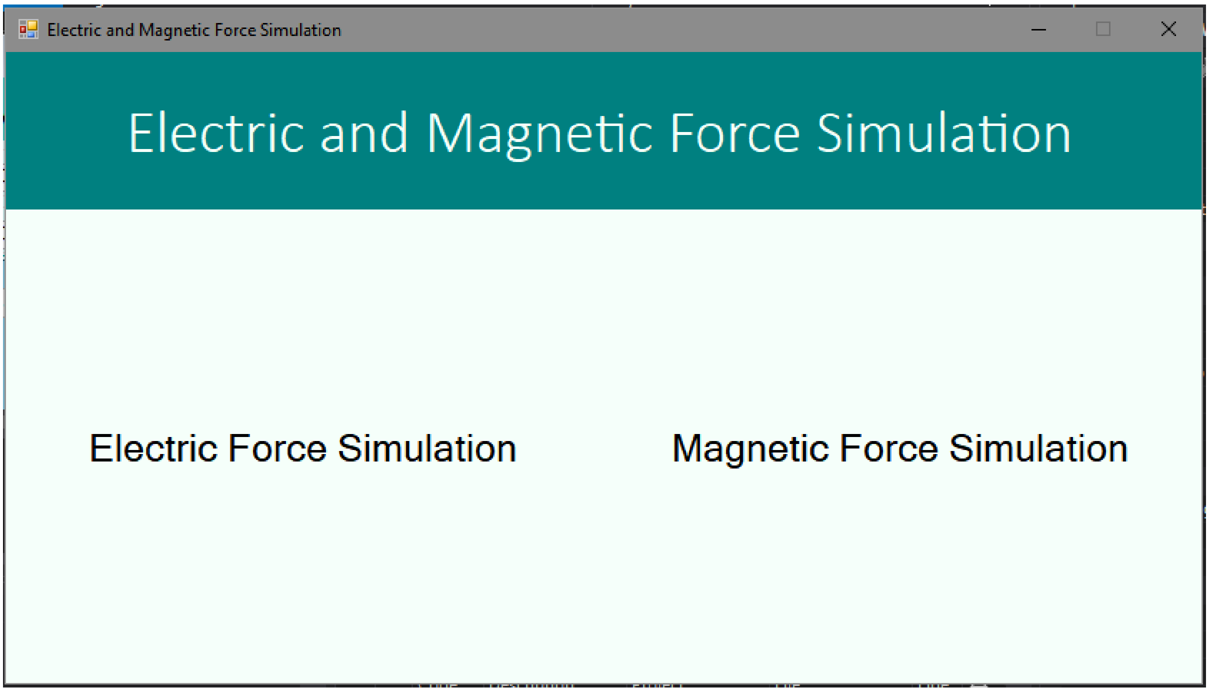

Figure 1. Main window of simulation application

Choice is made by clicking the text. Each of simulation type is displayed with new window. At simulation window, user may choose whether he want to see the physic concept within simulation or simulate the concept. **Figure 2** shows the electric force simulation window with physic concept tab. On the left side, there are tabs of physic concept topic.

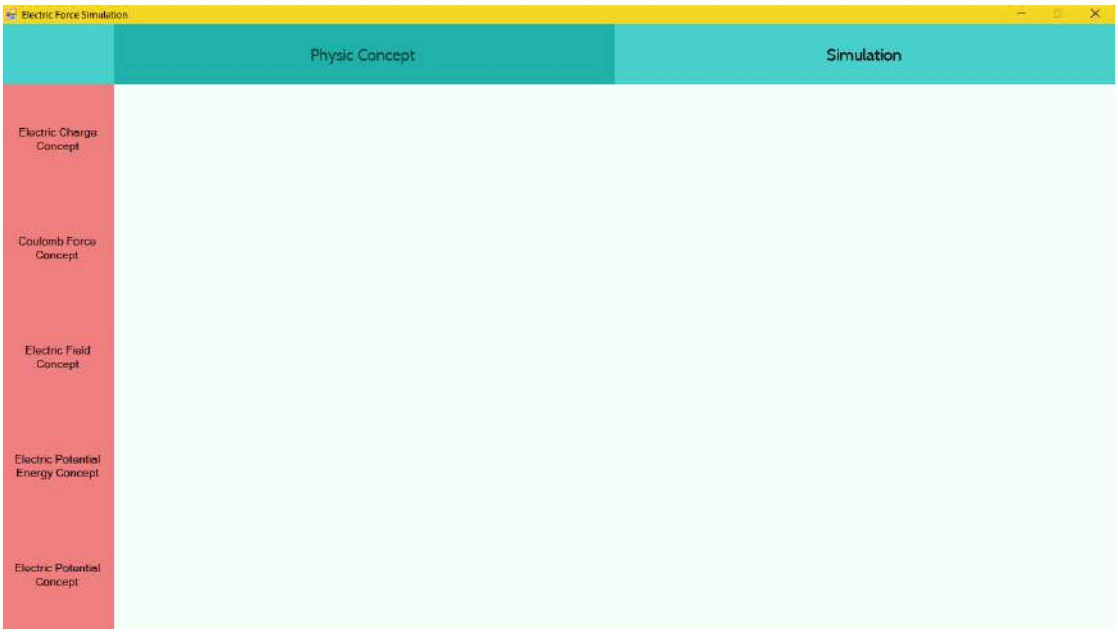

Figure 2. Physic concept tab in electric force simulation

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Simulation tab gives user animation of some simulation models, according to user choice. The models can be chosen by clicking tab on the left side of the window.**Figure 3** shows simulation of two charged particles motion tab. The particles can be moved by dragging it or set the location (x and y) value. Beside set its location, user can determine charge value, mass, and initial velocity of the particles. Location of the particles can be locked, so it not move while the other particle move.

Figure 3. Simulation tab in the electric force simulation window

When the animation is played by clicking start button, the particles will move and potential value at points in the simulation box will be given in the form of background colour that can be seen in **figure 4**.When simulation runs, user cannot edit the particle properties and there are some stopping criteria, beside stop button, that are 1) when the particles collide each other, 2) when either of the particle leaves the simulation box.

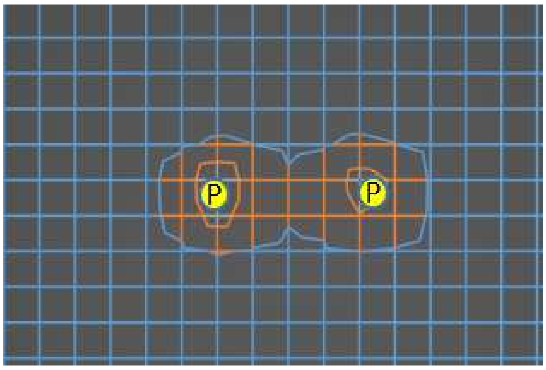

Figure 4. Snapshot of charged particles motion animation between proton and proton.

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Electric field between particle locations is calculated and will be presented in arrow figure in the simulation box when simulation goes and in line figure after the simulation finishes. The figure is shown by **figure 5**. From the figure we can see that electric field is inversely proportional to its square distance. We can conclude that the simulation is fit with the concept.

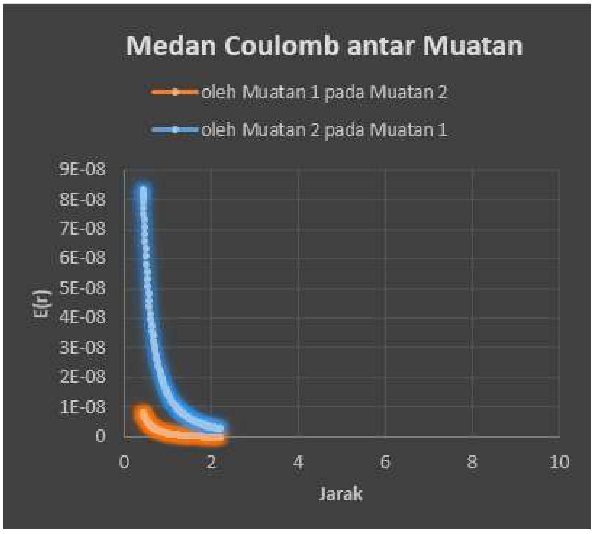

Figure 5. Electric field between the particle locations

User can also see the figure of potential coulomb at first particle by the other one, vice versa.**Figure 6** shows that the electric potential is inversely proportional to its distance.

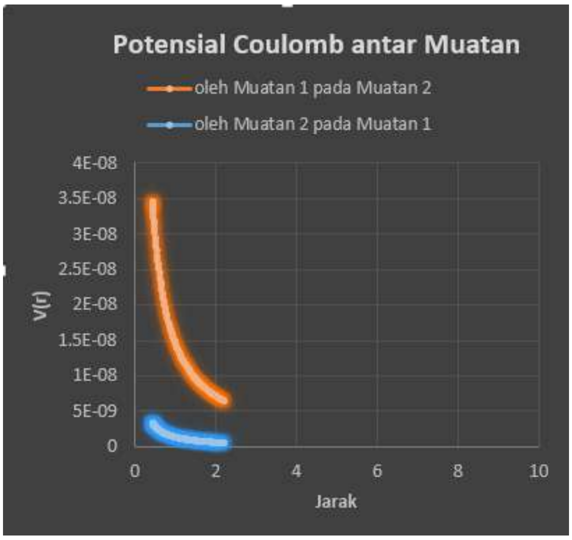

Figure 6. Electric potential at each of particle location that caused by the other

5. Conclusion

Understanding physic can be obtained by deriving equation mathematically and seeing phenomenon in experiment. Some experiments are difficult to be done, so numerical experiment using computer is one of the solution. The application offer to do experiment about electric and magnetic force that gives to student. Student can interact with the application through characteristic value entry and some other

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settings. Student can also see the motion in the form of animation, figure of the potential, electric field, and its potential energy.

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Developing Kinect-Based Instructional Media on Collisions Topic

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Abstract. The aim of the study is to develop kinect-based instructional media on collisions topic. This study was categorized as a Research and Development consisted of three stages: (1) need assessment, (2) instructional design, (3) media development. The results of the development of kinect-based instructional media products on collisions topic.
Keywords: instructional media, kinect, collisions

1. Introduction

Education on undergraduate level should be able to answer the challenge in the era of globalization. Society in 2020 must be able to compete globally with other nations. This should be addressed seriously so that later college graduates are able to compete with the community internationally. Various abilities must be given in the undergraduate level lecturing, especially the ability to dig information from various sources. The ability to extract information includes the ability to observe, ask questions, gather information, and associate or analyze. This ability needs to be developed on the students through lectures although knowledge is a major factor.

Lectures should be able to provide knowledge and ability to extract information for students. Selection of instructional media in addition to methods and learning models in the lectures has an effect on improving student learning outcomes. Lecturers as facilitators in lectures are required to be skilled at developing appropriate learning media in delivering lecture materials so that students are able to master the material as well as have various information-mining capabilities.

Mechanics is one of the courses in Physics Education course at Ahmad Dahlan University. One topic in the subject of mechanics is collisions. The learning material of mechanics is one of the difficult materials for the students. There are problems faced by UAD Physics Education students when studying mechanical materials. The average of the students' learning outcomes when studying the mechanics material is only at point 4.5 of the total of 10 points as shown in Figure 1.

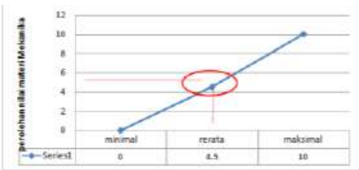

Figure 1. Student Average Score on Mechanics Lecture

There are several things that become factors causing the low acquisition of student value on mechanics materials. Students studying the learning material of mechanics is only limited to formulas when the material of mechanics requires understanding rather than just memorization. Students do not understand the basic concepts of mechanics so that to understand the mechanics of students continue to find difficulties. Students are not able to understand the application and proof of concept of mechanics in everyday life. This indicates that mechanics is a complex and abstract material.

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Instructional media needed students to help understand the concept of mechanical materials especially in the topic of collisions. Instructional media that appeal to students also supports the emergence of interest and willingness to learn the material in the topic of collisions.

2. LITERATURE REVIEW

Kinect Device

Kinect is a sensor input device for motion detection. Kinect is divided into 2 types, namely kinect for Xbox and Kinect for windows which is a special webcam that allows users to control and interact with the application without touching the control device. Such app interactions use the user interface naturally. At Kinect there are several components, namely RGB camera, depth sensor, microfon, and customized software. With Kinect, the full-bodey capture function, face detection, and voice recognition can be performed. This device has high potential to be utilized for E-learning applications. In the study of C. S. Sanoj (2013), an image approach has been presented to detect humans and their movements using a focus tracking analysis that yields conclusions that the method can be used at close range. In the Yuan (2013) study described the use of video images to monitor the work area and also shown monitoring strategies and applications in protected areas not only as an innovation, but an improvement in safety management. Kinect can also be combined with other technologies aimed at creating interactive learning systems.

Detection

It can be designed a tool and algorithm to detect negative behavior patterns for students with special needs. The detection device is a natural interface detection algorithm that is added to detect harmful movement and posture in the work area. The detection results in the form of audio visual response output to warn students.

In the study of Yu et al. (2011) has detected tantrum behavior by using kinect. Tantrums are angry behaviors in preschoolers, where their anger is expressed, among other things by lying on the floor, kicking, shouting, and sometimes holding their breath. In the study the children detected their patterns against themselves as well as against other children by detecting their skeletal position. The tantrum image detection image using kinect along with the detection pattern shown in Figure 1.

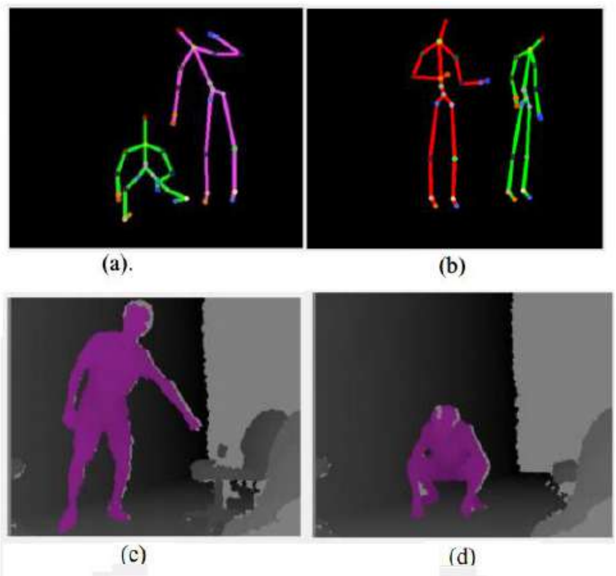

Figure 1. Tantrum attitude skeletal pattern of detection. (a) other children's behaviour, (b) neglect of other children, (c) demeanour, (d) cries and depression

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In DiIegel's (2005) research, an automated smart health detection system is presented in a house. The system detects healthy living habits, with the aim of creating an independent, healthy life.

Step Of Kinect-Based Instructional Media Development

System Designation

In designing required a device that can detect patterns of student behavior. These devices can use kinect devices. In practice kinect will be connected to a PC equipped with algorithms to detect behavior patterns of students with special needs. The PC is also used to provide feedback output from malicious movement in the work area of audio visual.

Figure 3. Motion detection scheme

The process of working this system based on the sensor to detect the student's body position. Kinect processes motion using software that detects certain movements and generates output responses in the form of text and audio visuals.

Normal Data Collection

In this section, experiments are made of normal daily activities. And the system will record the normal state data that will be used to evaluate the abnormal / dangerous situation. System embedded script program which will record the existing activity in the space, movement between point to point, detection of body position in normal circumstances. a natural motion detection sensor can be placed in a room for detecting daily life activities as for detection sensor placement shown in figure 4. In the figure there are markers, markers A, B, C, D, E, F where A, C, D , E is the area that can be detected natural motion detection sensors, while B and F is an area that can not be detected sensors. V. Gulshan's (2011) research describes the kinect can be embedded algorithm to record the data set taken as the main data.

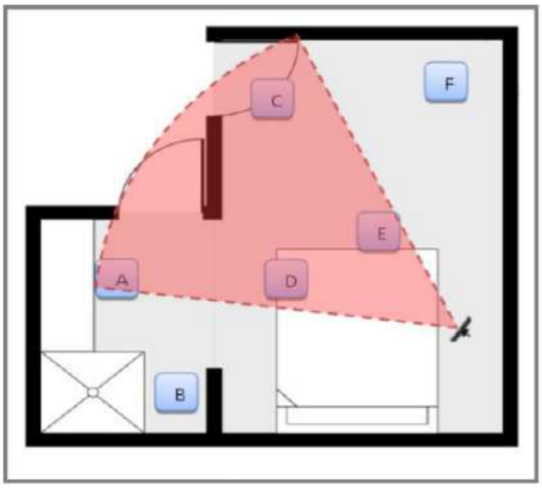

Figure 4. Image of sensor placement on space

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Evaluation Procedure

The system will compare the normal state of activity data set, and will be compared with the sensor detection at that time. Abnormal circumstances will be evaluated and warnings will be recorded to the system.

3. RESEARCH METHOD

This study is a research and development, which has produced a product orientation. Products which is developed in this study is an kinect-based instructional media on collisions topic.

Development procedure in this research refers to the stage of the development model which is adapted from the Borg and Gall model and set by researchers. Procedure development on the study include three main stages, namely (1) need assessment, (2) instructional design, (3) media development. The results of the development of kinect-based instructional media products on collisions topic.

4. RESULT

The product of this research is in the form of learning media of mechanical material on the topic of collision developed for kinect device. Product development is done through three main stages, namely needs analysis, instructional design, and media development. Data of research result and development of learning media of mechanics of collision topics: obtained from research stage which have been done until media development stage.

Needs analysis is conducted to obtain information about product characteristics required by prospective users, in this case the student. Such information is required as a basis for product development research. Needs analysis is done through two stages, namely field study and literature study. Field studies were conducted to find out the availability of instructional media, especially on mechanical materials on the topic of collision and analysis of student characteristics. Library study was conducted on the material that will be developed in the learning media through the assessment of various sources of literature. Needs analysis is important to know the level of need for media to be developed. The result of requirement analysis is described as follows. (a). The curriculum used in the Prodi of Education of PhysicsUAD uses KKNI with the achievements set by the Physics Education Study Forum all over Indonesia. It is known based on RPS analysis developed by lecturers and approved by UAD Physics Education Program, (b) The average of mechanical course of students of Physics Education Program in the previous year is not maximal, (c) There is no learning media of mechanical material on the subject of the collision compiled by utilizing Kinect technology., (d). Students have academic abilities that are categorized as diverse as are known from the variations of student cumulative achievement index .

Preliminary study results indicate that there is a need for learning media that utilizes Kinect technology to help visualize the concept of collision. Learning media developed are expected to facilitate learning to improve student learning outcomes.

Learning design phase in the form of analysis phase to the material that will be developed into learning media. At this stage the learning achievement analysis is performed. Analysis of learning materials on collision learning media developed from learning achievement. In learning achievement of study program graduates, it is known that on the aspect of knowledge achievement in the form of mastering physics concepts based on natural phenomena that support physics learning in school. In the aspect of general competence known competence is mastering the concept / principle / theory in the theory of Mechanics. On the special skills aspect that is able to guide and direct students by way of policy, question and answer, provide alternative solutions, and feedback to achieve the expected competencies. In the achievement of subject learning, in point eight it is known that the achievement is that students can define the concept of collision.

Media development stage is the third stage in this development research. This stage is done through the preparation of flow and media content, the collection of supporting materials, and the production of materials. The flow and media fields describe the contents of each view from each menu and sub-material in detail. Preparation of flow and content of the media facilitate the preparation of programs to

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display the program in accordance with the order of mechanics material on the topic of the collision. In the development of this media, the flow and content of the media in the form of draft material display with emphasis on material organizations. In the later stages collection of supporting materials, such as drawings and other supporting materials used to create the media.

The main stage in the process of media development is the stage of material production. This stage is the stage of making the object and display of learning media and improving program performance. Making the learning media of mechanics on the topic of collision involves various processes, especially the programming process, which involves the testing phase. The process that is also important in this stage is the process of improving program performance. The testing process is done at this stage to solidify the performance and performance of the program. The result of this process is the production of early products in the form of draft learning media.

There are sample of kinect programming which is developed to compose kinect-based instructional media:

```
Imports Microsoft.Kinect
Imports System.IO
Public Class Form1
Dim moveup As Boolean
Dim moveleft As Boolean
Dim skor As Integer
Private Sub Button1_Click(ByVal sender As System.Object, ByVal e As
System.EventArgs)
Handles Button1.
Click
Timer1.Enabled = True
End Sub
Private Sub Timer1_Tick(ByVal sender As System.Object, ByVal e As
System.EventArgs)
Handles Timer1.Tick
If moveleft = True Then
ball.Left += 7
End If
If moveleft = False Then
ball.Left -= 7
End If
If moveup = True Then
ball.Top += 7
End If
If moveup = False Then
ball.Top -= 7
End If
If ball.Left <= ClientRectangle.Left Then
moveleft = True
mewin.Text += 1
skor = skor + 1
Label1.Text = skor
Timer1.Enabled = False
Label1.Text = "Tidak Lenting"
timerlabel.Enabled = True
```

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```
End If
If ball.Right >= ClientRectangle.Right Then
moveleft = False
mewin.Text += 1

Timer1.Enabled = False
Label1.Text = "Tidak Lenting"
timerlabel.Enabled = True
End If
If ball.Top <= ClientRectangle.Top Then
moveup = True
Label1.Text = "Lenting Sempurna"
timerlabel.Enabled = True
End If
If ball.Bottom >= ClientRectangle.Bottom Then
moveup = False
Label1.Text = "Lenting Sempurna"
timerlabel.Enabled = True
End If
If ball.Left < pin1.Right Then
moveleft = True
If Timer1.Interval = 1 Then
Else
Timer1.Interval -= 1
End If
Label1.Text = "Lenting Sempurna"
timerlabel.Enabled = True
End If
If ball.Right > pin2.Left Then
moveleft = False
If Timer1.Interval = 1 Then
Else
Timer1.Interval -= 1

End If
End If
End Sub
Private Sub pin1timer_Tick(ByVal sender As System.Object, ByVal e As
System.EventArgs)
Handles
pin1timer.Tick
pin1.Top = MousePosition.Y - 200
End Sub
Private Sub pin3timer_Tick(ByVal sender As System.Object, ByVal e As
System.EventArgs)
Handles
pin3timer.Tick
```

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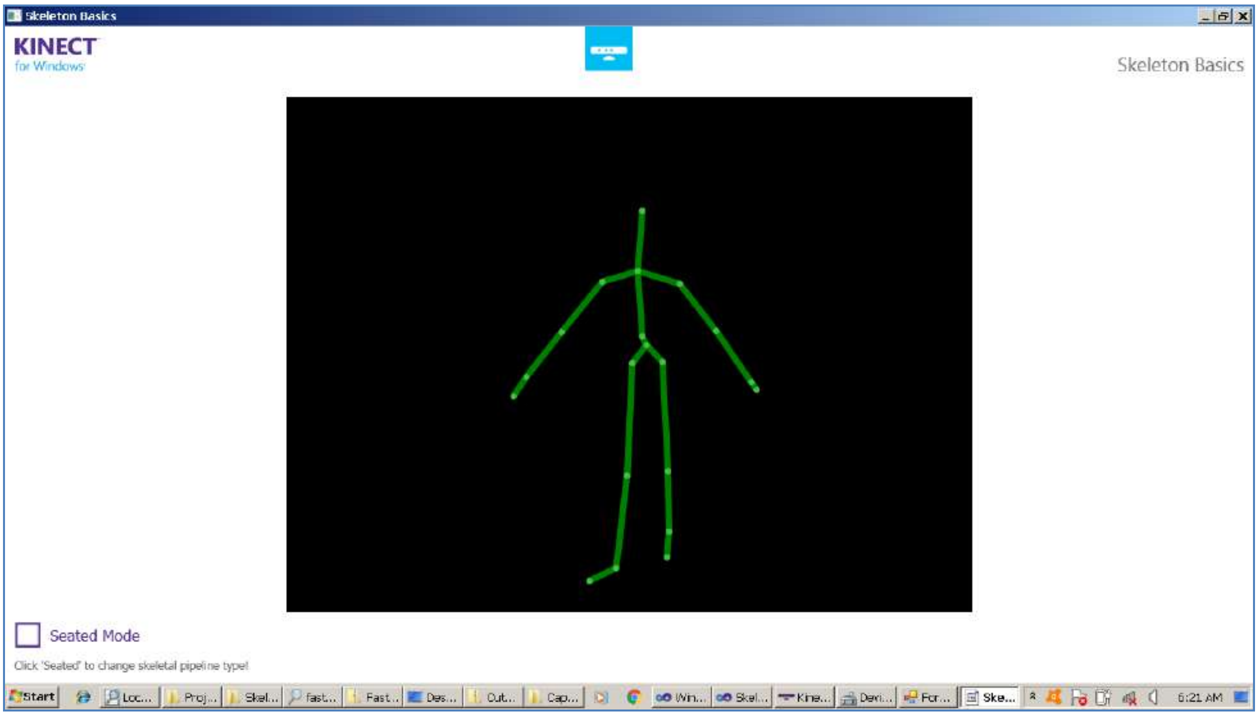
```
If ball.Top > pin2.Top Then
pin2.Top += 30
End If
If ball.Top < pin2.Top Then
pin2.Top -= 30
End If
End Sub
Private Sub Form1_Load(ByVal sender As System.Object, ByVal e As
System.EventArgs)
Handles MyBase.Load
skor = 0
Label1.Text = skor
End Sub
Private Sub timerlabel_Tick(ByVal sender As System.Object, ByVal e As
System.EventArgs)
Handles
timerlabel.Tick
Label1.Text = ""
End Sub
End Class
```

Kinect detect skeleton and motion of iser in front of the camera. The appearance of the detection show in figure below:



In the instructional media developed, there are many parameters which show the detection of collisions type. The appearance of the detection show in figure below:

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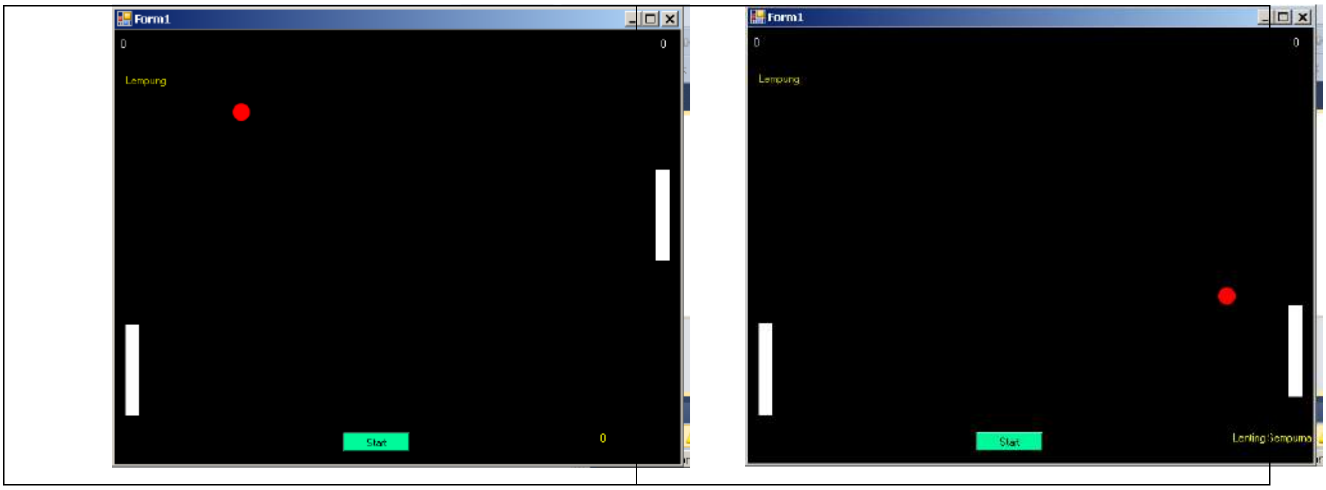

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Potential of Blended Learning to Optimize Performance Outcome, Motivation and Science Communication Skill in Physics Course

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Abstract. The era of Globalization exposes us to the challenge and opportunity to enhanced our human resources. One of the important skills required in the 21st century are information and communication technology (ICT) literacy. The use of ICT is realized with developed blended learning. The purpose of this paper is to develop a better understanding related to blended learning by comparing blended learning with face to face learning and online learning only. Blended learning becomes the solution to various limitations that occur in the classroom (eg time and distance). Blended learning is developed by combining various models, media and lecture delivery to improve the success of learning goal. The application of blended learning based on multimedia, whether it is video, audio or interactive media will enhance conceptual understanding as one of the most important performances outcome in physics learning. On the other hand, the online discussion grub in blended learning can improve their scientific communication skills, the ability to argue with more confidence, including improving the written communication skills of science. The statment above can improve of motivation for the learners to study physics subject.

Keywords: Blended Learning, Performe Outcome, Motivation, Science Comunication Skill

1. Introduction

One of the 21st century skills is information and communication technology literacy [1]. Information and communication technology is a factor that can support learning. The use of communication and information technology in the field of education has a huge impact. Innovation of learning that utilizes technology has been widely practiced including the integration of multimedia in online learning [2], [3].

Conventional learning of teaching where lecturer stands before the students and delivered his lecture while students listen, take notes and remained passive throughout the teaching and learning process. This method is a teacher-centerd approach. Teacher dominates the class and students accept what the teacher says without questioning or contributing to the lecture. In a classroom situation, students differed in terms of intellectual ideas and perception; they learn and understand more quickly and easily than others but these facts were not take into consideration in conventional learning of teaching. Conventional learning is considered to have some limitations. This learning model tends to make students saturated and passive [4], [5]. Therefore, learning by utilizing information and communications technology has the potential to be developed. Blended learning is one way to accommodate the use of information and communication technology to optimize learning. Blended learning is a learning that is done by combining online learning activities and face-to-face learning [6]. Blended learning combines face-to-face learning in the classroom and online learning outside the classroom. When online learning outside the classroom students can access the various learning resources provided by the teacher to help students understand the learning materials. Moreover, in online learning can also do group discussion to solve the problems they might find both to peers and teachers.

Then, when the learning in the classroom teacher to provide guidance relating to the materials they received in the online learning.

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Concepts learned in the field of physics studies are often abstract to be learned for example the forces acting on a field, effort and energy, electricity and other concepts. Therefore, to learn the concept takes more time to understand it, the space for discussion and the relevant ways and media. All things needed to learn concepts of physics can be done with blended learning. Blended lerning applied in physics learning will help students to understand the concept independently of online learning [7]–[9] and reduce the misconception when learning is also conducted face-to-face.

2. Research Method

The method in this paper use literature aproach. The literature that be used include books, journals, and articles. The paper is expected can be used as a resource for other writers, especially for studies related to Optimize Performance Outcome, Motivation and Science Communication Skill in Physics Course through blended learning .

3. Result And Discussion

3.1 Blended Learning

Blended learning is the development of e-learning which combined with face to face learning.

Some expert has some view that blended learning at least has definition as follows:

a. The combination between conventional learning with web online learning .
b. The combination of media and sets of equipment that be used to built e learning
c. The combination of pedagogy aproach that do not influenced by using technology. [30].

We can understand the intersection of the implementation of blended learning in teaching is shown below:

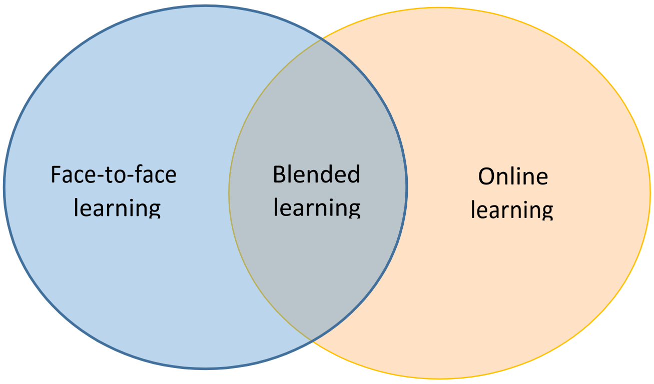

Figure 1. Sliced Blended Learning

In application of blended learning has some advantages, at least in the following aspects:

a. Online Delivery

Learning done not only by face to face but also through online learning can help students to learn independently [10]. During learning, students can study wherever and whenever they are ready. In addition to the grub discussion facilities students can be more active interaction both between each other and with teacher. [11].

b. Online Content

Online learning content (eg video, powerpoint slides) will make it easier for students to skip over material that they find easy and familiar while slowing down and repeating material that is considered difficult. Students may also seek other relevant sources to complement their knowledge of the material they are studying. Students may also mark and emphasize the

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material they consider important. In addition they can take time to rest during the process of pursuing if required.

3.2 Performance Outcome, Motivation and Science Communication Skill Performance Outcome

Research studies in the field of education is basically done to increase the variety of learning goals. Blended learning is one effort that is expected to improve learning outcomes, learning independence, liveliness and interest in student learning. With the variety of learning content contained in the blended learning students get various forms of supportive learning resources. Learning by using blended learning allows teachers and students to communicate freely and at any time that supports the teaching and learning process. It helps students in many ways, one of them in improving performance outcomes [12]. And from the research, it is found that the learning performance of students on Blended learning is higher on e-learning learning [13].

Motivation

Motivation is defined as the impulse that arises in a person to perform a particular action. Motivation is grouped into two types: internal motivation and external motivation [14]. Internal motivation is the motivation that comes from within each student to find the source of learning or solve problems or tasks that have been given teachers. External motivation is the motivation that comes from outside the student self such as learning environment, teachers, awards and others. Improving student motivation is the key to advancing / improving the classroom atmosphere and making learning more effective and persistent [15]. Learning with Blended learning can lead students to meaningful learning processes [16] .

Science Communication Skill

Limitations to-face learning passively perceived by students. That is because they are reluctant to think critically sift what is being delivered [11]. Blended learning requires students to search for as much information to support their learning. The information they get not only from journal articles, a blog, a variety of learning applications, virtual laboratories but also from teachers and peers through online group discussion.

Blended learning offers a different learning environment than just face-to-face learning. A lot of pursue content that can be integrated in blended learning. In the study of physics the concept of an abstract concept can be visualized. It can make it easier for students to understand the material of physics learned because different forms of representation can also be seen [17]. Much research has been done related compositions that can be loaded in blended learning. One of them by presenting video on blended learning class as prelecture before attending face to face class shows better student performance than just studying with textbook only [18], [19].

Blended Learning combined with Problem Based Learning (PBL) was known to show performance better outcomes when compared with Direct Instraction (DI) [18], [20]. PBL stimulates students to play an active role and develop thinking skills with challenging problems in learning activities, so that students using this model are able to generate many problem-solving strategies than students using DI models. Supported both of these learning models with Blended Learning approach that allows students to study outside school hours using web learning, students who have been trained independently in learning to use PBL model will be more encouraged to develop their skills with learning activities outside school hours than students who learn to use the DI models.

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The study revealed that undergraduates exposed to blended learning mode of instruction performed better than those in traditional teaching method. This finding reported that blended learning mode of instruction was found effective for learning educational technology concept. The undergraduates taught using blended learning mode of instruction performed better than their counterparts taught using e-learning and traditional teaching method [21]. One aspect of performance outcome is also conceptual understanding. Research shows through online learning modules (OLMs) can help students to improve understanding of physics concepts in blended learning [17].

Analysis of learning motivation with ARCS model (attention, Relevance, confidence, & satisfaction) in blended learning shows that students have more interest in learning when compared with face to face learning only [14]. In Blended learning, students' perceptions are that e-learning activities complement face-to-face activities but can not replace them. As long as blended learning is implemented, student motivation increases. The relationship between blended learning activities and student attendance in the classroom may indicate that greater student commitment and persistence are being achieved [22], [23].

Like the previous explanation we know that blended learning is also a combination of various media and sets of equipment to built learning. Learning involving interactive media not only improves learning motivation but also outcome performance in this case blended learning on the aspect of online content (blended media) [24]. In another research we founding that theacher's perceptions that students are challenged to doing research in blended learning with MOODLE [25]. However, the control of the teacher is also very determine the achievement of learning goals. The higher the role of teachers in controlling learning, the higher the perceived increase in learning [26] .

The interest of students to follow a blended learning will increase student interaction is also good at learning resources and communication with teachers and peers. It is also in line with research conducted, that the students know also active in seeking information, discuss, write the arguments of their understanding [27]. Blended learning includes formal instruction such as presentations and seminars and I nformal communications such as e-mail from a teacher. Learning through dialogue with the instructor as part of a blended learning can facilitate the transfer of knowledge [28] .

N*etworked learning*, students can be asked to contribute and share their knowledge using wikis. They can also be encouraged to express their views and give feedback to peers through online forums. For *materials development*, students can be asked to reflect on their knowledge and experiences using online journals. They can also be persuaded to demonstrate their learning progress and achievement using online presentations. As previously discussed, *materials development* and *networked learning* are underpinned by individual and social constructivism respectively. Both participation types impact positively on learning achievement and course satisfaction [29].

4. Conclution

Blended learning on physics learning can be modified in many forms. Not only the way of presentation of learning alone but the integration of various media can help students to understand the concept of physics. With a variety of learning experiences offered blended learning students are very motivated to follow the learning. In addition, his use of ICT in blended learning triggers students to skillfully seek out information sources and train their scientific communication skills.

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Implementation of Physics Learning Instrument Based On Hypermedia to Increase Science Process Skill

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Abstract. This research includes experimental research that aims to examine the application of learning instrument based on hypermedia that have been developed in physics education program students UNISMUH 2017. In addition, research aims to introduce the use of hypermedia as a means of learning for physics teacher candidate as well as measure the level of science process skills. The research method used was pre-experimental with research design was one shoot case study. In this study, students (physics teacher candidate) in three classes were treated through the application of hypermedia based learning instrument then at the same time were conducted observations by 3 observer to measure the science process skills of students and at the end of learning process, students were given questionnaire of student response to the utilization of learning instrument based on hypermedia. Based on the result of assessment of Student Worksheet and Hypermedia that are 94,9% and 95,1% which show hypermedia and Student Worksheet valid and reliable, while for science process skill with average every aspect is in range 85, And student responses to physics learning based on hypermedia is above 91%. This shows that the utilization of learning instruments that have been developed reach the categories of valid, interesting, practical and effective.
Keywords: ***Hypermedia, Learning Instrument, Student Worksheet.***

1. Introduction

National education aims to educate the life of the nation. If the process of educational output is not qualified, then the Indonesian nation is unlikely to achieve a bright future, peace and prosperity. Therefore, government policy in the education sector must be a top priority in the effort to face the challenges that arise in line with the changes that occur in all aspects of human life, especially in the era of globalization.

In terms of the quality of teaching of subjects especially physics, the TIMSS and PIRLS reports [1] showed that physics achievements measured on the reasoning aspect, Indonesia was ranked 40 out of 42 (TIMSS and PIRLS International Study Center, 2012). Based on the results TIMSS concluded that; (1) the average achievement of student physics in Indonesia in terms of cognitive aspects was still low; (2) the tendency of physics achievement of Indonesian students always decrease on the cognitive aspect so that students physics ability must be improved in all aspects. This shows that the thinking ability of high-middle-class students in Indonesia is still very low compared to other countries. Whereas according to Woolfolk (2008) stated that students who have higher order thinking skills (capable of distinguishing between facts and opinions, identify relevant information, solve problems, and able to deduce the information that has been analyzed. Or in other words, if students already have good high-level thinking skills then learning outcomes for all aspects of cognitive will also increase.

Based on observations and studies of researchers, there are some things that cause low quality of physics learning outcomes in high school. The first is the ability of teachers in teaching physics is still very lacking. Mastery of physics concepts and the use of models and learning methods are still simple to make less effective learning. Meanwhile, the demands of the 2013 curriculum with a scientific approach have not been applied maximally by most teachers. This is marked by the level of mastery of the class by teachers is still very high compared to the learners (teacher center) whereas K-13 demands , teachers only as a facilitator and learners are expected to be much more proactive in learning. The second is the learning tools used in the classroom has not been able to encourage students to be enthusiastic in learning physics. Most of the books and worksheets of learners used contain formulas

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and concepts summaries, while minimal in terms of applying physics in everyday life. This results in less interesting, monotonous and boring lessons. In addition, the use of information and communication technology has no direct impact on improving the quality of physics learning outcomes, teachers are still less in using power point display and other interactive learning media.

Therefore, based on the above problem. The research team developed a fundamental physics instruments based on hypermedia that aims to introduce the use of technology in physics teaching for physics teacher candidates (physics education students of UNISMUH). By presenting the concept of physics in the form of interactive simulation and students become the center of learning, it is expected that the use of hypermedia based physics learning devices can improve science process skill of physics teacher candidate.

2. Research Methods

Research method is the way of work used in doing a research ". The method used in this research is pre-experimental design method with one-shot case study design. The experimental research method is an experimental method for studying the effect of certain variables on other variables, through experiments in special conditions that are deliberately created [3]. The experimental research method is intended to investigate possible causal relationships by exposing one or more experimental groups and one or more experimental conditions. Pre-experimental design method has not been a serious experiment because there are still external variables that also influence the formation of dependent variable. Sugiyono [4] classifies three types of research design commonly used in pre-experimental design methods, namely one-shot case study, one-group pretest-posttest design, and intact-group comparison.

This study uses a one-shot case study design. In this study, no control group and students were given special treatment or teaching for some time (X mark). Subjects in this study will get treatment (treatment) that is the use of hypermedia based learning devices. Then at the end of the program, students are given tests related to the given treatment / teaching (mark T).

Subject	treatment	Test
Group	X	T

Information :

X: The use of learning instrument based on hypermedia in the experimental class

Q: Test after treatment

2.1 Data analysis of learning device to achieve validation result

Based on the assessment by three validators, the content validity analysis for each statement item using CVR (Content Validity Ratio) is used, while the validity analysis of each aspect consisting of several items using CVI (Content Validity Index) equation. Assessment is categorized valid if CVR or CVI is in the range value 0 s.d 1. To calculate the CVR used formula according to Lawshe [5] as follows:

$$CVR = \frac{n_e \frac{N}{2}}{\frac{N}{2}} \quad (1)$$

Information:

ne: The number of validators that provide an essential value (good or excellent)

N: Number of validators

Based on the validity of each item statement, it can be determined the validity of each aspect by using the CVI equation as follows:

$$CVI = \frac{CVR}{\sum n} \quad (2)$$

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Information:

n: Number of items from every aspect

Furthermore, the declared statement validly performed reliability analysis. Testing reliability using the Alpha formula as follows:

$$r_{11} = \left(\frac{k}{k-1}\right)\left(1 - \frac{\sum \sigma_b^2}{\sigma_b^2}\right) \tag{3}$$

r11: Instrument reliability

k: Number of items of statement

Σσb2: The number of variance items

Σσt2: Total Variance

Reliability value obtained then consulted with the value of the reliability table. Instruments are categorized reliably if the calculated reliability value is greater than the reliability of the table.

2.2 Student's activities science process skills

To know the percentage level in learning using the percentage of liveliness formula:

$$P_i = \frac{A}{N} x\, 100\% \tag{4}$$

Pi is the percentage of liveliness towards learning; A is the number of scores obtained by teacners / learners; N is the total number of scores

2.3 Student's Questionnaire response

Formula percentage of respondents questionnaire response:

$$S = \frac{b}{A} \tag{5}$$

S is the percentage of students' response questionnaire scores; b is the number of questionnaire scores obtained; and A is the maximum number of questionnaire scores

3. Results And Discussion

Learning instruments in this study in the form of Student Worksheet, Hypermedia and Evaluation Tools to determine student science process skill and their responses. Concept of physics are presented in the student's worksheet is concise and clear. In addition, the student's worksheet contains learning objectives for each unit. Students are then directed to make a virtual observation through hypermedia by following the work steps listed in the student's worksheet. The observations result is then written in the table of observation then analyzed and answer the questions that have been presented in each unit, this questions is divided that aims to be answered based on the results of observations and analysis and also additional questions are taken from relevant sources and appropriate indicator available.

The hypermedia developed using Lectora contains: (1) Learning Objectives, (2) Material Summary, (3) Simulations adapted from www.eduMedia.fr [6] and www.kcvs.ca [7].

The hypermedia display for several units of observation as follows:

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Figure 1 Initial Display of hypermedia

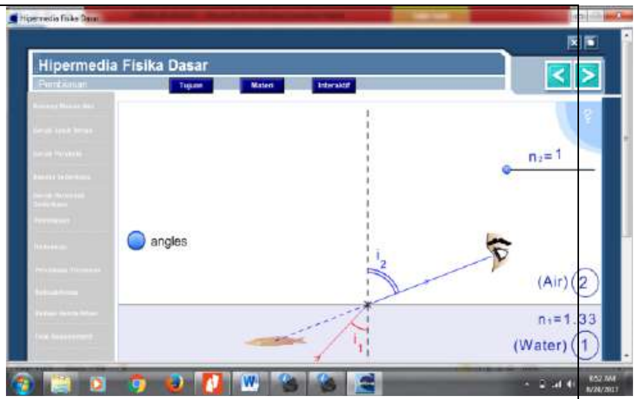

Figure 2 Display of refraction unit

Figure 3 Display of AC Current unit

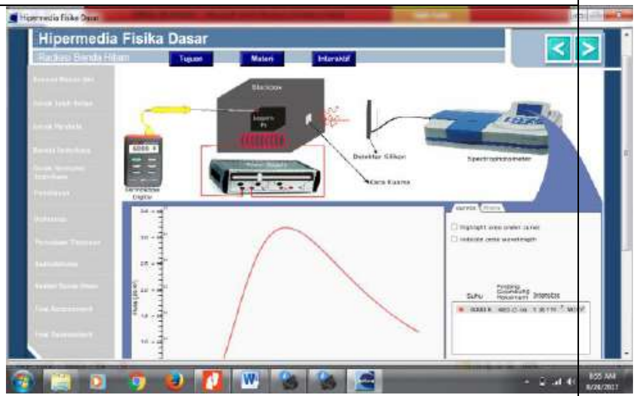

Figure 4 Display of Black Body Radiation unit

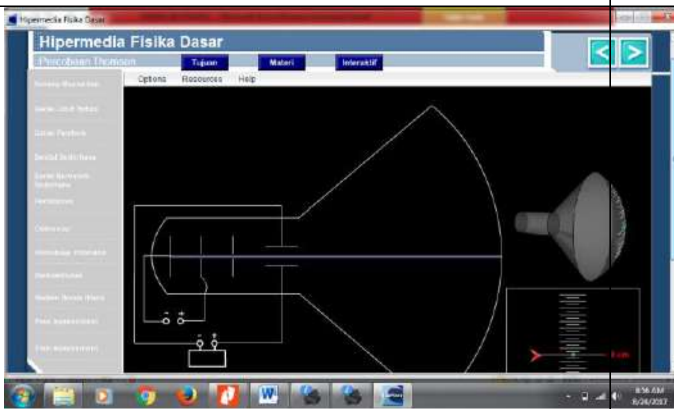

Figure 5 Display of Thomson Experiment unit

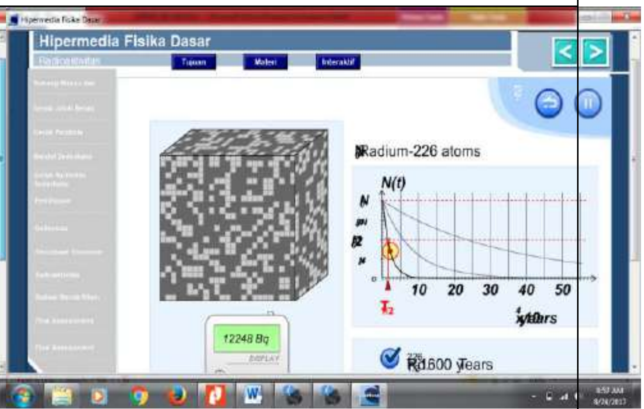

Figure 6 Display of Radioactive unit

This hypermedia can not be used if devices that used (laptop, computer and tab) are not completed with Flash Player and Adobe Reader. So the user need to download it by clicking the menu on initial display of hypermedia. In addition, Student's Worksheet can also be downloaded directly by clicking the download menu on the hypermedia in preliminary view. Examples of hypermedia display as follows:

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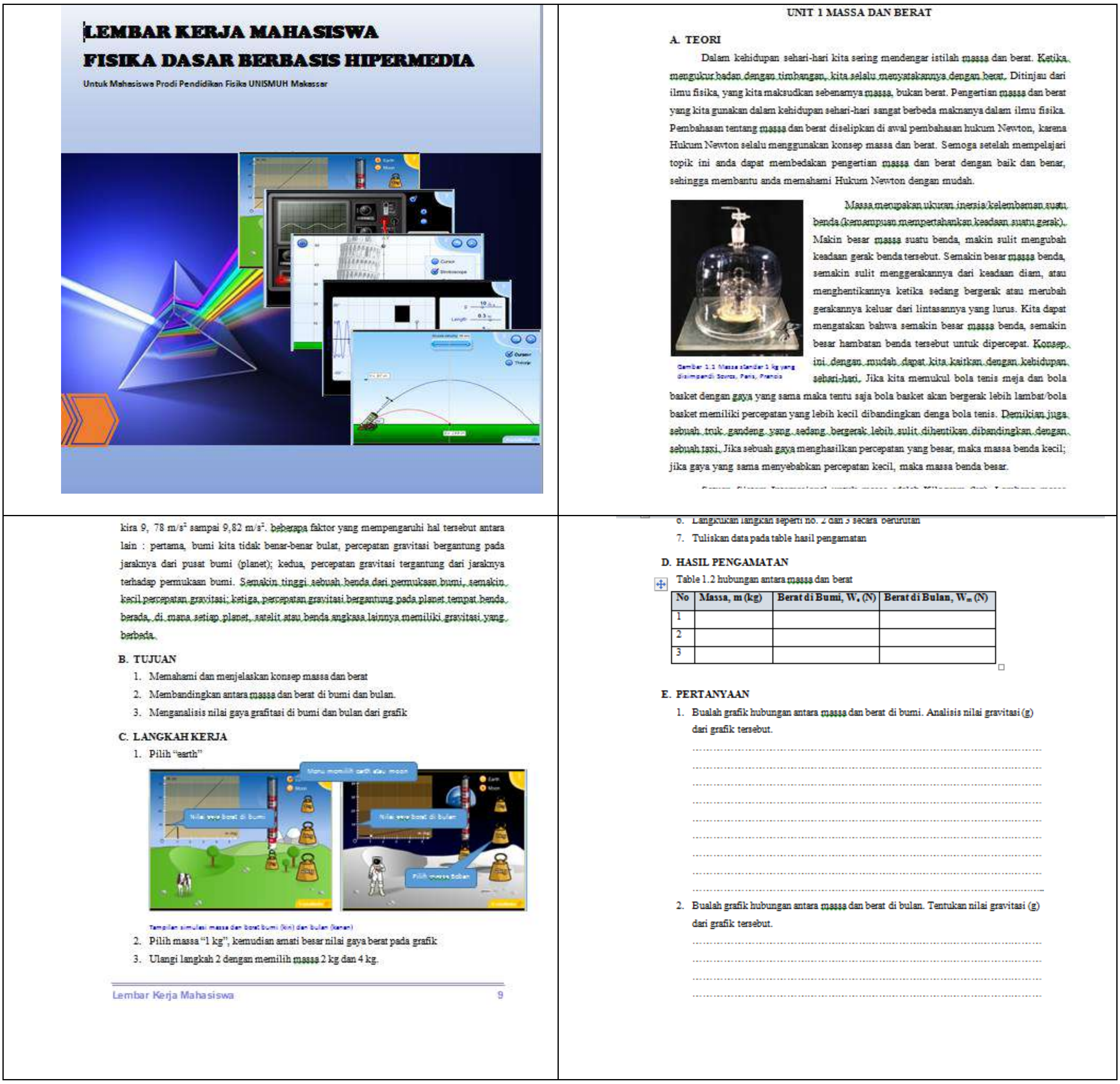

LEMBAR KERJA MAHASISWA
FISIKA DASAR BERBASIS HIPERMEDIA
Untuk Mahasiswa Prodi Pendidikan Fisika UNISMUH Makassar

UNIT 1 MASSA DAN BERAT

A. TEORI

Dalam kehidupan sehari-hari kita sering mendengar istilah massa dan berat. Ketika mengukur badan dengan timbangan, kita selalu menyatakannya dengan berat. Ditinjau dari ilmu fisika, yang kita maksudkan sebenarnya massa, bukan berat. Pengertian massa dan berat yang kita gunakan dalam kehidupan sehari-hari sangat berbeda maknanya dalam ilmu fisika. Pembahasan tentang massa dan berat diselipkan di awal pembahasan hukum Newton, karena Hukum Newton selalu menggunakan konsep massa dan berat. Semoga setelah mempelajari topik ini anda dapat membedakan pengertian massa dan berat dengan baik dan benar, sehingga membantu anda memahami Hukum Newton dengan mudah.

Gambar 1.1 Massa standar 1 kg yang disimpan di Sevres, Paris, Prancis

Massa merupakan ukuran inersia/kelembaman suatu benda (kemampuan mempertahankan keadaan suatu gerak). Makin besar massa suatu benda, makin sulit mengubah keadaan gerak benda tersebut. Semakin besar massa benda, semakin sulit menggerakannya dari keadaan diam, atau menghentikannya ketika sedang bergerak atau merubah gerakannya keluar dari lintasannya yang lurus. Kita dapat mengatakan bahwa semakin besar massa benda, semakin besar hambatan benda tersebut untuk dipercepat. Konsep ini dengan mudah dapat kita kaitkan dengan kehidupan sehari-hari. Jika kita memukul bola tenis meja dan bola basket dengan gaya yang sama maka tentu saja bola basket akan bergerak lebih lambat/bola basket memiliki percepatan yang lebih kecil dibandingkan denga bola tenis. Demikian juga sebuah truk gandeng yang sedang bergerak lebih sulit dihentikan dibandingkan dengan sebuah taxi. Jika sebuah gaya menghasilkan percepatan yang besar, maka massa benda kecil; jika gaya yang sama menyebabkan percepatan kecil, maka massa benda besar.

kira 9, 78 m/s^2 sampai 9,82 m/s^2. beberapa faktor yang mempengaruhi hal tersebut antara lain : pertama, bumi kita tidak benar-benar bulat, percepatan gravitasi bergantung pada jaraknya dari pusat bumi (planet); kedua, percepatan gravitasi tergantung dari jaraknya terhadap permukaan bumi. Semakin tinggi sebuah benda dari permukaan bumi, semakin kecil percepatan gravitasi; ketiga, percepatan gravitasi bergantung pada planet tempat benda berada, di mana setiap planet, satelit atau benda angkasa lainnya memiliki gravitasi yang berbeda.

B. TUJUAN
1. Memahami dan menjelaskan konsep massa dan berat
2. Membandingkan antara massa dan berat di bumi dan bulan.
3. Menganalisis nilai gaya grafitasi di bumi dan bulan dari grafik

C. LANGKAH KERJA
1. Pilih "earth"

Tampilan simulasi massa dan berat bumi (kiri) dan bulan (kanan)

2. Pilih massa "1 kg", kemudian amati besar nilai gaya berat pada grafik
3. Ulangi langkah 2 dengan memilih massa 2 kg dan 4 kg.

Lembar Kerja Mahasiswa 9

7. Tuliskan data pada table hasil pengamatan

D. HASIL PENGAMATAN

Table 1.2 hubungan antara massa dan berat

No	Massa, m (kg)	Berat di Bumi, W_e (N)	Berat di Bulan, W_m (N)
1			
2			
3			

E. PERTANYAAN
1. Bualah grafik hubungan antara massa dan berat di bumi. Analisis nilai gravitasi (g) dari grafik tersebut.
2. Bualah grafik hubungan antara massa dan berat di bulan. Tentukan nilai gravitasi (g) dari grafik tersebut.

Figure 7 Student's worksheet

Evaluation of hypermedia is done by material experts and media experts. The results of the validation analysis show that hypermedia is valid and reliable for all aspects as in the table below:

Table 1. Results Analysis of validation and reliability of hypermedia

No.	Aspect	Percentage (%)
1	Display Quality	96,4
2	Attractiveness	94,0
3	Technical	95,2
	Average	**95,2**

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While the results of validation analysis showed that the material in hypermedia valid and reliable for all aspects as in the table below:

Table 2. Results Validation and reliability analysis of the material in hypermedia

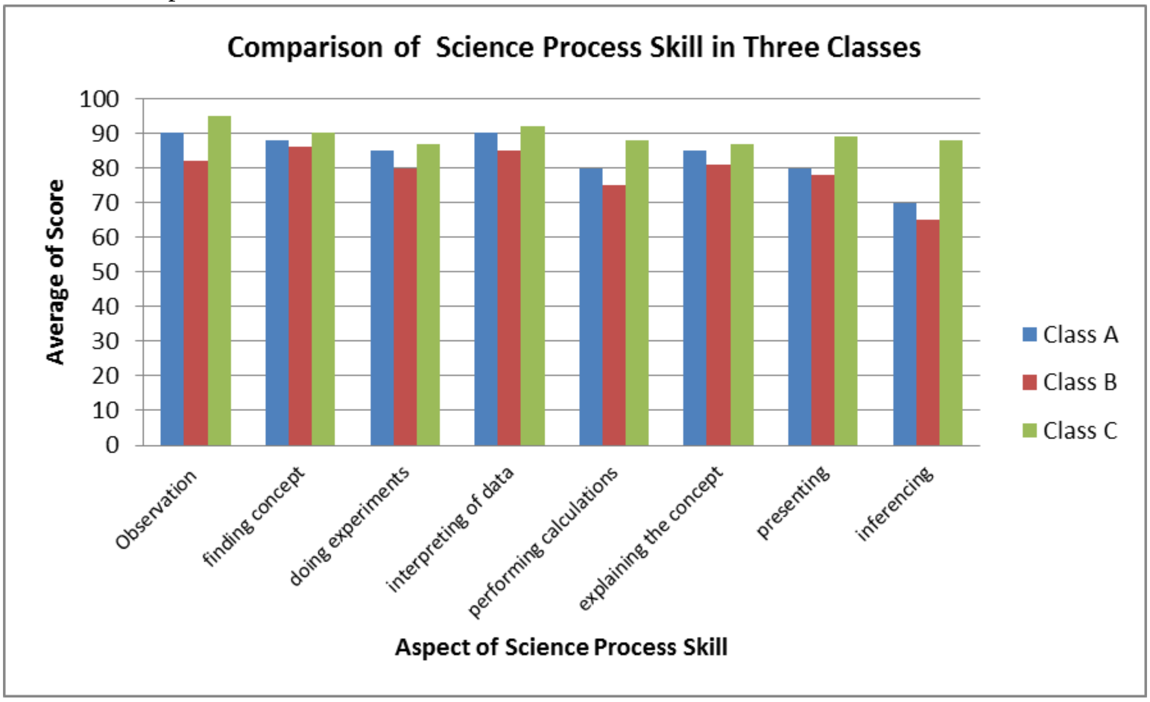
No.	Aspect	Percentage (%)
1	Materials / Concepts	92,0
2	Language	98,5
3	Presentation	94,5
	Average	**95,0**

While the results of validation analysis show that Student's Worksheet based on hypermedia is valid and reliable for all aspects as in the table below:

Table 3. Results Analysis of validation and reliability of Student's Worksheet based on hypermedia

No.	Aspect	Percentage (%)
1	Format of LKM	98,3
2	Content of LKM	96,4
3	Language of LKM	98,5
4	Benefit of LKM	98,3
	Average	**97,88**

when the learning process took place, observations were made by three observers who were assigned to provide an assessment of the student's activities using the observation sheet. on the observation sheet there are 8 aspects of science process skills as follows: Observation (observe demonstration); finding concept; doing experiments; interpreting of data; performing calculations; explaining the concept; presenting; and inferencing. here is the comparation of average score of the students' science process skill scores for the 3 classes.



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Abruscato (in Dahlan) [9], classifies the skills of the scientific process into two parts, namely basic process skills and Integrated Processes. Basic process skills consist of: Observation; Use of numbers; Classification; Measurement; Communications; Forecasting; Inference. While the integrated process skill consists of: Controlling variables; Data interpretation; Formulation of hypotheses; Defining operationally; Experimenting.

In order for students to have these skills, they must be trained to perform activities related to those skills. Based on the observer's assessment from each meeting, it was found that most aspects of student activity above 80% indicated that learning using hypermedia based learning tools gave students the opportunity to move. Hypermedia-based learning provides an opportunity for students to explore, enabling them to always move, not just listen and record as revealed by Cengiz [10] that media accompanied by appropriate learning tools can involve students actively in learning.

Some previous media development studies, such as those done by Swandi and Bunga Dara [11] which also measure student activity and perception. But the advantages of hypermedia-based learning tools enable students to access this media independently, whenever and wherever good used by hp, ipad, tab, notebook and laptop.

Although the results of this study indicate that student activities in both categories include activities of observing demonstrations, seeking concepts, calculating, categorizing, explaining, presenting, and creating processes. It is not claimed that virtual observations through computer media are more effective than experiments in real laboratories. Conversely, hypermedia experiments are done by reason of device limitations, timing considerations, abstract subject matter

The data about students' perceptions of learning using hypermedia learning devices as follows:

Table 4. Student Perceptions

No	Indicator	Percentage (%)
1	Facilities Learning Instrument Based on Hypermedia	85,40
2	Learning Appeal by Using Learning Instrument Based on Hypermedia	87,60
3	Learning Activity by Using Learning Instrument Based on Hypermedia	84,20
Rata-Rata		85,73

Based on the students' assessment of learning using hyermedia obtained data that the student response above 85% indicates that students strongly agree with the learning using hypermedia based learning tools Student perception after being treated in the form of application of Hipermedia based learning showed very agree, although there are some students who provide a disagreement assessment of some of the criteria proposed. Students interested in the display of learning hypermedia simulation, easy to run interactive simulations, easy to understand the subject matter, and happy to learn with the help of hypermedia. This is in accordance with Yulianti's research, et. al., [12] that the application of virtual media-based learning can improve students' affective abilities that describe feelings, interests, and attitudes toward the teaching process.

Acknowledgment

Thanks to physics concepts experts and hypermedia experts for their validations and advices, so that the development of learning tools based on hypermedia can be completed and implemented in fundamental physics learning.

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The Design of Android-Based Physics Mobile Pocket Learning Media

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Abstract. This research aims to design an interactive android-based physics mobile pocket learning media. This development is done as a form of innovation in the learning of physics in the form of electronic learning (e-learning). Furthermore, the combination of communication technology in the form of mobile phone application with e-learning creates a learning media called m-learning (mobile learning). M-learning is accessible through mobile phones and other devices such as PDAs and tablet PCs. Online learning resources can be designed for instructional media in this innovation called Physics Mobile Pocket Learning Media on Android Based, thus enabling the learning process more precisely to achieve the target. The subject in this research is an interactive physics mobile pocket learning media on android based on the subject of motion dynamics. Material of teaching materials refers to the subjectof Basic Physics 1. This research method used is ADDIE development model (analysis, design, development, implementation, and evaluation). The design of physics mobile pocket learning media on android based has been developed but not yet reached to the stage of expert validation, implementation and evaluation.
Keywords: Learning media, Physics, Android-based

1. Introduction

Physics learning is a series of learning process undertaken in order to understand natural phenomena and their interactions. Astra *et al*[1] said, "Physics is knowledge learning about nature phenomenon and interaction in the universe. Physics learning demands teachers to demonstrate the real nature phenomenon through direct observation or experiment so students are able to understand the whole concepts comprehensively." Physics learning does not only learn on the existing events, but also learn how the causes, processes and results of natural phenomena that occur. Nevertheless, most of the students who study physics are still in trouble. Sukarno dan Sutarman[2]said, "... physiscs is one of the the lessons that was less of learners'interest. Generally, the reason is because it has many formulas involved in its learning."

It is not easy for students to understand experiments, formulas and solutions, graphs, and theoretical explanations at the same time. In addition, it is due to the condition of students who are reluctant to read books, references, and other sources related to the concept of Physics. Based on the researchers' observation, one of the causes of students' reluctance to read a book is because the majority of Physics books are thick so it takes a lot of time to summarize and digest the contents. Moreover, the books are generally presented in a rigid format without any of the drawings, interesting color variations, and still use a monotone typeface.

On the basis of these problems, it needs an innovation in learning so that learning physics becomes interesting. The fast development ofscience and technology in this decade can be used as materials to create learning resources. In the process of learning physics requires media that can support the purpose of learning. Imamah[3]said, *"media merupakan faktor pendukung dalam pencapaian tujuan pembelajaran. Segala sesuatu yang dapat menyampaikan pesan pembelajaran sekaligus mampu merangsang perhatian, pikiran dan perasaan siswa sehingga terjadi proses pembelajaran disebut juga media pembelajaran".*Media is a means used to convey information. Thus, the learning media is a means to convey information in the form of lessons to attract students' attention.

As the times progressed, many printed books were transformed into more practical electronic books. If a book generally consists of a collection of papers that can contain text or images, then the electronic book contains digital information that can be also in the forms of texts or images. Innovations emerges to a concept of learning in the form of electronic learning (e-learning).

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Furthermore, the combination of communication technology in the form of mobile phone application with e-learning creates a learning media called m-learning (mobile learning). M-learning can be accessed through mobile phone devices and other devices such as PDAs and tablet PCs. The advantages of learning media based on m-learning, which is easy to access with activities that are not limited by the area. In addition, the equipment used in m-learning learning is more sophisticated, lightweight, and practical that allows users to learn anytime and anywhere in everyday mobility in a device called smartphone.Physics mobile pocket as well as physics pocket books that are packed in such a way which learning can be done with m-learning (in the form of electronic digital learning) so that it is effective and easy to carry anywhere by students.

Physics mobile pocket is an android based learning application that is different from its conventional forms because therein there is a very interesting content to use. The distinction of this android based smartphone learning application genearlly lies on the terms of the contents of the application. Fatimah dan Mufti[4]said, *"Smartphone mampu menjadikan salah satu media pembelajaran yang menarik, karena siswa dapat mempelajari materi sains dengan cara yang berbeda, yaitu memanfaatkan HP sebagai sumber belajar. Selain membuat pembelajaran lebih menarik, siswa dapat mempelajari materi tanpa terbatas waktu, artinya siswa dapat belajar di luar jam pembelajaran, sehingga akan memberikan dampak positif bagi siswa dalam penggunaan HP/Smartphone sebagai sarana belajar."*Growth of smartphone usage of course can be utilized by lecturers to develop instructional media, so as to enable more appropriate learning process on target. Students can maximize the function of the smartphone to understand the concepts of physics being studied. Anggraeni dan Kustijono[5]concluded, "*pengembangan media animasi fisika pada materi cahaya dengan aplikasi flash berbasis android memberikan dampak bagi peserta didik berupa motivasi belajar fisika, pemahaman konsep, serta timbulnya rasa senang."*

Researchers plan to provide a discussion forum between students and lecturers on the application about the physics material contained in the android application so that it is used to bridge communication between lecturers and students. So there is a virtual classroom which can be accessed anytime and anywhere, so that the learning between students and lecturers do not have to be in a face to face interaction but in the e-learning process by android. The development of android-based learning media will be in the kind of aninteractive learning application Physics mobile pocketon android based in which there is some content such as material, physics animation, instructional videos, interactive quizzes, evaluation up to discussion, and evaluation report.

2. Research Method

This research was conducted at Universitas Indraprasta PGRI Jalan Raya Tengah No 80, Gedong, Pasar Rebo, Jakarta Timur. The type of research used is the type of research and development (research and development), which is a research method used to produce a particular product, and test the effectiveness of the product (Sukmadinata[6]). This research procedure adapts the development model of ADDIE, a development model consists of five stages consisting of analysis, design, development, implementation, and evaluating. Nevertheless, this research is only up to the design stage of designing and making learning media.

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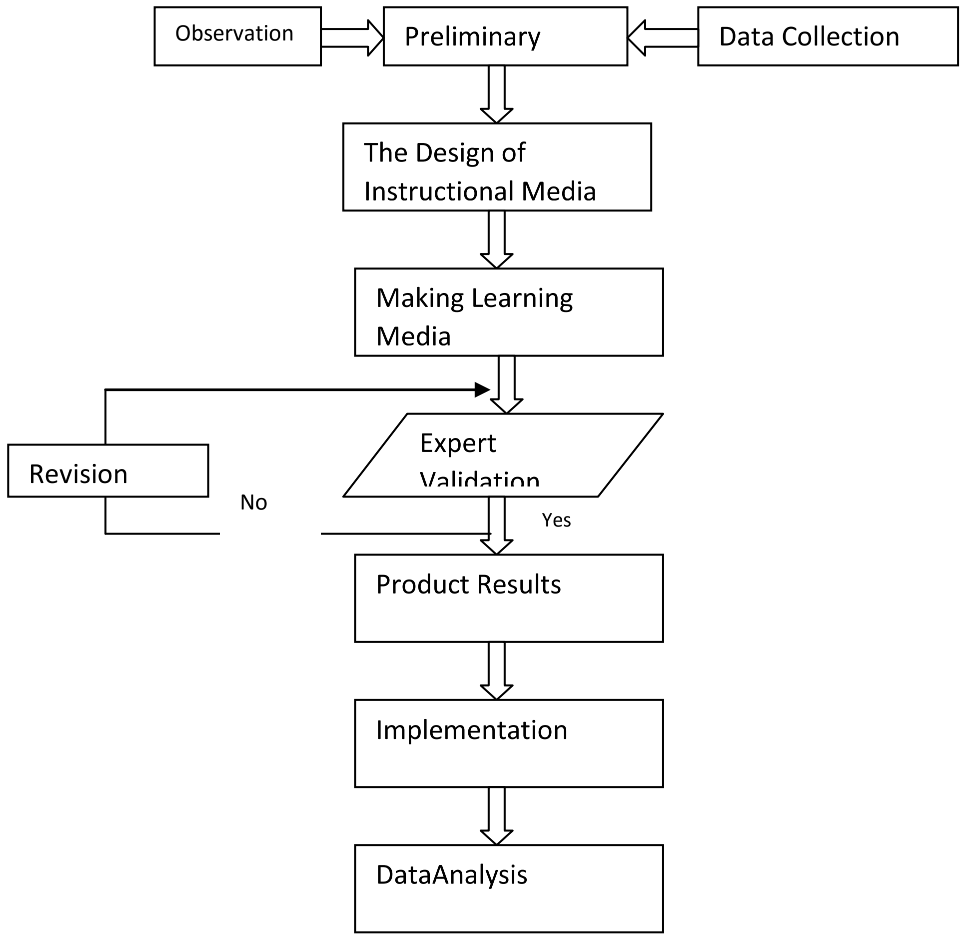

Figure 1. Research *Flowchart*

3. Result and Discussion

The product resulting from this development research is in the form of application of Physics mobile pocket learning media on android based. This learning media product is created and designed by the researchers themselves that can be used as a tool of lecturers and students in delivering the material. It can also be as a source of independent learning which at any time can be used by students outside the learning activities. The development of learning media uses a learning model of ADDIE. The ADDIE model has 5 stages including analysis, design, development, implementation, and evaluation. The research of ADDIE model development is done only until development stage, because the purpose of this research is limited to develop and produce a valid learning media to be implemented based on validator assessment.

Stage analysis of product development consists of analysis of material and analysis of learning media. From the analysis, the materials that need media aid as a lecturer's tool in conveying the material and the students for the self-study chosen are the dynamic materials, because the subject needs concrete matters to make it easier for the students to understand the material.

In the design stage, among others are 1) create a storyboard, 2) design android-based learning media applications, 3) materials, images, illustrations (animation) and video appropriate and appropriate with the material), 4) create a validation sheet instrument, sheet questionnaire interest in learning, and sheet of evaluation problems. After obtaining materials to create learning media at the analysis stage, then researchers do the design of learning media and conduct discussions with

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validators and lecturers who teach the Basic Physics course in University of Indraprasta PGRI. The results obtained from this stage is the design of learning scenarios and storyboards which will be validated later.

Creating learning media is done to understand the concepts, procedures and application of learning materials in the real world. This media is then packed by using Adobe Animate CC program in the form of Physics mobile pocket-based android application to attract student interest in learning. The result of the development stage is the application of android-based learning media which consists of indicators, teaching materials, images, video, sample questions, and interactive evaluation questions. Design of instructional media is presented in the following displays.

gure 2. Opening Appearance

gure 3. Options Menu

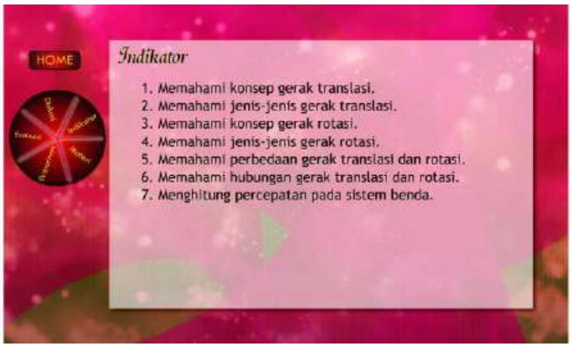
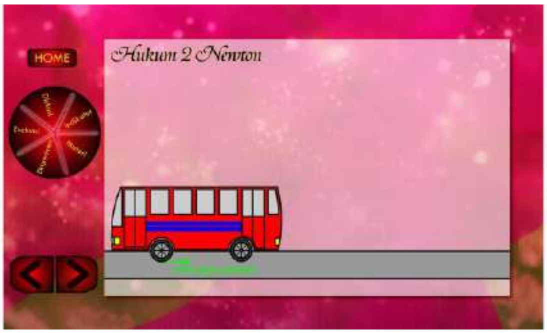
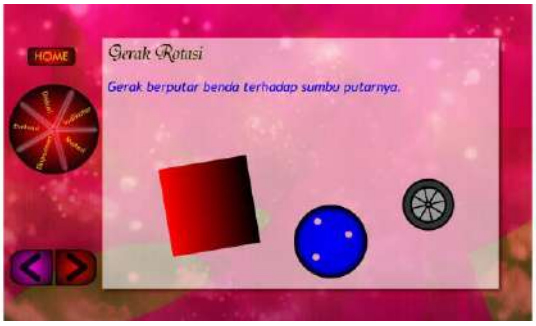


Figure 4. Indicators

gure 5. Material Options



gure 6. Translation Material



gure 7. Rotation Material

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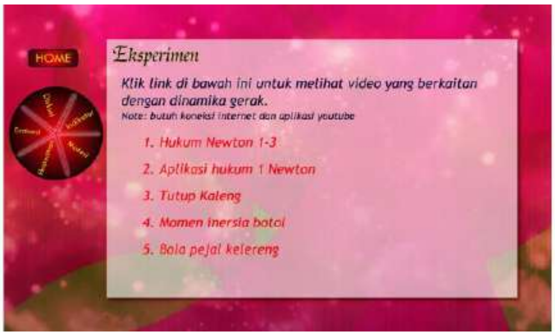
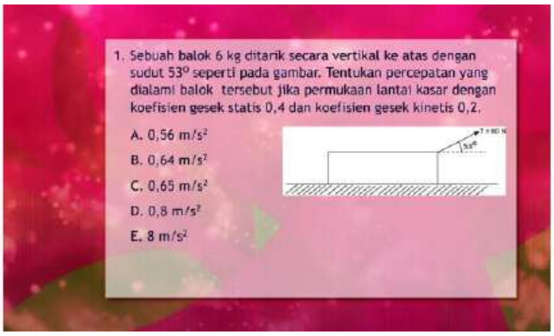


Figure 8. Experiment Menu



gure 9. Multiple Choice Examinition

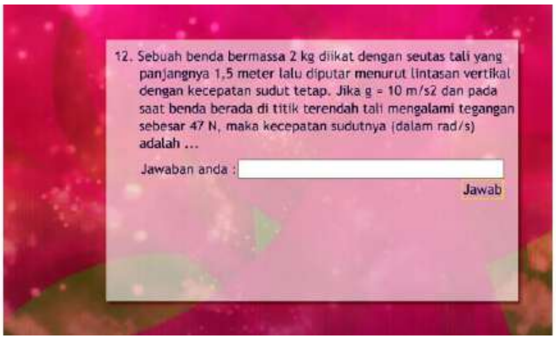


Figure 10. Essay Examination

gure 11. Evaluation Result

The development of interactive Physics mobile pocket-based learning application aims to design and create an interactive and interactive Physics mobile pocket-based learning media that meets the characteristics and quality of good learning media for students to use. This is motivated by the use of android-based smartphones owned by students to not only be useful as a means of communication but also as a source of learning. That is, learning can be done anywhere and anytime in a simple, simple way through their respective smartphone applications. In addition, the development of this media is made to help lecturers as an alternative teaching materials so that learning can take place effectively and efficiently.

Multimedia is a new technology that can provide many benefits to develop the world of education that provides more meaningful learning. The development of learning media through multimedia must always be developed to provide ease in learning so that the ultimate goal of learning can be achieved with the maximum. With the development of equipment and technological development, the development of instructional media must also adjust to the needs and proximity of technology used by users. Astra et.al[7]said that, “Technological development has created breakthroughs in learning. In the development process, students often contact devices of mobile communication and internet being a new trend that have possibility to organize mobile learning (m-learning). Because of m-learning students should not always attend in any learning process. Beside that, students can access the learning material anytime and anywhere”.

The development and use of instructional media in learning must be able to accommodate learning objectives in the form of competencies that must be mastered by students. Making learning media selected for use needs to pay attention to the content of the curriculum and the material being taught. In other words, the making and use of instructional media should be able to support the competencies set out according to the curriculum.

This research has resulted an interactive Physics mobile pocket learning media.Based on the results of their study, Anggraeni dan Kustijono[7]concluded, *“pengembangan media animasi fisika pada materi cahaya dengan aplikasi flash berbasis android memberikan dampak bagi peserta didik berupa motivasi belajar fisika, pemahaman konsep, serta timbulnya rasa senang”*. On the basis of the results

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of research, it is clear that the development of learning media becomes an important role in the learning process because it affects the motivation to learn, the understanding of the concept and the emergence of a sense of fun in learning. Therefore, this research will be continued up to the evaluation stage in order to know the effectiveness of developed learning media.

4. Conclusion and Suggestion

This research has resulted an interactive Physics mobile pocket learning media. This instructional media application meets with the aims of the research that is to design and create an interactive Physics mobile pocket based learning media. This also meets with the characteristics and quality of good learning media to be used by students. The suggestions for further research include: 1) Visualization of material concept should be developed to be more visually appealing to make it easier for students to understand the material, 2) Development of media should be made in a more interesting instructional in order to develop creativity, innovation and understanding of correct concept so that learning objectives can be achieved, 3) In terms of quality, it should give more attention to image quality/clarity, and suitability of lighting and color.

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Enhancing Physics Student's Achievement Through Problem Based Learning Assisted PhET on High School

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Abstract. The aim of this study is to enhance physics student's achievement in high school after implementation of problem-based learning (PBL) assisted PHET and compare this increasing with student's cooperative learning achievement. The population of this research was the 11th grade of science students of SMAN 4 Yogyakarta. The sample was determined by purposive sampling which consists of two classes amount 50 students. The quasi experimental method used in this study using a pretest-posttest group design. The data analysis technique used General Linear Model (GLM). Based on these study findings the mean difference (MD) class experiment score of -45,52 and mean difference (MD) class control score of -20,00. From this results can be concluded that PBL assisted PHET can enhance the student's achievement and better than cooperative learning.
Keywords: Problem Based Learning, PhET, Student's Achievement

1. Introduction

Twenty-first century skill is needed to overcome the challanges 21st century in science and technology sector. This makes students competitiveness in the globalization era [1]. Also, this is in line with the development of curriculum in Indonesia. All component of 2013 curriculum is aimed to bear the competitive human resources [2]. There are three main categories of 21st-century skills : learning and innovation, information, media, and technology and life and career skills [3]. Therefore, it's crucial to incorporate 21st-century skills in science education.

Science learning, including physics is aimed at explaining nature and its phenomenon. Also, to build understanding and communicate it in development of scientific knowledge [4]. However, student's physics achievement in many research are low [5].

Physics learning in the high school must familiarize students actively in problem-solving [6]. Problem-solving in physics learning will help students to improve their achievement [7]. Learning models which can facilitate it are a Problem Based Learning (PBL). It is because PBL considers solving the problem as its major focus [8]. The syntax of Problem Based Learning (PBL) model is the orientation to the problem, the organization to learn, guide individual and group investigation, developing and presenting problem-solving activities, analyze and evaluate problem-solving process [9,10].

PBL model is can integrate with technology [11], such as the virtual laboratory. A virtual laboratory is more effective than real [12]. A kind of virtual laboratory is PhET. PhET simulation allows students to learn materials which difficult to experiment. Through PhET, materials can provide more understanding and interesting for students [13]. This study is focused on learning with PBL model assisted PhET to improve physics student's achievement. With this present study, it is believed that the result will enhance physics student's achievement. The implementation of PBL assisted PhET in learning activities can be seen in Table 1.

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Table 1. Implementation of PBL assisted PhET

Learning Activities	Syntax of PBL	Media
Introduction	-	Video
Core	The orientation to problem	Video, PowerPoint
	The organization to learn	
	Guide individual and group investigation	PhET, Worksheet
	Developing and presenting	Worksheet, PowerPoint
	Analyze and evaluate	Worksheet
Closure	-	PowerPoint

2. Methodology

The study was conducted by using the quasi experimental with pretest-posttest control group design. The population of this study was the 11^{th} grade of science students of SMAN 4 Yogyakarta. The sample was determined by purposive sampling which consists of two classes amount 50 students. First class as an experimental group given a treatment with PBL assisted PhET and second class as a control group given cooperative learning. The research design was shown in Table 2.

Table 2. Research Design

Group	Pretest	Treatment	Posttest
Eksperiment	T_1	X_1	T_2
Control	T_1	X_2	T_2

Description
T_1 : Pretest
T_2 : Posttest
X_1 : PBL Assisted PhET
X_2 : Cooperative Learning

The data was collected through observation and testing. The instrument was used a multiple choice test to measure student's achievement. The data analysis technique used general linier model (GLM) mixed design test.

3. Results and Discussion

The data obtained and analyzed in this study is the score of student's achievement on kinetic gas theorem after being given treatment PBL assisted PhET and cooperative learning. Descriptive data of student's achievement can be viewed in Table 3.

Table 3. Descriptive Data of Student's Achievement

Component	Group	Minimum	Maximum	Mean	Std. Deviation
Pretest	Experiment	10,00	50,00	26,55	1,32
	Control	20,00	50,00	37,14	1,76
Posttest	Experiment	20,00	90,00	72,07	1,54
	Control	50,00	90,00	57,14	1,14

Table 3 shows that the minimum, maximum and mean score of experiment and control class is different. The pretest - posttest results in each class showed that both treatments were able to enhance student's achievement but table 4 shows that the experimental class have the higher mean differences than the control class (MD_E = -45,52; MD_C= 20,00)

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Table 4. Pairwise comparisons

Group	(i) time	(j) time	Mean Difference (i-j)	Std. Error
Experiment	Pretest	Posttest	-45,52	0,327
	Posttest	Pretest	45,52	0,327
Control	Pretest	Posttest	-20,00	0,385
	Posttest	Pretest	20,00	0,385

After the test of normality and homogeneity, the analysis was continued with the general linier model (GLM) mixed design test to see how much contribution from each treatment. The amount contribution of each treatment can be viewed in the multivariate test output on partial eta squared part shown in Table 5.

Table 5. Multivariate Test

Group		Partial Eta Squared
Experiment	Wilks' Lambda	0,801
Control	Wilks' Lambda	0,360

Table 5 shows that amount contribution of PBL assisted PhET to enhance student's achievement is 0.801 or 80.1% and 0.360 or 36% for cooperative learning. Based on these results, we know that the PBL assisted PhET more effective to enhance student's achievement than cooperative learning.

4. Conclusions and Suggestion

Problem Based Learning assisted PhET in gas property simulation giving convenience to understanding gas property as an abstract particle on The kinetic gas theorem. This is proven from differences of physics student's achievement between problem-based learning (PBL) assisted PHET group and cooperative learning group. The problem-based learning (PBL) assisted PHET group has more increased than cooperative learning group. General Linear Model (GLM) mixed design test provides mean difference (MD) from experiment class -45,52 and control class -20,00. Based on this mean difference, we can conclude that mean difference from experiment class is higher than control class. It's mean physics student's achievement in experiment class is better than control class. So, this learning innovation has given positive effect for physics student's achievement.

Some suggestion for further research :

a. For similar researches, it's recommended to noticed the nonexperimental variable, such as gender, student's background, and age.
b. Teacher should apply PBL model assisted PhET because can increasing physics student's achievement
c. Quasi-experiment research should use a different school with the assumption that both school has similar characteristics.

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Learning Model Comparison *Problem Posing* mode *SolutionPosing Pre* with Learning Model *Problem Solving* Achievement Motivation Against Seen From Physics Student Learning Outcomes

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ABSTRACT

This study aims to determine whether there is an interaction effect significantly between the use of models of learning and student achievement motivation on learning outcomes of students in high school physicsJakarta.Results of this research is a preliminary study carried out in high school YAPPENDA Jakarta, for 3 months starting in August 2016 to October 2016.

The method used in this study is the experimental*method.* With a target population in this study is a class XI SMA YAPPENDA Jakarta, while the inaccessibility population is class XI IPA I and IPA II SMA YAPPENDA Jakarta. Samples were taken at random*(randomsampling)*by taking 68 students from class XI IPA. The design used in the study was *nonequivalent control group*design.Data collection techniques using research instruments in the form of a written test*(paperand pencil of*test)the 35 multiple-choice questions.

Based on the hypothesis test using t test, the obtained$_t$ at 2.78. While t_{table} obtained from table t with a significance level of $\alpha = 0.05$ and degrees of freedom (df) = 66 is equal to 1,998. Because $t_{count>}$ t_{table} 2,656> 1,998 then $H_{0\ is}$ rejected. Thus H_1 received stating that a significant proportion of students studying physics results between usinglearning model *problem posing* pre-type *posingsolution of* with alearning model of *problem*solving.

Keywords: *Learning Model Solution Problem Posing Posing Pre mode. Learning Model Problem Solving, Achievement Motivation, Learning Outcomes Physics Students.*

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INTRODUCTION

Model learning *problem posing* types *posing solutionpre* isof learning activities in which the formulation of questions or problems done by the students who were given a particular situation as a stimulus in formulating the problem. learning model *Problem solving* is a model of learning in which way of presenting the lesson material through a problem that must be solved and sought answers by students in order to achieve teaching objectives.

In addition to the role model of learning that is an external factor affecting student learning outcomes of students, there are some internal factors or factors of the student himself, who gives the impact on student learning outcomes. One internal factor is the motivation that can affect student achievement. Motivation to learn is the overall driving power of the student whose learning activities, which ensure the continuity of activities and provide direction on learning activities, so that the desired objectives by studying subjects that can be achieved.

Therefore, in this study the researchers also reviewing the motivation, the motivation of achievement as a student characteristic variable because of differences in physics learning outcomes are influenced by the students' motivation towards physics is still questionable.

For this reason the researchers moved to do research on"LearningModel Comparison *Problem Posing* mode *SolutionPosing Pre* withLearning Model *Problem Solving* Learning Motivation Against Seen From Physics Student LearningOutcomes".

FORMULATION ISSUES

Is there a difference significant effect between the use of Cooperative Learning ModelType *Problem Posing* Type *Pre PosingSolution* and *Problem Solving* to the learning outcomes of high school physics class XI student YAPPENDA Jakarta?

STUDY THEORY

A. Hekekat Learning Model *Problem Posing* the type of *SolutionPosing Pre*

Regardingrole *Problem Posing* types *Pre SolutionPosing* in learning physics, Sutiarso (Thobroni, 2011) describes that *Problem Posing* the type

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of *Pre SolutionPosing* is a form of learning physics approach that emphasizes formulation of the problem, which can develop the ability to think mathematically or using mathematical mindset.

This is in line with Lyn D. English (Thobroni, 2011) which describes that *Problem Posing* type of *Pre SolutionPosing* is important in mathematics curriculum because it constitutes the core of physical activity, including activity where students build their own problems. This suggests that someactivity *Problem Posing* type of *Posing Pre Solution* has an additional benefit in the development of children's knowledge and understanding of the important concepts of physics.

Problem Posing type *PosingSolution Pre* is the formulation of questions or problems by students. Students are only given a certain situation as a stimulus in formulating questions or problems. In connection with the situation that is used in the formulation of problems / questions in the study of physics, matter can be built through several forms, including drawing, manipulative objects, games, theorem / concept, props, problems and solutions of the problem.

From the definition that has been raised by several experts in the above, it can be concluded that the *model ofProblem Posing* the type of *Pre SolutionPosing* is learning that emphasizes the manufacture or formulation problems by students. Students are faced with certain situations that serve as a stimulus to formulate questions.

B. Hekekat Learning Model *Problem Solving*

Muhhibin Shah in his (Shah, 1998) which says that solving*(ProblemSolving)*is basically learning to use scientific methods or to think in a systematic, logical, organized and meticulous. The goal is to gain abilities and cognitive skills to solve problems in a rational, straightforward, and complete. To that end, the ability of students in mastering the concepts, principles, and generalization and *insight* (titikan sense) would be required.

David Johnson and Johnson revealed in Thobroni and Mustafa (Thobroni, 2011) that the learning model solving*(ProblemSolving)*is done

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through the group. A related issue to the subject in the context of the lessons to students to complete. Problems that have hadnature, *conflict issues* or *controversial*the problem is considered essential*(important),*urgent, and can be completed(solutionable).

In line with the above definition, Suparno revealed that *Problem Solving* (Suparno, 2007) is a model of learning by solving problems. Usually teachers give the issue in accordance with the topics that would be taught and students are asked to solve the problem. In the definition set forth above gives the sense that the *problem solving* in the learning process of students faced with a problem to be solved and solved, which in finding a solution of this problem the students are guided using *Problem Solving*framework. So in the implementation of student learning must be active in solving the problem of the issues that have been presented by the teacher, either individually or in groups.

B. Hekekat Achievement Motivation

According to Mc Clelland (1987: 40) the sense of achievement motivation is defined as the effort to succeed or to succeed in the competition with a measure of excellence may be the achievements of others and achievement alone. Lindgren (1976: 67) suggested similar things that achievement motivation as an encouragement that there is someone in connection with the achievement, that is controlled, manipulated fiber set of the environmental social and physical, to overcome all obstacles and maintain the high quality work, competing with efforts to exceed theof workthe past, as well as surpass the work another.

In line with the above opinion, Santrork (2003: 103) explains that achievement motivation is a desire to get something for achieve a standard of success, and to make an effort to goal to achieve success.

Gagne and Barliner (1975: 77) adding that achievement motivation is a way for someone to seeks well for his performance. According Heckhausen (1967: 54) motif of achievement defined as efforts to improve or make personal capacity as high as possible in all activities and a measure of excellence used as In comparison, though in an effort to do these activities there are two the possibility of failure or success.

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From the description it can be concluded that the motivation of achievement or *achievement motivation* is a encouragement related to how to do things better, faster, more efficient compared to what has been done before, in an effort to succeed or to succeed in competition with a size advantages can be achievements of people others or of his own achievements.

RESULTS AND DISCUSSION

A. Testing Requirements Analysis

1. Normality Test

Normality test used for the experimental class is *the chi-square test* at the significant level α = 0.05. Based on test results, obtained price χ^2_{count} in the experimental class of 4.147, while the price of χ^2_{tables} at α = 0.05 df = 66 is equal to 7.815, thus χ^2_{count} <χ^2_{tables} of 4.147 <7.815, and χ^2_{count} on control class is 4.777 while the price of χ^2_{tables} at α = 0.05 is equal to 7.815. Thus χ^2_{count} <χ^2_{tables} of 4.777 <7.815, these results suggest that the samples obtained from normal distributed population.

2. Homogeneity Test

Test Test homogeneity or similarity between the two variable populations of both classes performed usingtest *Fisher(Test-F)* at significance level α = 0.05.

Based on testing criteria, the greatest variance price obtained in class *Problem Posing* at 45.42, and the smallest variance inclass *Problem Solving* at 65.07, the price of F_{count} obtained 0.70 while the price of the F_{table} at α = 0.05 is equal to 1.808, thus $F_{arithmetic}$<F_{table} is 0,70 <1.808. And the price of the F_{table} at the 1-α = 1 to 0.05 is 0.95 that is equal to 0.55, thus $F_{count>}F_{table}$ is 0,70> 0.55.

From the homogeneity test calculations using Fisher test obtained F = 0.70 lies between 0.55 and 1.808 ($F_{1-\alpha\ (ny2-1,\ ny1-1)}$<$F_{arithmetic}$<$F_{\alpha\ (ny2-1,\ ny1-1)}$ or 0.55 <0.70 <1.808). It can be concluded that the samples ofpre-class *problem posing* the type of *solutionposing* andclasses *problem solving* have a homogeneous condition

B. Hypothesis Testing

In testing the hypothesis used t-test formula of the test results obtained$_t$ = 4.997. From the list of critical value of the t-test with a significance level of α = 0.05 and degrees of freedom (df) 66 obtained t_{table} = 1.998 while the significance level α

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= 0.01 and degrees of freedom (df) 66 obtained t_{table} = 2.656 for$_t$ > t_{table} is 4.997> 2.656. By$_{(t>}t_{table)}$then $H_{0\ is}$ rejected.

So it can be concluded that there is a significant proportion of students studying physics results between usinglearning model *problem posing* pre-type *posingsolution of* with alearning model of *problem*solving.

CONCLUSIONS AND RECOMMENDATIONS

A. Conclusions

The average value of learning outcomes physics class *Problem Posing* Type *PreSolutionPosing* on the subject of the kinetic theory of gases and thermodynamics 80.6, while theclass *Problem Solving* has an average value of learning outcomes physics on the subject of the kinetic theory gas and thermodynamics of 71.5. This shows that the average physics student learning outcomes given the treatment usinglearning model *problem posing* the type of *posing pre solution* is higher than the average of physics learning outcomes of students who uselearning *problem solvingmodel.*

B. Recommendations

Based on the conclusions of this study, to applylearning model *problem solving* we need to pay attention to the allocation of time needed in the learning process, while applyinglearning model *problem posing* types *posing pre solution* we need to pay attention to the students in discussions that the situation in learning activities does not seem monotonous. This study will Waku researchers perfected in particular for the results obtained in accordance with the title that researchers want.

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Groupinvestigation: Increase Learning Motivation, Cooperative Skill, And Biology Science Process Skill Of Students SMA

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ABSTRACT

The study aimed to find out is the effect of Group Investigation to increase learning motivation, CS, and biology science process skill of students SMA. This study using a quasi-experimental with study design is the non-equivalent pretest-posttest control group design. The research population comprised all grade X MIPA students of SMA Negeri 1 Pengasih in the 2016/2017 academic year. The sample was X MIPA 2 was selected as the experimental group and X MIPA 4 as the control group. The instruments consisted of a learning motivation questionnaire, a cooperative skill questionnaire, a peer assessment sheet, a science process skills observation sheet, and the science process skills pretest and posttest. The data were analyzed using MANOVA analysis. The results of data analysis showed that: the Group Investigation effected on their learning motivation, cooperative skill, and biology science process skills of students SMA

Keywords: group investigation (GI), learning motivation, cooperative skill (CS), science process skill (SPS)

1. Introduction

Education is an important effort that must be done for the creation of human beings who have good resources. The implementation process of education is regulated in a curriculum whose its development is carried out by referring to the national standard of education.

The curriculum continued undergoing changes and improvements to achieve the goals of national education. Currently, the curriculum being used in Indonesia is the 2013 Curriculum which has changes and improvements. Some of the elements that are changed and refined in the 2013 curriculum include graduate competencies, content standards, process standards, and assessment standards.

A 2013 curriculum consists of 4 core competencies that must be developed by the teacher for the students, namely the 1st Core Competence on spiritual ability, 2nd Core Competence on social skills, 3rd Core Competence about knowledge, and 4th Core Competence on skills. The development of competencies is that one with the other can not be separated from each other so that students are expected to have skills in the field of attitude knowledge, and skills competence.

One of the subjects in the 2013 curriculum is biology. Biology is a parts of science. Science has three main parts to remember and use: attitude, skill, and knowledge. Science as an attitude means that science encourages people to develop positive abilities, including a strong curiosity. Skill means that science stimulates people to use curiosity to generate new habits by investigating and understanding. Knowledge means that science produces human students. This knowledge is used in practical learning and everyday life, meaning that human builds knowledge for himself [1].

Cooperation is one part of the emotional ability that can be developed through cooperative learning in a team. The process of working together allows students to express ideas, listen to the others' opinion, and jointly build understanding. This will have a positive effect on student learning outcomes.

Students' cooperation can be developed through cooperative learning in groups with learning patterns designed so that its learning experience involves many students. The implementation

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of cooperative to learn will encourage students to interact, communicate, collaborate or cooperate with teachers, learning sources, and fellow students [2].

The cooperative learning contributes to the idea that students who work together to study and responsible for their teammates can make students learn equally well[3]. It means that students' motivation to learn will be encouraged by this cooperation through cooperative learning. Good learning motivation will have a good impact on cooperative learning because students will be able to work together to complete group tasks well. Therefore, between cooperation and learning motivation affect each other.

Another competence that should be developed in biology based on the demands of the 2013 Curriculum is a skill. The skill domain is a field related to the skill or ability to act after a person has received a particular learning experience. Skill relates to learning outcomes attained through skills as a result of achieving knowledge competence [4]. This means that knowledge competence with skill has a close relationship because the skill is an implication of the knowledge already possessed by a person.

Science process skill (SPS) is example of competency skill domains. Science process skill is knowledge of scientific procedures, values and habits, and social relationships that describe the nature of science[5].

SPS becomes very important in biology because essentially learning biology is as a part of science which in its learning investigates by using the skill in applying science concept. Students' science process skill can develop in the learning process if teachers also understand well the nature of biology as a part of science.

The development of these competencies requires teachers to be able to design and implement interactive, inspirational, fun, challenging learning, and motivate students to participate by the current 2013 curriculum requirements [6].

Curriculum 2013 is a curriculum that emphasizes on the process of scientific learning. Scientific learning is learning that adopts scientist steps in building knowledge through the science method [7]. Scientific learning not only views learning outcomes as ends, but also the learning process of how knowledge, skills, and abilities are acquired by students.

There are a lot of science-based learning models. However, the choice of learning models used should consider the characteristics of learning materials, such as objects and issues, and students' needs and characteristics. One of the science-based learning model is the Cooperative Learning (CL) model type Group Investigation (GI) .

The GI type of CL model is one of the cooperative learning models that involves students working in a group. These activities require students to learn together and cooperatively contribute their thoughts and ideas and be responsible for the achievement of individual and group learning outcomes. The cognitive objectives of GI learning are to obtain high-level academic information and inquiry skills, while its social goal is to develop student cooperation in study groups [7]. The learning can be applied in all subjects and age levels including biology lessons with Bryophytes learning materials.

Learning steps of CL models type GI if it is developed in biology for Bryophytes materials can develop students' motivation, collaborative skills, and students' science process skills. Cooperation can be developed through GI learning steps starting from grouping, planning, investigating, final product preparation and presentation. These activities encourage students to work together in dividing the tasks. Also, in the process of forming students' learning concept is also motivated to learn more diligent in completing the group task.

Learning motivation will also be encouraged when students conduct group investigations to analyze and evaluate data and prepare the final results. Students' science process skill can be developed through investigation, the preparation of outcomes and presentations. Therefore, CL learning model type GI can develop students' science process skills.

Based on the description that has been explained, it is necessary to conduct a study to examine the effect of CL learning model type GI toward learning motivation, cooperative skill, and science process skills on biology subjects of grade X students in high school.

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2. Research Methodology

This study is a quasi experimental research with non-equivalent pretest-posttest control group design (Table 1) design conducted at SMA Negeri 1 Pengasih in the even semester of January to February 2016 for three meetings.

Tabel1. Experimental Design

Group	*Pre*	*Treatment*	*Post*
Experiment	O_1	X	O_2
Control	O_3	-	O_4

Keterangan :
O_1 = *pretest* experiment group
O_2 = *posttest* experiment group
O_3 = *pretest* control group
O_4 = *posttest* control group
X= learning by CL type GI

The population is all students of class X MIPA in SMA Negeri 1 Pengasih. The sample used in this research is class X MIPA 2 as an experimental class and X MIPA 4 for the control class.

Data analysis to test hypothesis uses MANOVA test. Required data include learning motivation score, an average score of cooperative skill, and an average value of KPS.

The data of learning motivation and cooperative skill were obtained through nontest technique using Likert 5 category scale questionnaire. Also, the data of cooperative skill were also obtained from the assessment results among friends. KPS data were obtained through the test technique using KPS pretest and posttest. Also, the KPS data were also obtained from the observation of KPS during the learning process.

3. Research Results and Discussion

Learning Motivation

Motivation comes from the word motive that can be interpreted as the strength contained in the individual. The power within the individual is what can cause the individual to act or do something [8]. Weiner [9] argues that social scientists see motivation as a concept that explains the reason for thinking and acting.

Motivation and development are very important for students in learning[10]. Motivation is important not only because it improves learning but also affects student learning outcomes [9].

Learning motivation is closely related to learning objectives. Associated with these statements motivation has the following functions: (1) encourage students to do in every learning activity; (2) determine the direction of learning activities that is toward the learning objectives to be achieved; and (3) selecting learning activities, namely determining what activities should be done according to achieving the learning objectives by selecting activities that are not supportive for the achievement[2].

The dimensions of motivation are: (1) internal motivation dimension and personal relevance, (2) external motivation dimension, (3) self determination dimension, (4) career motivation dimension, and (5) dimension of motivation grade.

Based on the results of questionnaires before and after learning, it is known that the average learning motivation of experimental and control classes have increased. The increase can be seen in Table 4.

Tabel 2. Learning Motivation Score Student

Experiment class		Control class	
Before	After	Before	After
102,93	105,42	103,42	103,85

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Cooperative skill

Cooperation is working together to achieve the same goal. Group activities in cooperative learning can develop an individual's active role to contribute his ideas to his group. Group learning is a small group so that students can work optimally. Cooperation is a very important group skill. Group collaboration can only be implemented in an educational environment that supports interpersonal dialogue [11].

The ability to work together is a behavior that place cooperative group to achieve common goals [12]. Some factors that affect cooperation: reciprocity is the most certain factor that will affect the ability of cooperation, personal orientation in a person prefers to be ready to cooperate, and communication between group members can enhance cooperation[12].

Aspects of collaborative skills according to include: (1) using agreement, (2) contributing, (3) taking turns and sharing tasks, (4) being in groups, (5) , (6) actively participating, (7) inviting others to speak, (8) completing tasks on time, (9) respecting individual differences and, (10) being responsible[13].

Based on the above explanation, it can be concluded that cooperation is the social ability of students in exchanging ideas and opinions in group discussions directed to achieve a particular goal or task. Some aspects observed in this study include: (1) proposing opinions, (2) responding to opinions, (3) asking questions, (4) answering questions, (5) doing tasks as agreed, and (6) being active in group work and finding ways to overcome differences of opinion / mind.

Based on the results of filling questionnaires of cooperation ability and assessment between friends, it can be seen that the average ability of experimental class and control classes have increased. The increase can be seen from the average score contained in Table 6.

Tabel 3. Cooperation ability student

Experiment class		Control class	
Before	After	Before	After
102,93	105,42	103,42	103,85

Science Process Skills (KPS)

Science Process Skills can be applied in all fields of science. "science process skills (SPS) are defined as transfers of science that apply to many sciences and that reflect the behavior of science[14]." Therefore, KPS is needed in the learning process, especially in investigation-based science learning.

A relationship between KPS and the ability of science. The relationship is when students are skillful in applying KPS then the student will be more interested in science. It will also have an impact on the increasing of students' science ability[15].

Students need to have the science process skills as a provision to use science methods in developing biology and are expected to acquire new knowledge or develop the knowledge that has been owned and most importantly grow the experience. Therefore, teachers should gradually begin to assess the results of learning in the aspects of science process skills. Assessment of science process skills may vary according to the type of process skills to be recorded.

KPS, in this study, develop basic science process skills [5]. Basic science process skills include observing, measuring, classifying, inferring, communicating, and predicting.

Based on the result of pretest and posttest score and the result of KPS observation, it can be known that the average of pretest KPS in experiment and control classes have increased (Table 8).

Tabel4. The Result of KPS Score

Experiment class		Control class	
Pretest	*Posttest* + observasi	*Pretest*	*Posttest* + observasi
53,07	80,36	54,00	77,18

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Hypothesis testing

Analyzing the effect of GI on learning motivation, cooperative skill, and KPS uses MANOVA test. The test results can be seen in the Hoteling's Trace section. The summary can be seen in Table 10.

Tabel 10.The Result of Statistic about Learning Motivation, Cooperation Ability, and KPS by MANOVA

value	F	*Hypothesis df*	Sig.
0,168	3,137	3,000	0,032

Based on the results of statistical tests in Table 5, it can be seen that the significance level of Hotelling's Trace 0.032 is smaller than $\alpha = 0.05$. This shows that both CL models type GI tested for their effectiveness have significant effect on learning motivation, cooperative skill, and KPS.

CL type GI study if tested together effects on learning motivation, cooperative skill, and student KPS. The effect is when students learn to use CL type GI, it shows a positive influence on learning motivation, cooperative skills, and KPS. CL can improve science skills, inquiry learning, and improve science learning achievement[16].

The influence of CL models type GI on biology learning motivation is caused by the GI element. GI is a group study in which there are investigation activities. An investigation conducted by students relates to the facts or events that exist in the students' environment. Facts investigated by students in this study are related to Bryophytes. Students are asked to investigate the various species of Bryophytes that exist in the school environment and their home.

The investigation requires students to take an active role in the learning process. Also, students will also be more interested to learn their surround things or facts. GI learning there are four components, namely investigation, interaction, interpretation, and intrinsic motivation[17].

That investigation activities focus on group learning through a discovery process about a chosen learning topic. Interaction emphasizes the characteristic of cooperative learning that requires students to explore ideas and help one another. Interpretation occurs when groups synthesize and collaborate ideas, discoveries and understanding of each group member. As a result, students are more motivated to learn independently through the investigation process.

Investigations in the learning activities are conducted in groups so that students are demanded to work together well and complement each other. The activity also shows that students who already understand the awareness should explain to other students who do not understand. The students in cooperative groups would learn better both for cooperation and team spirit[18].

Cooperative learning such as group investigation (GI) puts students in small groups to make it possible for deeper cooperative relationship. That small groups will be more intimate, therefore, the relationship between students will be formed more quickly[17].

Students working in cooperative groups when placed in new groups to perform experimental tasks, they will also work well together in groups [3]. In line with this, [19] also states that directly the level or group level will be related to the quality and quantity of student cooperation.

The investigation activities undertaken in the learning process are also able to develop and improve students' science process skills (KPS). The cooperative learning syntax type GI places students in a group work. In line with [20] research results that cooperative learning can help develop skills and improve better learning outcomes.

The group work consists of 4-5 people. The task of the study group is to do a plan, investigate, and report the work result. Direct experiences gained from the process can further appreciate the process or activity being performed. That cooperative learning is needed to improve the scientific skills and science achievement[16].

These activities train students in process skills, especially KPS. Students are required to work together and be more active in the learning process. Siregar & Motlan (2012, p.53) in their research results explained that the average of students' science process skills in the experimental class is higher than the control class. Significant results in the study were caused by CL type GI learning

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activities that invited students to be more active in the learning process, exchange ideas and work with members of the group.

4. Conclusions and suggestions

Based on the facts that have been found, it can be concluded that the CL model type GI simultaneously affects the learning motivation, cooperative skills and KPS of X class high school students.

Learning with CL models type GI in biology learning has an effective effect on students' cooperative skills, and KPS in biology lessons. Therefore, it is necessary to apply it in learning biology with appropriate material. Other researchers are advised to expand the material used in the study, the reby it is possible a broad generalization and further analysis on the relationship between learning motivation variables, cooperative skills, and KPS.

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Efficient And Effective Learning: An Innovative Idea Of Approach Scientific In Learning Science

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Abstract. Science learning is assessed by the general public, teachers, education observers, and education experts that low quality. Many of the efforts of teachers to improve the quality of learning that will be at risk for low quality of education quality, especially the quality of learners. To realize good teaching, learning needs to be done that efficient and effective. The purpose of science learning that efficient and effective learners to create character, smart, and perform. Forms of science learning that efficient and effective : a. follow the whole learning; b. consider the natural surroundings; c. use literature; d. use the mass media; e. ask the experts; f. make conclusions; g. create a question; h. ask questions; answer questions orally and in writing; j. implement practicum. Model of science learning

that efficient and effective can create maximum learning conditions, involving all the learning so that the learning factor is expected to be done by all students in order to create maximum quality science learning.

Keywords : learning science, efficient, effective

1. Introduction

Education is one of the most important aspects of nation building. History shows that the key of successful development of the developed countries is the availability of well-educated population in the number, type, and an adequate level. Therefore, nearly all nations put development of education as a priority in their national development programs . Qualified human resources, which is a product of education, is the secret of the success of a country's development.(Indra Djati Sidi,2001) One of the educational problems faced by the nation of Indonesia is the low quality of education at all levels and units of education , especially primary and secondary education. Various attempts have been made to improve the quality of national education, for example, national and local curriculum development, teacher kompentesi improvement through training, procurement of books and learning tool procurement and improvement of educational facilities , and improving the quality of school management. Nevertheless, the various indicators of the quality of education has not shown significant improvement . Some schools , especially in the cities , showed an increase in the quality of education is rather encouraging, but many still pay attention .One important element in teaching is stimulating and directing learners to learn. Learners in learning can be stimulated and guided through a variety of ways that lead to learning objectives. Teaching is essentially helping students gain the knowledge, skills, attitudes, ideas, and appreciation that lead to changes in behavior and mindset development. Helping learners towards improved behavioral changes, require teaching methods that effective and efficient. Teaching methods effective and efficient is one of the keys to the learners in order to learn well.(Hamzah B,209)

2. Discussion

2.1 Following Learning In Whole

To realize efficient learning and learners should follow sangkil learning intact. Learners who follow will cut off a lot of learning left behind learning materials. Following the study as a whole, the lessons given by the teacher will be followed by participants coherent teach. This contestual means learning materials can be understood by learners, learners have to follow the lesson as a whole, they just consultatet by reading the source.(Kementerian Pendidikan Dan Kebudayaan Republik

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Indonesia,2014) Homeroom teacher as a mentor to encourage and teach her seyogia students leave the classroom and not seriously follow classroom learning, learners should not be doing activities that make them lose sight of the learning material presented by the teacher . Classroom atmosphere that is comfortable, orderly and discipline is needed. The task of the teacher should manage the class well .

2.2 Reading Natural Around

Nature to be a teacher. This statement illustrates that the natural surroundings can provide a lot of information and can be used as a place of learning. So far, teachers and students do not care about nature or all factors that influence it, the natural things around can be listened to and analyzed. The results of the analysis will be the study of matter and can add insight of teachers and learners .

During the natural surroundings just enjoy the beauty and marvel at the role and function of the universe for human life . In learning science learners should make about as natural objects and materials to better understand the problems of science learned in school. About nature as an open laboratory, should really be utilized by students and teachers.

Science teacher at school can invite students to listen to and understand all natural phenomena and natural events occur. Learn results discussed in school. Learning science is directly confronted to nature will add to the understanding of students in the marvel universe and its creator .

2.3 Using the Library

Literature is a very important component of learning. Without learning literature in schools would be meaningless. Teachers and learners should maximally utilize the library. Reading should be learners. Learners were not reading a textbook is an attitude of learning harassment (Ibrahim,1988). Reading should be done students in school and at home. The habit of reading books should be made of each learner. By reading textbooks, all the things that are not understood at school learners will be able to be understood. The low utilization of literature is one factor in the quality of education and learning to be low. To understand the science of matter to the fullest then interest reading textbooks must be grown by teachers and parents. School learning would be meaningless if the students did not use to read books. Learning without literature would not achieve the goals of learning, knowledge obtained is very shallow, vague and narrow. In learning science, the laboratory is an integral part of teaching and learning activities. This is because the students are not just listening to the teacher of the subject information. .

2.4 Using Mass Media

One mass media is learning component that greatly contribute to further understanding of material science . Media can be television , internet , magazines and newspapers . All media will be fully utilized if it meant improving the quality of science teaching . Many mass media raised a lot of information about science and material science which have program specialty channels.

The fact the media is not utilized well learners . Learners simply use the mass media to watch, hear and read information that is not education with material science. Habits at learners do not use mass media to support science learning ipa cause learning does not reach the target .

Science teacher should encourage students to take advantage of the mass media as an information source material science are many ways that can be done by the teacher to encourage students to use the mass media . One of which could be done by the teacher is to assign learners to record television programs and radio programs broadcast aired associated with natural science . The task is made learners are learning prodak utilization of mass media. Learning the IPA and mangkus sangkil are expecting teachers and learners together to make the mass media as a medium of learning.

2.5 Asking to Experts

In learning science students have a lot to ask the teacher, the clever and colleagues who understand the problems of science. Asks an important learning step to do, as asked can reveal many

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things. By asking the question will obtain information about the problem in question (Anonymus,2000).
Activity asks students less done . Learners lazy and shy to ask questions to the teacher when learning takes place . They tend to be quiet and just listen to the teacher the subject matter presented. This condition will worsen participants' knowledge of science.
The low interest student asked the teacher or peers to understand the material of science lessons, because students feel inferior and embarrassed to ask questions. This is due to fear of being wrong .

To improve the ability of learners to ask , the teacher needs to be addressed. many ways can do the teachers , so that students are willing and skilled to ask the teacher . One way that sangkil and skilled mangkus encourage learners to ask : a. teacher gives the students the task of making inquiries material science lessons ; b . teachers make the questions and give the learners to be submitted of the class .

2.5 Making Conclusions , Questions And Answer Questions

After the students to follow the learning intact, nature listening , reading books , using the mass media , to ask , then the students have to make conclusions about the learning material . Learning materials to comply with the order of that of the curriculum. conclusions to be made should be dense and contained . Furthermore learners make inquiries in accordance with the conclusions of matter . The question is made as much as possible include cognitive, affective and psychomotor (Syaiful Bahri Djamarah,2006.)
Questions that have been made in the edit and then submitted to a friend. If the students do not like learning group then posed the question posed to the natural environment means there no a friend to answer the question . The question asked was answered by a friend as a switch . If you do not have friends to answer the question then answered his own question. All questions are answered should be written in full, must not be mistaken. Asking and answering questions in repeated so many times memorized .
Answer the questions and write the answers in their entirety , is an act of meaningful learning because the answer orally and in writing will stay in the memory and hard oblivion. Learning science in desperate need of a way to memorize the subject matter . According to learning theory to answer questions by writing answers in a pleasant atmosphere makes learning science .
To familiarize the students ask and answer questions orally and in writing the role of the teacher is needed many ways you can do the teachers to make the students want to make a conclusion , making the question and answer in writing and orally . Learning science is in need of tips and mangkus sangkil learning models .

2.6 Conducting Practicum

Has been given , but it should do its own activity to find out more about the science studying. With the laboratory , it is expected that the process of science teaching can be implemented optimally , although it does not mean that science can not be taught without a laboratory (Maman Rumanta.2014) . From the side it looks just how important the role of laboratory activities to achieve the goals of science education. There are at least four reasons that strengthens the role of the laboratory in school learning, among others (Rustaman , 1995) :
1 . Practicum generate motivation to learn science . In the study , students are influenced by motivation . Students are motivated to learn to be serious about learning something . Through laboratory activities , students are given the opportunity to fulfill the urge of curiosity and want to be . This principle would support the practical activities where students discover knowledge through exploration .
2 . Practicum develop basic skills to conduct experiments . Activity is an activity that a lot of experiments conducted by scientists . To perform the experiment required some basic skills such as observing , estimating , measuring , manipulating laboratory equipment to train students to develop the ability to experiment with practice their skills in observing carefully , measure accurately with a

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simple measuring tools or more sophisticated , use and handling of the equipment safe , to design , conduct and interpret experiments.
3 . Practicum become a vehicle for learning approach to scientific experts believe that the best way to learn the scientific approach is to make students into scientists . Learning science should be conducted through scientific inquiry approach (scientific) to cultivate the ability to think , work and communicate scientific and act as an important aspect of life skills . Therefore science learning both in SMA / MA or SMP / MTS emphasizes providing direct learning experience through the use and development of science process skills and attitudes.
4 . Practicum support the subject matter . Practicum provides an opportunity for students to discover the theory , and the theory . In addition to learning science lab can be formed illustrations for concepts and principles of science . Of these activities can be concluded that the lab can support students' understanding of the subject matter (Amin,1987).

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Multimedia Worksheet Development On Environment Pollution As Learning Media For High School Students Class X

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Abstract. National Education aims to develop the potential of students. It also makes students responsible for their environment. Today, the environment is the biggest challenge and problem faced by humans, which requires them to be wiser to manage it. The intrinsic motivation that arises within students can lead to the right attitude and behavior toward the environment. This study aims to develop a multimedia worksheet on pollution as an effort in awakening environment responsibility of student. The specific target expected in this research is the result of student worksheet in the form of multimedia which can be accessed anytime and well structured so that its utilization will be more optimal in supporting the formation of student responsibility attitude toward the environment. The method used was the development of Borg and Gall for the development of multimedia worksheet on pollution. The research was conducted in Biology Education Program of FMIPA UNJ in February to September 2017. The samples of this research were students of class X SMAN 21 and 77 Jakarta. The result of media development can be seen at http://lekersmulia.com. Validation resulted from linguist got average rates of 85.42 which categorized into good. Validation of the material experts obtained an average value of 60.2 which including in the medium criteria. Validation from media expert got mean value equal to 61.6 which including in medium criteria. Assessment is given by teachers to the media and obtained an average value of 80.75 including in the good category. Assessment given by students to the media obtained the average of 76.9 means that it was in medium category. We conclude that the media has been developed and able to be used as an instrument for measuring student's responsibility to the environment.
Keyword: environment, multimedia, worksheet, pollution, responsibility

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1. Introduction

Law no. 20, 2003, article 3 mentions national education aims to develop the potential of students and make students responsible to the environment. Students discuss material on the environment in the biology subjects. One way to relate environmental theory to everyday life is to conduct self-structured activities using learning tools. Structured self-activities are student-centered, where learning processes prioritize participants' experiences through observation, questioning, reasoning, and trying (Ministry of Education and Culture, 2013). One of the learning tools is Student Worksheet (LKS). LKS is a worksheet that contains information and instruction from teachers to students in order to work on their own a learning activity, through the practice or application of learning outcomes to achieve instructional goals (Ekosari, 2009). Structured self-activity using a Structured systematic Student Worksheet is composed of information, examples and tasks. The student Worksheet demands student independence, whereas the teacher has little opportunity to guide. Nevertheless, Teacher keeps an eye on the learning process (Trianto, 2008).

Structured student worksheet contains three stages that must be done by students. They are doing, observing, and analyzing (Trianto, 2008). The use of LKS in schools is still very poor. It was evidenced by the results of needs analysis done in SMAN 77 Jakarta and SMAN 21 Jakarta. Learning tools used by teachers and students in the school were books (27%), teachers (25%), internet (25 %), And LKS (14%). Based on the observation result, LKS used in school mostly use unstructured student Worksheet. The fact was that the LKS used in the school contains more practice questions compared to the students' self-activities.

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Students who master information and technology will be more quickly and easily access information and learning materials. The ability to understand the media, information and communication technology can improve the competitiveness of students. Based on the results of requirement analysis at SMAN 77 Jakarta and SMAN 21 Jakarta, 31 students (97%) have used smart phone device and 32(100%) used computer or laptop. However, smartphones, computers and laptops have not been widely used as learning tools by teachers and students in schools. As seen from the need assesment at SMAN 77 Jakarta and SMAN 21 Jakarta, teacher use printed books (27%) more often than multimedia worksheet. Multimedia worksheet incorporates the concept of structured independent activities with the ability to utilize media, information, technology and communications.

This research develops “Lekersmulia” (Worksheet multimedia) on environmental pollution. The worksheet encompasses observation activities, group experiment activities, making recycled products and exercises. Each activity contains learning objectives, short materials, materials and tools, work methods that guide students to do their learning activities and achieve learning objectives, and discussion questions. Short discussion with videos, comics and pictures were inserted to support the material. The assignment on each activity use video, so the students will be more easily to understand it. Result report on each activity can be seen on the page that has been provided and automatically sent to the teacher's email. Students do all assignment in online and interactive way. They can immediately know the results of their assignment when they finished it, so that students will be able to know their score.

According to Parson and Alexander in Shih (1998), during the application of a new model or technology in learning activities, teachers need to know how and why students learn. It is important for teachers to know the effect of new technology when used by different types of students. Several factors will influence the types of students such as intelligence, motivation, interest, attitude, confidence, and talent (Sugihartono, 2007). In addition, every person has a different attitude towards an object. They are caused by various factors that exist, such as differences of talent, interest, motivation, experience, knowledge, an intensity of feeling and environmental situation (Purwanto, 2003).

2. Methodology

2.1 Time and Place of Study

The research was conducted in Biology Education Studies of FMIPA UNJ Jakarta in February - November 2017.

2.2 Research Approach and Method

This research uses Dick and Carey model approach (2005). It is consists of 10 steps, namely: (1) identification of needs and determining general goals (2) conducting learning analysis (3) identifying behavior and initial characteristics of students, (4) writing purposes (7) developing and choosing learning materials, (8) designing and executing formative evaluation, (9) designing and executing summative evaluation, (10) revising learning activities, (5) developing learning guidance, and (6) developing learning strategies. The research method used was development of Borg and Gall.

3. Result

Linguist expert validation resulted in an average score of 85.42. This means that the media lies in good criteria. Language used in the media has been shown to clarify the massage. Information on the media has been widely accepted and didn’t caused misinterpestation. Media developed has met Indonesia language structure. It has met the student’s language developmental stage. Illustrations used were concrete and abstract, nevertheless student were still able to image them.

Material expert validation resulted in an average score of 60.2 which concluded in medium criteria. All aspect in the media has met the cohesiveness of the material with learning purposes, indicators, material aspects and precision. Some aspects needed to be revised such as presenting and completeness aspects.

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Media expert validation resulted in average score of 61.6 which categorized into medium criteria. All aspects which supported "Lekersmulia" multimedia development such as: Technical quality, usability, textual and visual element, the audio element, and interactivity.

"Lekersmulia" multimedia validation from 8 teachers from 8 different schools in Jakarta, Bekasi and Pandeglang show good category on the media (80.75). This has described that the content of the multimedia developed was connected to everyday life need. Materials was mostly covers environment pollution needed in 2013 curriculum. From language side, "Lekersmulia" has presented by easy and attractive language. The presentation of the media was easy to understand and easy to be used. "Lekersmulia" has comfortable audio, visual and design. Graphic aspect of the media said that it can be used as learning instrument inside or outside the classroom.

Validation result on students assessment, gave an average score of medium criteria (76.93). The validators consist of 58 students from 2 different schools, SMAN 21 AND SMAN 77 central Jakarta. The score showed that the media content has connection with everyday life. Material presented has encompassed subject on environment pollution as needed in 2013 curriculum. The language of the media was interesting. Although, some students still has difficulties on understanding the web. Moreover, some also found difficulties in using the media. Based on the students result, it can be known that the media was eligible to be used as a learning instrument.

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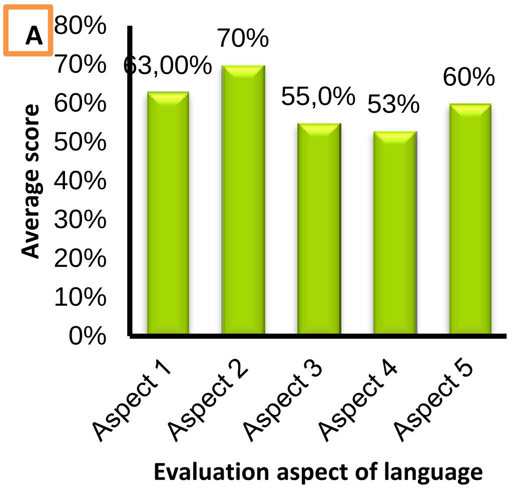

Fig. 1 Validation result of linguist expert

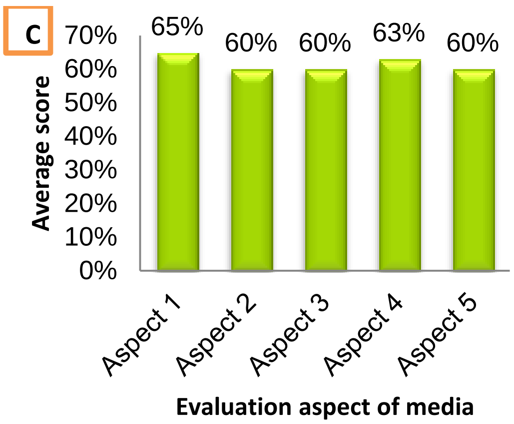

Fig. 3 Validation result of media expert

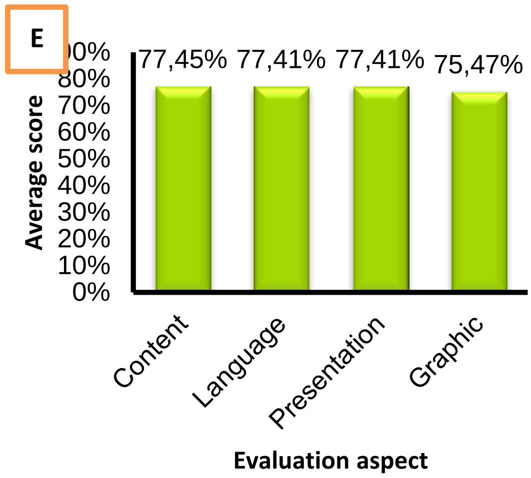

Fig. 5 Students validation result

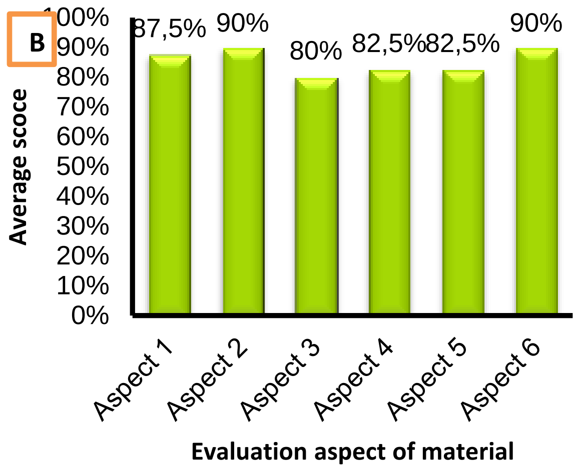

Fig 2. Validation result of material expert

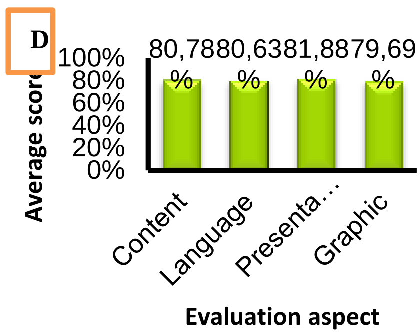

Fig. 4. Teachers validation result

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Science Learning Based On Serukam's Local Culture To Improve Analysis Skill And Student Environment Caring Attitude

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Abstract. Science learning in junior high schools is developed as applied-oriented integrated science subjects, developing thinking skills, learning abilities, curiosity, and developing the caring and responsibilities attitudes toward the natural and social environment. Learning based on culture is a strategy to create a learning environment and designing student learning experience which integrated with the culture as a part of the learning process. Learning based culture is a learning of the recognize culture as a fundamental part of education as an expression and communication ideas, also developing the knowledge. Learning based on Serukam's local culture aims to awaken students to be active and directly involved in preserving cultures that have done for the generations in preserving an environment. This research lifted traditional farming, blading, as an environmental conservation effort undertaken by other to preserve the diversity of living things in the forest. Blading had done by cutting down the forest annually then planted with rice and vegetables and after the harvest, peoples will re-plant with the tree such as rubber trees. Based on the existing environmental problems, students are invited to analyze why the problem can occur and thinking the solution of the problems. So, the student's analysis skills will be increase and environment caring attitude of the students we expected will appear.
Keywords: analysis skill, environment caring attitude, Serukam's local culture

1. Introduction

The nature have a big potential to be managed to supply what they need to live. If we can manage it, the environment will be save from damage. Indonesia is an agrarian country that has many great natural potentials. Unconsciously, peoples become one of the causes environmental damage because they still do not realize the potential. Some factors which cause it is the lacking of knowledge about the environment, people's awareness about how to caring it and the technology which growth rapidly make peoples be lazy to work. Therefore the young generation needs to start to be introduced their good environment and culture conservation well. So, their caring attitude to the environment will grow earlier.

Education is a conscious and planned effort to realize the learning atmosphere in learning so that students are actively developing their potential to have spiritual power, self-control, personality, intelligence, noble character and skills needed to itself, their society, nation, and state (Taqiyuddin, 2018).

Based on the Regulation of the Minister of Education and Culture No. 22 of 2016 on Graduate Competency Standards, learning objectives included developing domains of attitudes, knowledge, and skills that describe each unit of education. The three domains have different paths (psychological processes). the attitude domain is gained through the activity of " accepting, running, respecting, living, and practicing." Knowledge gained through activities of " remember, understand, apply, analyze, create." Skills gained through activity "wake up, ask, try, reason, taste, and create. The powerfulness through the activities is "showing up, questioning, testing, reasoning, tasting, and creation." Based on the Regulation of the Minister of Education and Culture No. 22 of 2016, the understanding every graduate of elementary and secondary schools has competencies in three

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dimensions of competency standards. They are attitudes, knowledge, and skills. The competency standards of graduates should possess by students in the attitudes dimension is attention, knowledge domain is science and technology, and also in mind.

Ave and King (1986), stated that one of the important features of the Dayak community is farming. The shifting cultivation system is a process that supports the livelihood of the peasant community regularly and naturally in ways that do not damage the nature and environment. However, by this time the culture seems to have shifted somewhat, people are starting to care less about preserving the culture and maintaining its environment, much of the illegal logging and forest fires that occur for massive palm oil plantation clearance. The province of West Kalimantan as one of the largest provinces in Indonesia is dealing with an alarming deforestation because every year there is a narrowing of forest cover area of about 427,000 Ha, and an average degradation of 94.5 ha/year (Governor's Climate & Forests Task Force of West Kalimantan Province). The widespread deforestation and degradation in West Kalimantan resulted in various disasters and problems such as floods, landslides, air pollution (smoke), and the loss of many species of animals and plants living in the forest.

Sardjiyo & Pannen (2005) stated that culture-based learning is a strategy for creating learning environments and designing learning experiences that integrate culture as part of the learning process. Cultural-based learning based on the recognition of culture as a fundamental part of education as an expression and communication of ideas and the development of knowledge. Natural science learning should pay attention to its characteristics as a process, product, and an attitude, but in fact, the natural science lessons that take place in schools pay attention only Natural Science as a product without studying science as a process and attitude first. Therefore, special learning required that can present the Natural Science as a product of process and attitude so that students will be easier in studying the material. To improve the analytical skills and the student'scaring environment attitude, it is necessary to take steps to improve the quality of natural science learning and to provide rich learning of meaningful and creative activities so that students are more active and skilled in problem-solving around them, by doing local culture-based learning.

2. Discussion

2.1. Nature of Science Instructions

Integrated science learning is an approach to science learning that connects or integrates various fields of science study into a single unit. Integrated science learning should also include the dimensions of attitudes, processes, products, applications, and creativity. Students are expected to have a holistic science knowledge to deal with daily life problems contextually through integrated science learning (Depdiknas, 2011). Integrated learning serves as a container, event or estuary blend of concepts contained some of the subjects that should have the relevance and integrity of understanding (Trianto, 2012).

According to behavioristic learning theory by Gage and Berliner (1984), behavioral changes as a result of experience. Learning is the result of interaction between stimulus and response (Slavin, 2000). A person is considered to have learned something if he can show changes in his behavior. Behavioristic learning theory explains that learning is a behavioral change that can observed, measured and assessed concretely. The changes occur through stimuli (stimulants) that cause a reactive behavioral relationship (response) based on mechanistic laws. Stimulants is none other than the learning environment of children, both internal and external that cause learning. While the response is a result or impact, a physical reaction to stimulants. Learning means strengthening bonds,

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associations, traits and behavioral trends. Whereas Piaget, known as the first constructivist (Dahar, 1989) emphasizes the constructivism theory on the process to finding theory or knowledge built from the fact in the field. According to this theory, one of the fundamental principles is that teachers not only provide knowledge to students, but students must also play an active role to build their knowledge.

Ellen Hazelkorn (2015) in his book "SCIENCE EDUCATION" for Responsibility Citizenship, says that Science learning helps us interpret and understand our world, manage risk and put uncertainty into perspective to guide technological development and innovation and to forecast and plan the future front. It will enhance job prospects, cultural awareness and our ability to act as citizens who are knowledgeable in solidarity with citizens around the world. It means the subject of science as a means to understand nature and trained the mindset of students in solving various problems related to the object of science that will encountered in daily life.

2.2. Local Culture

Local culture is understanding as a wise, wise, good-value, embedded, and followed by many (Sartini, 2009) local ideas. Meanwhile, according to Edi Susilo et al. (2013) local culture is the order of life values inherited from one generation to another in the form of religion, culture or custom which commonly spoken in the natural social system of society. Local culture is anything that local people have in a particular area that is characteristic of the authenticity and uniqueness of the area without any influence or mixed elements from other regions. In general, local wisdom divided into two local tangible local wisdom such as cultural objects, historic cultural heritage and religious activities; and intangible local wisdom in the form of value or meaning of an object or cultural activity (Faton Sihabul, 2012). Meanwhile, according to Revelation (2007), the ability to interpret the local culture by individuals, communities, and governments embodied in sustainable ways of thinking, lifestyle and policy in managing natural resources and the environment can be expected to result in improved quality of life in society and the State.

The Dayak people of West Kalimantan have a wealth of local culture and traditions in the management of the environment. Local culture and traditions are loaded with wisdom values and have been applied since ancient times past to present. One of the local wisdom in West Kalimantan is farming with a moving system; local people call it "Bahuma" or "Bauma." Almutahar (1995) suggests that the activities of Dayaks in farming in Kalimantan are quite varied, but in this variation, there is also the same basis. The equation seen from the technology used, how to find the land or open the forest to be used, the source of labor and so forth.

2.3. Learning-Based Culture

Sardjiyo & Pannen (2005) stated that culture-based learning is a strategy for creating learning environments and designing learning experiences that integrate culture as part of the learning process. Cultural-based learning based on the recognition of culture as a fundamental (fundamental and important) part of education as an expression and communication of ideas and the development of knowledge. There are four things to be considered in cultural-based learning (1) Substance and competence of field of study, (2)Meaning and learning process, (3) Assessment of learning outcomes, (4) cultural roles.

Objectives and benefits of local culture-based learning are also included in Law No. 20 of 2003 on National Education System in Article 3, stating that national education is functioning to develop the ability and form the character and civilization of dignified nation to educate the nation.

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2.4. Teaching Administrations

In Permendikbud No. 22 of 2016 on the Standard Process of Primary and Secondary Education mentioned that the preparation of learning tools is part of the preparation of learning tools. Learning planning is designed in the form of syllabus and RPP which refers to the content standard. Lesson planning includes preparation of lesson plans and media preparation and learning resources, learning assessment tools, and learning scenarios.

According to Zuhdan (2011), teaching administrations is a tool or equipment to implement a process that allows educators and learners to do learning activities. While Suhadi (2007) suggests that the learning tool is some materials, tools, media, instructions, and guidelines to be used in the learning process.

2.5. Analysis Skill

Ability analysis is one of the high-level cognitive abilities that are important for students to master in learning. Ability analysis can interpreted as the ability of the individual to determine the part of a problem and show the relationship between these parts, see the causes of an event or give arguments that support a statement (Sudrajat, 2011).

The ability to analyze means being able to break the material into substantial parts and to illustrate how these parts are connected each other or to a whole structure (Kuswana, 2012). The ability of this analysis includes three processes: students can parse relevant information elements, determine relationships between relevant elements, and define the point of view about the purpose of learning the information (Anderson & Krathwohl, 2010). The analytical abilities are classify into three, i.e. differentiating, organizing and attributing (Anderson & Krathwohl, 2010).

Brookhart (2010), states that in order to assess students' thinking skills in solving information into sections and with reasons, questions or tasks should require students to find or describe parts of a task, and how they connected, as well as presenting issues whose answers require differentiating or organizing parts with the reasons. Student explanation of the reason for the relationship of one part to another is the task of analysis.

2.6. Environment Caring Attitudes

The environmental awareness by the Ministry of National Education (2010) is an attitude and actions that always try to prevent damage to the surrounding natural environment, and develop the efforts to repair the environment damage that has occurred. Sri Narwanti (2011) argues that environmental care is an attitude and action that seeks to prevent damage to the surrounding natural environment, and developing the efforts to repair the already existing environment damage.

According to Van Liere and Dunlap (Andromeda, 2009: 74), the environmental care attitude indicator consists of five sections conceived by the name New Ecological Paradigm (NEP), consisting of 1) Constraints to grow 2) Anti anthropocentric view 3) 4) Disturbance to environmental balance 5) Rejection of arbitrary behavior on the environment.

Attitudes cannot be obtained immediately but must go through several stages including knowledge (knowing), execution (acting), and habit (Holil, 2011). The response in the form of interest or neglect arises to the incoming stimuli, followed by the tendency to select the best response from stimulation and end by acting according to have tendency of the selected response. Continuous action is a manifestation of new behavior by the consciousness and attitude toward response. The formation of this character can started from simple issues, such as the formulation of an action plan on environmental awareness programs. Through the formation of this character is expected to be born a generation that has environmental awareness.

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3. Conclusion

Besides developing cognitive aspects, in Science learning also have to develop other aspects, because the learning objectives include developing attitudes, knowledge, and skills domains which elaborated for each unit of education. Serukam's local culture-based learning is expected to make learning more meaningful by increasing environmental cares and student analysis skills.

Teachers who become the leading agents of change in education are expected to integrate the existing culture in the local community with science learning, so students will begin to be interested in engaging in preserving their culture and environment.

4. Acknowledgment

This paper can used as a consideration and literature review materials that can used as a reference in developing teaching administrations based on Serukam's local culture to improve student's analysis skills and the environmental caring attitude. Thanks to Dr. Heru Kuswanto

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The Development Of Snake And Ladder Game Based Flash Of Excretory System Subject On Eleventh Grade In Senior High School

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Abstract. Learning media is an intermediary delivery of information from teachers to students one of them through snake and ladder game. Along with the development of technology, snake and ladder game can be played in computer system technology devices and expected to fulfill the students need on the excretory system subject. The purpose of this research was produced snake and ladder game based flash of excretory system subject. The research was conducted in April 2017 until June 2017. The research method was development and research. The research steps were the information collecting, the product development, and the product testing. The result of need assessment in the information collection showed that most students supported the development of snake and ladder game based flash of excretory system subject. The development steps were concept making an application in the storyboard, setting game rules, creating flowcharts, making questions, until synchronizing content. The product testing was subjected by the experts, Biology teacher, and students. The average score of all the tests were 86%. The snake and ladder game based flash of excretory system subject had been the best of quality became a learning media.
Keywords: excretory system, learning media, snake and ladder

1. Introduction

One resource of a country is supporting the education system. Education is inseparable from the existence of learning provided by the teacher in the school. Especially science-based such as biology to high school level. The learning have many difficulty (Nasution, 2016). Based on the results interview from Biology teacher in SMAN 15 Jakarta, students still use the powerpoint slides, videos, and mannequins as a medium of instruction. The use of multiple media learning as it raises the mood of boredom in the teaching and learning in the classroom, so it takes one variation in the activity of learning that can maximize the active role of students in the class. The game can be used to overcome this problem.

A game that in use in the process of learning activities may be referred to as a medium of learning one simple game is Snake and Ladder game. It was chosen because it included a relatively popular game and easily played and rated highly effective to repeat particular matter (review) in the lessons that are considered the most difficult to be understood by students (Malahayati, 2012). We obtained from an observation on students of XII IPA; the data clarified the fact that 100% of the students said have never done the exercise biology in the form of Snake and Ladder game. The observation also provides data which reveal that 44% of the students do not reach the passing grade expected on the matter concerning about excretory system.

However, in line with the development of science and technology is currently learning media use, in particular, the audiovisual media, it is an urgent demand so with the support of technology development, Snake and Ladder game can now be played on the system devices of computer technology. Accordingly, we decided to develop Snake and Ladder game for XI students of Science Department specifically in the matter about an excretory system.

2. Literature Review

The media can represent what is less able to understand by the words or sentence the teacher in the classroom. Use of the media learning aims to make the learning process more effective and efficient, so that subject matter more quickly accepted students with intact as well as the interests of students to learn more (Arsyad, 2011). Thus, students find it easier to digest the learning with the help of the media. The game includes a learning media not projected (Purnomo, 2010).

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Every game is a contest between the players. The games can be used as a means to develop some aspects are physical, motor, cognitive ,social, language, emotions, independence, and others (Malahayati, 2012). Snakes Ladders is a board game played by two or more. Flash is one of the leading software makers of animated vector images are very. Flash currently enjoyed by the very type of Adobe Flash opens up opportunities for designers with creative ideas and engaging in realizing a works-based flash. Especially the media game. (Anggara, 2005).

3. Method

The method used is the research and development, with the data collection which consists of the needs assessment and biology teacher interviews, product development and product testing next to the refinement of a product that will produce a product (Sugiyono, 2010). This research is held in SMAN Jakarta. The first stage is needs assessment and biology teacher interviews which were held in February 2017. The Snake and Ladder game development stage was held from February to March 2017. The proper test stage by experts from various fields such as matter and media was from March to April 2017. The game started being tested to teachers, small-group students, and large-group students in May until June 2017.

4. Result and Discussion

The stage of product development, there are 11 steps of creation to produce Snake and Ladder game.

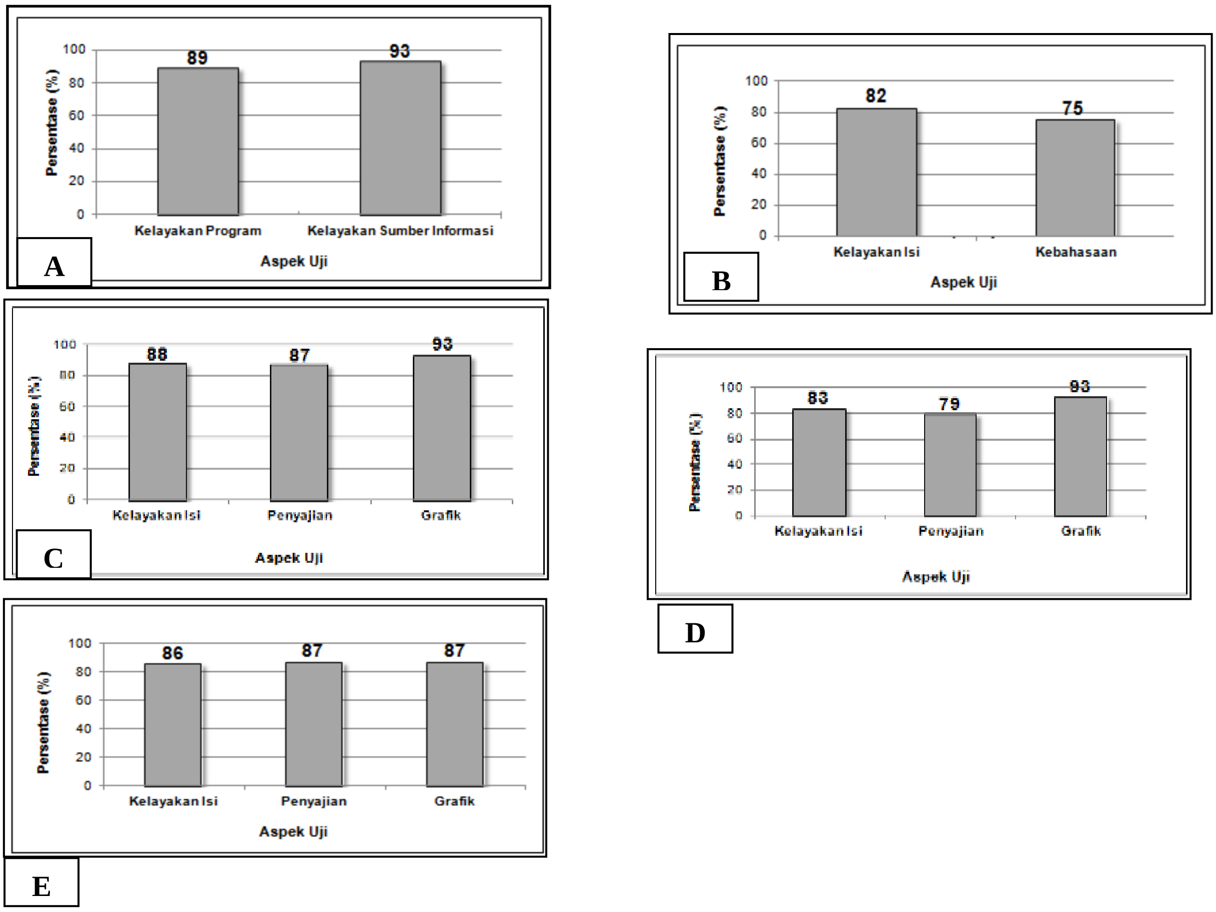

Figure 1. The proper result test by media expert (A), (B) matter expert, biology teacher (C), a small group of students (D), and a large group of students (E).

According to data obtained from the proper test by media expert, it was described as the following:

a. An indicator of eligibility programs reached the average percentage of 89% with good interpretation from 14 questions.

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b. An indicator of eligibility information sources reached the average percentage of 93% with good interpretation from nine questions.
According to the data obtained from the proper test by matter expert, it was described as the following:
a. An indicator of eligibility contents reached the average percentage of 82% with good interpretation from 17 questions.
b. An indicator of linguistic reached the average percentage of 75% with not good interpretation from four questions.

According to the data obtained from product test to biology teacher of SMAN 15 Jakarta, it was described as the following:
a. An indicator of eligibility contents reached the average percentage of 88% with good interpretation from seven questions.
b. An indicator of presentation reached the average percentage of 87% with good interpretation from six questions.
c. An indicator of graphical reached the average percentage of 93% with good interpretation from four questions.

According to the data obtained from product test to small groups of 35, it was described as the following:
a. An indicator of eligibility contents reached the average percentage of 83% with good interpretation from seven questions.
b. An indicator of presentation reached the average percentage of 79% with not good interpretation from 6 six questions.
c. An indicator of graphical reached the average percentage of 93% with good interpretation from four questions.

According to the data obtained from product test to small groups of 65, it was described as the following:
a. An indicator of eligibility contents reached the average percentage of 86% with good interpretation from seven questions.
b. An indicator of presentation reached the average percentage of 87% with good interpretation from 6 six questions.
c. An indicator of graphical reached the average percentage of 87% with good interpretation from four questions.

Based on a needs assessment, then developed the learning media in the form of a flash-based ladder snake game on matter system for excretion. The game product called ‘Biosnadder’ or stands for ‘Biology Snakes and Ladders.’ The game consists of questions with basic snake and ladder with one player. It gets point and using dice after answering a question correctly. Questions arise during play snake and ladder. Players who cannot answer, given two opportunities between ' continue ' and ' back '. ' continue ' by replacing the question and ' back ' to end. The proper test by media expert, the assessment of the product made during the trial twice. The first assessment revised in the majority of media display both audio and visual. The revision is a change in sound from the audio menu instructions become equal to the main menu.

This attempted to create the appearance of a snake voice stairs become more consistent and not interfere with the concentration of the players. Also regarding of appearance, it can improve students motivation and interest in learning. Based on the results proper test by media expert gets the final value of 85% with interpretation either while on the second assessment gets the final value of 91% with good interpretation (Sugiyono, 2010). At the proper test by matter expert was done in the same span of time by media expert. It gains average percentage score of 78% with good interpretation. From this result, researchers get more suggestions for adding other matters in Biology lesson so that students insight can be increased again. Suggestions obtained from the two experts then used to fine-

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tune the media. The revised media then tested by teachers and users, namely the students. The revised media then tested by the teacher and students.

The product test to biology teacher obtained 91% with good interpretation. The test conducted by teacher, cause it is one of the components in the learning that continually directs and supervises the users to use the product in the teaching activities (Saleh, 2009). According to the teacher, a serving of the product has been very good and interesting regarding of content and display media, but playing time was judged less efficient (45 minutes) regarding learning and a winner in the game of snake and ladder, preferably removed due to the luck factor difference for each player. The product test results in small and large groups were obtained 85% and 86%, with good interpretation.

According to most of the students , the products presented have been good, regarding of the matter or product display and highly motivating them to learn and facilitate them in considering the concept of a previously learned matter as well as add their interest to learn about the other matter in the study of biology. This shows that from the beginning the student did show great enthusiasm towards these products. Learning of matter that will be incorporated into a snake and ladder game, it assisted students in understanding a subject matter without making the student study taught saturated. It is caused due to different student than before and was impressed more enjoyable (Abdillah, 2014). A fun learning can cultivate student motivation, and the desire of students to search for information in the form of other matters become more deeply (Zakaria, 2007). The total average percentage value from the fifth test obtained was 85%. Thus the product has excellent value quality of interpretation (Sugiyono, 2010).

5. Conclusion

Snake and Ladder game based flash of excretory system subject value is good. This product can be summed up well to be a learning media of biology in the excretory system subject in SMAN 15 Jakarta.

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10th Grade Biology Teacher's PCK Capability in All Surakarta in Preparing Lesson Plan in 2015/2016 Academic Year

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Abstract. Teachers are the spearhead for successing the learning process. A teacher must have several skills that already exist in teacher competence. This research is aiming to find the PCK capability of biology teachers at Xth grade high school in Surakarta in arranging the lesson plan 2015/2016 academic year. The type of this research is descriptive qualitative using documentation method. The technique of collecting research sample of this research is insidental sampling. The technique of analyzing data of this research is descriptive qualitative. Based on the result, CK (Content Knowledge) capability of teachers at Xth grade high school in Surakarta in arranging the lesson plan 2015/2016 academic year includes material suitability capabilities 72.22% (good), the ability of deeping the material 52.78% (sufficient), the ability of material development 59.72% (sufficient), with the result that the average is 72.22% (good). The PK capability includes the ability to use the method 91.67% (excellent), the ability to use various method 58.33% (sufficient), the ability of the media type of learning 41.67% (sufficient), the ability of the media' selection capability of learning activities 100% (excellent), the ability to draw up the evaluation tool suitable material 26.39% (less good), the ability of the realm of electoral votes 61.11% (good), so the average is 63.20% (excellent). PCK capabilities which includes preliminary activities 65.27% (good), the core activity of 100% (excellent), the closing 70.83%, so the average is 78.70% (good).

Keywords: **PCK, Biology Teacher, Surakarta, Lesson Plan.**

1. Introduction

Teacher is the spearhead for the success of a learning process, from teacher student begin to learn the wider world. Therefore, teacher must have various skills that must already exist in the competence of teachers. Qualified teachers have always been demands at various levels and types of educational institutions, both producer institutions (LPTK) and user institutions (schools) (Hendri, 2010). As one of the elements of educational staff, a teacher must be able to carry out tasks professionally, always holding firmly to work ethics, they are must be productive, effective, efficient, and innovative (Suyanto, 2008). In addition professional teacher should have the ability in the teaching, preparing administrative task, semester program, annual program, and the design of learning programs for one year. But in reality there are not many teachers who perform their duties according to competence. There are a teacher tahat do not implementing with various reasons such as not able to make learning devices, the process of making the device is too long and complicated, not have much time, and etc. Pedagogic competence is a science in educating students who become one of the requirements of competence that must be knowed as a professional teacher. The phenomenon that occurs in many teacher is preparing a plan of learning activities that are still monotonous, the habit in the preparation of the material carried on from generation to generation without development.

Government Regulation of the Republic of Indonesia No. 74 year 2008 article 2 paragraph (2) says the competence of teachers include pedagogic competence, personal competence, social competence and professional competence that get through professional education or PPG. In paragraph (4) explained that pedagogic competence is the ability of teachers in student learning management, while in paragraph (7) explained that professional competence is the ability of teachers in mastering knowledge in science, technology, and / or art and culture. In Permendiknas Number 16 of 2007, explained in general about the four competencies of teachers of pedagogical, professional, social and personal competence.

Shulman (1986) says PCK (Pedagogic Content Knowledge) is an important knowledge and must be knowed by a teacher. The results of several studies suggested that PCK (Pedagogic Content Knowledge) is a very important knowledge and must be owned by a teacher. Through a professional fulfillment program, It designed , a professional teacher education program with

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consecutive approach. Its goal is combining knowledge of teaching materials and pedagogical knowledge. The skills of PCK (Pedagogic Content Knowledge) is the teachers ability in the learning process who must be realized by every teacher to educate the nation's life . Furthermore, in the National Education Standards, the explanation of article 28 paragraph (3) point (a) says that the meaning of pedagodic competence is the ability to manage the learning of learners include understanding of learners, design and implementation of learners learn to actualize their potention.

At least there are three pillars of basic knowledge of a science teacher that is Content Knowledge (CK), Pedagogical Knowledge (PK), and Pedagogical Content Knowledge (PCK). CK is a basic teachers ability in mastering learning materials. PK is general knowledge about how students learn, including knowledge of cognitive psychology, about students' memory, collaborative learning through groups, and others. PCK is knowledge of how a e teacher combines CK and PK to manage learning to improve and to achieve student academic ability optimally (Etkina, 2010)

2. Research Methodology

The type of research that be used was descriptive qualitative research, describing objectively about the ability of PCK's Biology teachers in tenth grade of all Surakarta's state school, in arranging what we called RPP for the 2015/2016 academic year. The nature of this research is qualitative because researchers only describe and interpret the data as it shown in written or verbal form of the people that observed and indicate the relationship of subjects research (RPP).

Source of data in this research is RPP of Biology teachers in tenth grade of all Surakarta's state school. The techniques of data collection that be used in this study is documentation by taking data from Biology teachers's RPP in tenth grade of all Surakarta's state, meanwhile the instrument that used is identification sheet, research data, data sources, techniques, and instruments.

Sampling is done by Incidental Sampling. Data collection technique that be used in this research is documentation method. Documentation method was doing by taking and collecting data in the form of RPP that has been made by the biology teacher in tenth grade of all Surakarta's state school, that will be interpreted and taken conclusion.

3. Result And Discussion

This research describes the ability of CK, the ability of PK, and the ability of Biology Teachers's PCK in tenth grade of all Surakarta's state school in arranging RPP for the 2015/2016 academic year.

3.1 The Ability of Biology Teacher's CK in tenth grade of all Surakarta's state school in arranging RPP for the 2015/2016 academic year

The ability of teachers's CK is shown as knowledge of material concepts covering material conformity, breadth and depth of material, and material development (Table 6).

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Table 6. Percentage Of CK Teacher's Ability in Tenth Grade of All Surakarta's State School in Arranging RPP for the 2015/2016 Academic Year

SUB ASPEK	SEKOLAH						Σ (%)	Rata-rata%	ket
	A	B	C	D	E	F			
1.Kesesuaian materi	**91,66**	58,33	75	**50**	75	83,33	433,32	**72,22**	B
2. Keluasan dan kedalaman materi	58,33	**66,67**	50	**41,67**	**41,67**	58,33	316,67	**52,78**	C
3.Pengembangan materi	**100**	**50**	58,33	**50**	**50**	**50**	358,33	59,72	C
JUMLAH (%)	249,99	175	183,33	141,67	166,67	191,66	1108,32	184,72	
RATA-RATA (%)	**83,33**	58,33	61,11	**47,22**	55,56	63,89	369,44	**61,57**	B

Kriteria interpretasi skor (Widoyoko, 2013):
> 80% = Sangat Baik (SB) 20% - 40% = Kurang Baik (KB)
60% - 80% = Baik (B) ≤ 20% =Sangat Kurang Baik (SKB)

The breadth and depth of the material that obtained the highest percentage was school B with 66.67%, while the lowest percentage was school D and E with 41.67%. In general, the indicator component is sufficient category (52.78%), this is because the teacher has been good at compiling and describing the learning materials, but the teacher is still lacking in dividing the material with the number of meeting specified, as well as in giving material samples still not include about Daily life to be more easily understood by learners. Indicators that must be fulfilled are a) can compile the material according to education level, b) can divide the material according to Kompetensi Dasar (KD), c) can describe the material according to Kompetensi Dasar (KD), d) can analogize sample material according to life daily.

The highest percentage of material development capability is school A with 100% perfect percentage (excellent). This is because in accordance with the indicators in the sub aspect of the development of the material which includes: a) reference material in the form of textbook lessons from the government at least 2, b) reference material refers to material obtained from the library, c) reference material refers to the internet with a specific web address As a source of learning, d) can write the scope or scope of learning materials in the form of cognitive aspects (facts, concepts, principles, procedures). Meanwhile, the material development ability that obtained the lowest percentage was school B, school D, school E, and school F with percentage of 50%. This is because teachers do not provide references in the form of reading books that are in the school library and other sources that refer to the internet with a particular web address as an additional source of refreshing.

3.2 PK capability of 10th grade Biology Teachers in Senior High School of All Surakarta in Preparing Lesson Plan in 2015/2016 Academic Year

The teacher's PK capability consists of three aspects of assessment: model / method knowledge, media knowledge, and evaluation knowledge (Table 7).

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Tabel 7. PK capability of 10th grade Biology Teachers in Senior High School of All Surakarta in Preparing Lesson Plan in 2015/2016 Academic Year.

SUB ASPECT	SCHOOL						Σ (%)	Rata-rata%	ket
	A	B	C	D	E	F			
1. Method/Model Using	**100**	83,33	**100**	91,67	**100**	**75**	550	91,67	SB
2. The kind of method/model using	**75**	**75**	58,33	**41,67**	50	50	350	58,33	C
3. The kind of learning media	33,33	41,67	**25**	41,67	**58,33**	50	250	41,67	C
4. Media choosing in learning activity	**100**	**100**	**100**	**100**	**100**	**100**	600	**100**	SB
5. Evaluaion tools making that suistinable with material	**0**	58,33	**66,67**	16,67	**0**	16,67	158,34	**26,39**	KB
6. Assessment choosing	66,67	**50**	**83,33**	**50**	**50**	66,67	366,67	61,11	B
JUMLAH (%)	375	408,33	433,33	341,68	358,33	358,34	2275,01	379,17	
RATA-RATA (%)	62,50	68,06	**72,22**	56,95	**59,72**	**59,72**	379,17	**63,20**	B

Score interpetration (Widoyoko, 2013):
> 80% = Very Good (SB) 20% - 40% = Bad (KB)
60% - 80% = Good (B) ≤ 20% = Very Bad (SKB)
40% - 60% = Enough (C)

Based on table 7, it is shown that the average of PK ability of 10th grade biology teacher in Senior High School at Surakarta in preparing the Learning Plan in academic year 2015/2016 is 63.20% (good). Percentage of using method / model is 91, 67% (very good), percentage of use of various strategies is 58, 33% (enough), percentage of learning media type is 41, 67% (enough), percentage of media selection according to learning activity is 100% (very good), percentage in compiled the evaluation tool according to the material is 26, 39% (less good), percentage of selection of sphere of evaluation is 61, 11% (enough).

The ability to use the model / method that get the highest percentage is school A, school C and school E equal to 100% (very good). This is because the indicator has been met which includes: a) The ability to determine or choose the method / model appropriately, b) The ability to write the steps of the method / model correctly, c) The ability to write how to use media on learning activities, d) The ability to manage time according to the method / model used. Meanwhile, the ability to use the model / method that gets the lowest percentage is school F by 75%. This is because the experience of teaching by school F's teachers for 21 years in using the method / model is still limited, because it only uses the same model / method in every Learning Plan making. Thus, it may affect the lack of up-to-date knowledge of the use of the model / method.

The highest percentage of using various methods / models is school A and school B with percentage of 75% (good), while who get the lowest percentage is school D with percentage of 41, 67% (enough). This is because in preparing the lesson plan is less varied in using the method / model and strategy and it became monotone, thus influencing the lack of up to date knowledge in the use of strategy.

The highest percentage of using the kind of learning media is school E with the percentage of 58.33% (enough), while the lowest percentage is school C with the percentage of 25%, in general the ability to use the type of learning media including enough category (41.67%). This is because the teachers are still less use of learning media in the form of modules, electronic materials in the form of PPT and video. Indicators that must be fulfilled by the teacher in the ability of using the type of instructional media are: a) instructional media in the form of textbook, b) instructional media in the form of module, c) learning media of electronic material in the form of PPT, d) learning media of electronic material in the form of video.

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The ability of media selection according to learning activities, all teachers get the equivalent percentage of 100% (very good). This is consistent with the indicators in the media selection capability according to the learning activities which include: a) The ability to adjust the media based on the number of students, b) The ability to adjust the media based on learning activities, c) The ability to adjust the media based on the scope of the material, d) easy to use.

The highest percentage to arrange evaluation tool according to the material that get highest percentage is school C with percentage 66, 67%. This is due to the experience of teaching school C's teachers for 29 years and be a supervisor of biology olympiad at school. Thus, the teacher is already accustomed in making evaluation tools in the form of questions and rubric assessment. Meanwhile, schools with the lowest percentage were school A and E schools with 0% percentage. This is because teachers do not include evaluation tools in lesson plan. Indicators that must be fulfilled by the teacher in the preparation of the evaluation tool are: a) The ability to determine the assessment technique appropriately, b) The ability to arrange the problem according to the rules of writing questions, c) The ability to arrange the questions in accordance with the purpose of learning, d) The ability to determine the number of questions in accordance with the time which is determined.

The highest scoring percentage of the scoring aspect is School C with the percentage of 83.33% (very good), whereas the school with the lowest percentage is school B, school D, and school E with percentage of 50% (enough). There are factors that affect the teacher to get the lowest percentage. The first factor is that teachers only include cognitive judgments and affective ratings but do not include psychomotor assessments. The second factor is the number of assessment components that teachers need to do in a small amount of time while the number of students is large, so teachers get around using the same assessment techniques in several meetings. The third factor, the condition of the class and the condition of the learners is also a concern for teachers to develop assessment techniques, because not all learners understand if teachers implement different assessment techniques to measure the ability of learners so that teachers only use certain assessment techniques.

3.3 Ability of PCK Teachers Biology Class X of All Surakarta's State School in Preparing RPP Academic Year 2015/2016.

PCK ability of teachers in the form of material conformity with the strategies, methods, and evaluation in the learning process that includes the introduction, core activitites, and closing activities (Table 8).

Table 8. Percentage of the ability of PCK teachers of class X biology of All Surakarta's State School in preparing the academic year 2015/2016 RPP.

SUB ASPECT	**SCHOOL**						**Σ (%)**	**Average %**	**Inf.**
	A	**B**	**C**	**D**	**E**	**F**			
1. Preliminary activities	**100**	66,67	**50**	**50**	**50**	75	391,67	**65,27**	G
2. Core activities	**100**	**100**	**100**	**100**	**100**	**100**	600	**100**	VG
3. Closing activitities	**75**	**75**	**75**	**58,33**	**75**	66,67	425	70,83	G
AMOUNT (%)	275	241,67	225	208,33	225	241,67	1416,67	236,1	
AVERAGE (%)	**91,67**	80,56	75	**69,44**	75	80,56	472,22	**78,70**	G

Script interpretation criteria (Widoyoko, 2013):

> 80%	= Very good (VG)	20% - 40%	= Not good (NG)
60% - 80%	= Good (G)	≤ 20%	= Very Less Good (VLG)
40% - 60%	= Enough (E)		

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Based on Table 8, it was shown that the ability of PCK Biology teacher class X SHS of all Surakarta in preparing the RPP school year 2015-2016 the average was 78.70% (good). 65.27% Percentage of preliminary activities (good), the percentage of core activities amounted to 100% (very good), the percentage of cover activities 70.83% (good).

The ability of teachers in designing activities that obtain preliminary highest prosentse is A school of 100% (very good), while the lowest percentage is obtained C school, D school, and E school by 50% (enough). There are factors that lead to teachers who earn the lowest percentage in designing the preliminary activities. The factors that teachers don't include learning objectives, the teacher doesn't specify the material to be covered, and don't give a motivation (a question which supports students). Indicators to be fulfilled are: a) There apersepsi activities, b) there is a motivation activity, c) include the material to be discussed, d) include learning objectives. This is done the teacher to shorten the time, so for motivation and learning objectives only delivered at the first meeting.

The ability of the core activities of teachers in designing all of school prosentse obtain the equivalent of 100% (excellent). This is consistent with the indicators in the core activities which include: a) involve students in finding information, b) facilitate interaction between students, c) involving students actively in various activities, d) KTSP: Formulate learning that includes exploration, elaboration, and confirmation, Curriculum 2013: Formulate learning components that include scientific approach (Observe, ask, Gathering Information, reasoning / associates, and Communicate) so that teachers don't see the problem in compiling core activities.

The ability of teachers in designing closing activities that get the highest percentage is A school, B school , C school, and E school by 75% (good), while the lowest percentage of schools receiving C school with prosentse is 58.33% (enough). There are factors that lead to teachers who earn the lowest percentage in designing the closing activity.factor, *The first*, the teacher doesn't include reflection or a summary that engage learners. *The second* factor, there are no oral test or written test and there has been no follow-up activities. *The third* factor, is insufficient instructional time for reflection, oral test or written test, so it held at the last meeting. Indicators that must be met are: a) there is a reflection or a summary to engage learners, b) there is a feedback activity, c) there is a written or oral test, d) there are follow-up activities.

4. Conclusion

Based on the research that has been done about PCK'S (Pedagogic Content Knowledge) ability of Biology Teachers in tenth grade of all Surakarta's state school for the 2015/2016 academic year in arranging RPP, can be concluded that the ability of CK (Content Knowledge) is 61.57% (good), ability of PK (Pedagogic Knowledge) is 63.20% (good), while the ability of PCK is 78.70% (good).

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Correlation between Conservation Knowledge and Conservation Attitude of Fishermen to Conserve *Anadara* spp at Lada Bay of Sunda Strait

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Abstract. Knowledge is an important factor in revealing the positive attitude of someone. This also applies to clam fishing fishermen in the clams resource conservation efforts at Lada Bay of Sunda Strait. This research was done to determine the correlation of knowledge about conservation in a manner to preserve *Anadara* spp. This research was conducted in October-December 2012 in Sidamukti village, Panimbang Pandeglang-Banten. The method was used descriptive with survey techniques through correlational studies. Accidental sampling technique was used with 30 fishermen as respondents. The data collection consists of primary data by using test of knowledge about conservation and questionnaire sheet of the fishermen conservation attitude, while the secondary data was from interteviews with fishermen directly. The data was analyzed by regression and linear analysis, continued by testing the correlation coefficient and coefficient of determination. The results indicated that there is a correlation between knowledge about conservation and conservation attitude of fisherman to preserve *Anadara* spp clams at Lada Bay of Sunda Strait. Conservation knowledge contributes as much as 68% with a coefficient of determination of 0.83 to fisherman for conservation attitude to preserve Anadara spp clams. The higher conservation knowledge, the better attitude of fisherman to conserve *Anadara* spp. clams at Lada Bay of Sunda Strait.
Keywords: Anadara, conservation attitudes, fishermen, knowledge

1. Introduction

Lada Bay is one of the territorial waters in Indonesia located in the Sunda Strait that is influenced by the oceanic characteristics of the Indian Ocean and Java Sea [1]. The Lada Bay has a variety of potential resources to develop. One of them is the Mollusca Phylum (Bivalvia class, Pelecypoda, Lamelli branchiata) [2,3]. Bivalve class belonging to *Anadara* spp includes *Angiara granosa*, *Anadara antiquata* shell, Barley shell (*Barbatiadecussata*) and arc shell (*Scapharcapilula*) as well as several other types of shells such as green shells (*Mytilusviridis*) and shellfish (*Meretrixmeretrix*) [4,5].

Anadara spp plays an ecologically important role in the mineralization and recycling processes of organic materials as well as an indication of the suitability of potential water quality especially as an indicator of pollution [6]. Economically, these shellfish can be consumed and can also be a source of income for the local fishermen.

In the waters of the Lada Bay, the capture of *Anadara* spp by fishermen has been going on aggressively. Fishermen can easily harvest the clams by using shell/scratch catcher, that various sizes can be netted. Such conditions are feared to cause a decline in the population that will impact on the balance of ecosystems. To prevent the extinction of shell resources, a conservation effort is needed [7].

Successful preservation of a resource depends on several aspects that are directly related to the resources. In this case, fishermen become an important aspect in conservation efforts through their conservation knowledge because fishermen are the individuals that directly uses the resources. This knowledge of conservation can be seen in several ways, including seasons of fishing at sea, boat making techniques, boat operation, and much more that are thought to come from local knowledge related to the sea.

Knowledge is the result of human being's thought of something or all human's actions to understand an object it faces or the results of human effort to understand a particular object [8]. There are four

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categories of knowledge according to Anderson and Krathwohl [9] namely: Factual, Conceptual, Procedural and Metacognitive

According to Azwar [10], the manifestation of one's attitude relates to the knowledge, habits, and the belief that it has. If the knowledge of fishermen is good enough, a positive attitude to preserve these shells is expected to appear.

Azwar [10] explains that the three components of interrelated attitudes are: a) Cognitive form of knowledge, belief or mind based on information and related to the object, b) Affective, the emotional dimension of attitudes ie emotions related to objects and c) Behaviour or conative, involves one predisposition to act on the object.

To know the attitude of fishermen about the preservation of *Anadara*spp, a related research about the knowledge of fishermen who live around Lada Bay of Sunda Strait waters associated with knowledge conservation is necessary.

2.Methodology

The research uses a descriptive method with survey technique through correlational study. This research was conducted in Sidamukti Village Sukaresmi Teluk District of Pandeglang Banten Regency in October-December 2012. The variables studied were knowledge of conservation and fisherman's attitude to preserve *Anadara* spp.

The target population is fishermen in the Sunda Strait waters, the accessible population is shellfish fishermen, as many as 30% (30 people) of the total number of 100 clam fishermen. The samples of fishermen are chosen accidentally. The data collection techniques used in this study are 1) Questionnaire (level of knowledge and attitude), 2) Direct observation, and 3) Interview. The instruments of research used are :

2.1. Instrument of conservation knowledge

The instrument used to measure the knowledge of conservation is using questionnaire with five choices of answers (multiple choice), in the form of dichotomy score, that is by giving score 1 for a correct answer, and 0 for a wrong answer [11]. Problem amounted to 50 questions. The instrument grid on knowledge of preservation based on Anderson and Krathwohl [9] and UU No. 5 [12] includes aspects of factual, conceptual, procedural and metacognitive knowledge.

2.2. Instrument of conservation attitude

The grating of fishermen attitude toward shellfish preservation based on Ahmadi [13] and UU No. 5 [12] covers cognitive, affective and conative/behavioral aspects. The questionnaire used to measure the attitude of the fishermen to preserve *Anadara* spp was made using the Guttman scale which has two possible answers or dichotomy ratios. For example, two alternatives "agree" and "disagree" or "yes" or "no" answers to 52 questions. The instrumental specifications of the attitude of fisherman to preserve *Anadara* spp shells covers aspects of protection, conservation, and exploitation.

2.3. Validation and Reliability

The validity of the instrument of knowledge and the validity of the instrument of attitudes was obtained by examining the validity of the content by considering the extent to which the statement in the test encompasses the overall situation to be measured in the test. Reliability is derived from an understanding that an instrument is reasonably reliable to be used as a data-gathering tool because the instrument is good [14].

2.4. Data Analysis

The analytical requirement in the form of normality test was conducted using Kolmogorov-Smirnov (K-S), followed by homogeneity test by Bartlett test to check the homogeneity of taken sample data. The hypothesis is tested by examining the correlation coefficient using Person's Product Moment formula. Furthermore, the obtained correlation coefficient had its significance tested by an approach to the distribution of t (t-test). The analysis of the relationship of conservation knowledge with the attitude of the fisherman to preserve the shell Anadara spp. In Lada Bay of Sunda Strait waters is done by calculating the coefficient of determination. All tests were performed using the significance level $\alpha = 0.05$.

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3.Results

Based on observation results and calculations, the following results are acquired:

3.1. Conservation knowledge

Based on the criterion of Riduwan [15], the calculations revealed that the fishermen's score of conservation knowledge was present in very good category, good category, and fair category. Meanwhile, the poor category was absent. The data can be seen in Table 1 and Figure 1.

Table 1. Scores for conservation knowledge

Score	Category	Amount (Person)	Percentage
81-100	Very good	10	33.33
61-80	Good	18	60
41-60	Fair	2	6.67
< 40	Poor	0	0

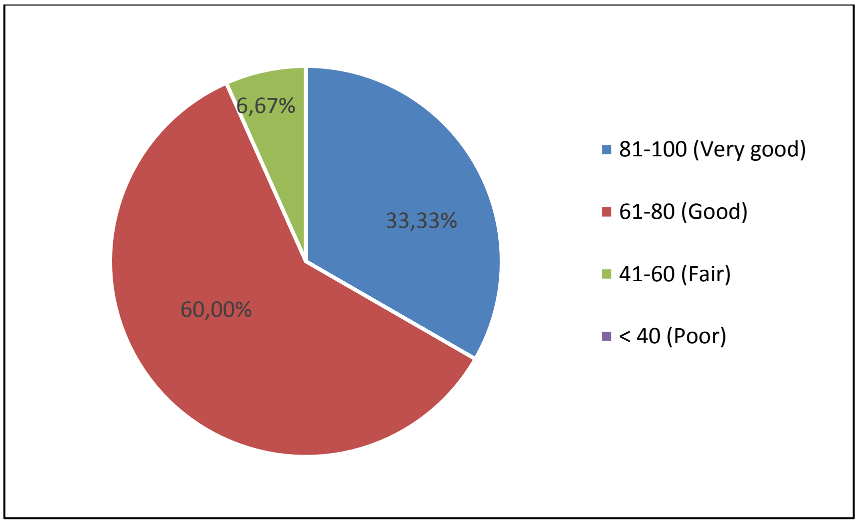

Figure 1. Percentage of shellfish conservation knowledge criteria

3.2. Conservation attitude of fishermen to preserve the shells

Based on the criterion of Riduwan[15], the calculations revealed that the fishermen's score of conservation attitudewaspresent in very good category and good category. Meanwhile, fair category and poor category was absent. The data can be seen in Table 2 and Figure 2.

Table 2. Scores for conservation attitude

Score	Category	Amount (Person)	Percentage
81-100	Very good	10	63.33
61-80	Good	18	36.67
41-60	Fair	2	0
< 40	Poor	0	0

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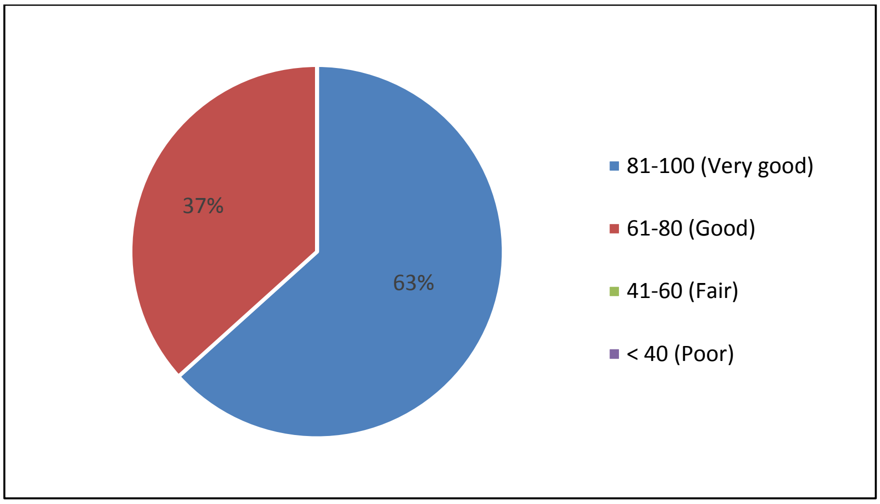

Figure 2. Percentage of shellfish conservation attitude criteria

By testing the significance of the regression model at α = 0.05, it was obtained thatF_{count} 52.56 is greater than F_{table} 4.20, this means $H_0$was rejected and it was concluded that the regression model $\hat{Y}$ = 2.29 + 0,9X is significant. Through linearity test on a regression model with α = 0.05, it was obtained that F_{count} 1,4 is smaller than F_{table} 2,48 which means H_0 was accepted and it can be concluded that the regression form of $\hat{Y}$ = 2.29 + 0,9X is linear.

The relationship strength is shown by the correlation coefficient which was calculated by the Pearson Product Moment formula, resulting in the value of 0.83. The value of this coefficient was tested on its significance; the result was t_{count} value 14.12 bigger than t_{table} of 1.701 at α = 0,05. It means H_0 was rejected. Thus, the correlation coefficient is 0.83 The coefficient of determination obtained in this study amounted to 68% which means the knowledge of conservation variables contribute 68% to the attitude of fishermen to preserve *Anadara* spp shells in Lada Bay of Sunda Strait waters through regression model $\hat{Y}$ = 2.29 + 0.9X.

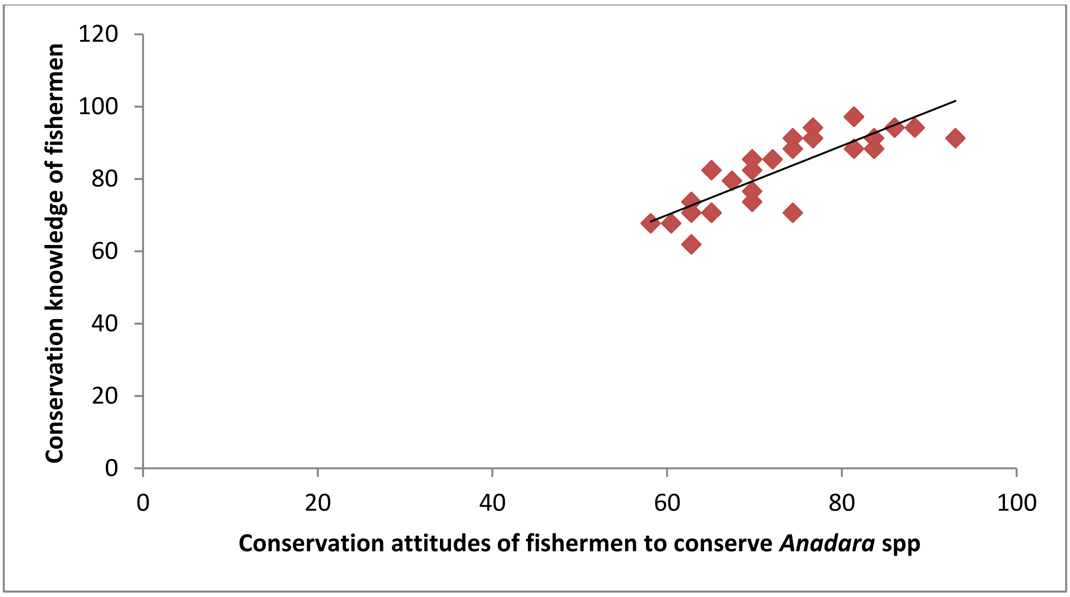

Figure 3. Graphical correlation between conservation knowledge and the attitude of the fisherman to preserve the *Anadara*spp shells.

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4.Discussions

Conservation knowledge categories owned by shellfish fishermen was found in three criterions: very good, good and fair. As many as 60% knowledge of fishermen was classified as good. This can be explained because the knowledge can be acquired from several sources, among them are from education, television, newspapers, training, and counseling and most importantly is from direct experiences in the field. Experiences in the field as a fisherman that directly relates to nature greatly affects the knowledge of conservation. According to Utina *et al* [16] knowledge gained by humans is a result of the interaction between humans and the environment that lasted continuously.

The conservation attitude of fishermen to preserve seashell was found in two criterions: very good (63.33) and good (36.67). The high percentage of very good criteria is because of the life of fishermen who have a close relationship with the marine environment as a place of livelihood to capture shells. According to Sukadana's opinion [17], the closeness of the relationship between fishermen and nature creates fishermen's dependence on existing biological resources in the natural environment that can provide a source of livelihood for them.

Based on the calculation and data analysis, it was found that there is a positive relationship between the knowledge of fishermen conservation with the attitude of conservation of fishermen to preserve *Anadara* spp, the higher the knowledge the better the conservation attitude. In line with the opinion of Azwar [10] that knowledge and attitude have a positive relationship, because of the encouragement in an individual consciousness topreserve an environment.

The strength of the relationship between the knowledge of conservation and the attitude of the fishermen to preserve *Anadara* spp based on the results of the calculations shows a high positive strength. And fisherman knowledge about conservation contributes 68%.

Fishermen with a good knowledge of conservation will have a good attitude towards the presence of shells *Anadara* spp in Lada Bay of Sunda Strait waters. This is supported by the opinion of Sabri [17]that the manifestation of one's attitude relates to the knowledge, customs, and beliefs the individual has.

Aspects of knowledge about the conservation of *Anadara* spp shellfish that is widely known to fishermen is about protection. This result is seen from questionnaires distributed to fishermen. The question in which most of the fishermen answered correctly from the knowledge aspects of the conservation was about environmental protection aspect, followed by preservation aspect and the lowest is the aspect of utilization

Knowledge of fishermen in terms of utilization of fishery resources can be seen in several ways, including seawater fishing seasons, boat making techniques, boat operations, and much more that are thought to come from local knowledge related to the sea, and also from their environment [10].

5.Conclusion

Based on the results of research and data analysis, it can be concluded that there is a positive relationship between knowledge about conservation and the attitude of fishermen to preserve *Anadara* spp shells in Lada Bay of Sunda Strait waters. The higher the level of knowledge that fishermen have, the better the attitude of the fishermen to preserve *Anadara*spp shells. Knowledge of conservation contributes 68% to the attitude of fishermen to preserve *Anadara*spp in Lada Bay of Sunda Strait waters.

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The Local Knowledge By Karo Ethnic In Doulu Village, Karo District To Intercropping Agricultural

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Abstract. This study aims to the documentation of the local knowledge by Karo ethnic in agricultural intercropping. The research method through participatory observation, interviews, and surveys. This research was done in August 2016. A total of 8 respondents were interviewed. The selection of respondents was done by purposive sampling with criteria as farmers who undertaken agricultural intercropping patterns of at least three years. The data were analyzed descriptively. Karo ethnic in the village Doulu do intercropping agricultural for the efficiency of land and to improve productivity. Intercropping is done by planting 2-3 species of the annual in the land simultaneously. Types of plants that are intercropping among others celery (*Apium graveolens*), leek (*Allium Porum*), chili (*Capsicum annuum*), cabbage (*Brassica* sp.), and tomato (*Solanum licopersicum*). The main factor to consider selecting plants are age, canopy, and production of plants.
Keywords: *Apium graveolens*, intercropping, karo ethnic, local knowledge

1. Introduction

Karo highlands are the areas in North Sumatra with fertile soil, because the region flanked by two active volcanoes (Sinabung and Sibayak). The lands use by local communities in Karo highlands to agricultural are limited. To efficiency and to support of necessary, the local communities manage agricultural land by intercropping. Francis [1], stated that intercropping is the cultivation of two types of plants on the land in a time to increase the productivity per unit area. Intercropping is used to express to the application in multiple cropping [2].

Intercropping has been done by various local communities in Indonesia. The factors to influence of farmers to used that such as: limited of the land, the need of life [3], the efficiency of land and increase the productivity [1,4]. Various types of intercropping have developed by local communities, ie: sugarcane (*Sacharrum officinarum*) with soybean (*Glycine max*) by the Javanese (Rifai, 2014), corn (*Zea mays*) with peanuts (*Arachis hypogea*) [2,5], upland rice (*Oryza sativa*) with corn [4], rubber (*Hevea brasiliensis*) with banana (*Musa pardisiaca*) [6]. The plants selection to cultivate in intercropping are influenced by various factors, such as: the character of the land, primary productivity of the local community, topography, customs / culture of owned of land, age of the plant, and market demand [6,7]. Those resulted that pattern and type of intercropping are different in regions. The acctually of the farmers have used two types (species) plants in a area. The plants which used in intercropping are the annual plants with life cycle around 3-4 months such as: chili (*Capsicum annuum*), corn (*Zea mays*), rice (*Oryza sativa*), peanut (*Arachis hypogea*), soybean (*Glycine max*.

The plants productivities through intercropping no different than monocultur [3,4]. Dewi et al. [4] reported that intercropping upland rice with corn did not affect to productivity of upland rice but affect to a amount of light received rice, height, number of tillers, and weight of 1000 grain. Intercropping resulted to shade of the lower plants [4], so that the selection of plants are very important with plants specified criteria.

The main factors that influenced the local communities to done intercropping are limited land area [3]. The limited area is often found in various ethnic groups, like in Doulu village. The farmers in this village have the land area (garden) are around 0.5-1.0 ha for a household. The limited of the garden to inspired of the farmers to optimized of the land use and to increase income through intercropping.

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This research was conducted to the documentation of the local knowledge in the Doulu village to manage of intercropping.

2. Methods

This research was conducted in August 2016 in Doulu village, Karo District, North Sumatra. Research carried out used the ethnobotanical survey and parsipativatory observation methods. The respondents determinated through purposive sampling with criteria are the farmers have done intercropping. Total eight farmers in the Doulu village in interviewed. Surveys were conducted with semistructured, open, and deep interviewed. Some things are asked to farmers, such as: the way of land preparation, rotation patterns on land, the selection of the plants, way to crop, maintenance of plants, and how to control pests and diseases. The data obtained were analyzed descriptively.

3. Results

3.1. Description Doulu Village

Doulu village is located at the base of the Sibayak volcono. The village is inhabited 430 households with 2.300 people. Local communities more than 90% are ethnic Batak Karo and remaining are Batak Toba ethnic and the other ethnic. The main income sourced from cultivation of celery (*Apium graveolens*), chilli (*Capsicum annuum*), tomato (*Solanum lycopersicum*), and leek (*Allium porum*). The local communities have limited garden are 0.5 ha - 1.0 ha of a household. To efficiency and to increase the productivity of land the farmers are cultivate with intercropping.

Most people in the Doulu village are immigrants, so that haven't a land. To supplies of life its necessities, they rent of land from the people which have broad of land or from people which not ativities agricultural. The rental price of land varies are 150000-200000 IDR for 10 m x 10 m, depend to distance of land.

3.2. Local Knowledge to Intercropping

Karo ethnic in the Doulu village managed their land in intercropping. The plants which used in intercropping are rice (*Oryza sativa*), celery (*Apium graveolens*), leek (*Allium porum*), peppers (*Capsicum annum*), cabbage (*Brassica* sp.), tomato (*Solanum lycopersicum*), corn (*Zea mays*), chives (*Allium* sp.). These species are routinely grown in rotation and alternately.

The irrigation system in the Doulu village actually been functioning properly to allow for the planting of rice (*Oryza sativa*) in the fields, but the respondents stated that the land is planted with rice paddy fields, the results are not sufficient to meet demand. Nevertheless, farmers in the village are mostly still doing activities in paddy rice cultivation. At the beginning of the land flowed with water to form wetlands. The land is planted with rice by the local people called the *page Cimen* (rice varieties *Cimen*). Rice has two characters who produce rice seeds are colored red and white colored rice. In taste white colored rice preferred by the people because fluffier than the red. Substitution intercropping with crops of paddy aims to break the pests and diseases that attack plants. Local communities state if not done pergiriran wetlands and dry land will occur pests and diseases that result in the failure of agricultural products, especially in plants that ditumpang extracted.

When they are wet land paddy rice farmers plant only, but now dry land farmers to variations in land that monoculture and intercropping. Farmers wisely determine the pattern of land that they till cultivation among farmers and between the adjacent land area. Plots of adjacent land planted with plant species are different. This causes variations in the harvest season, the type of intercropping. Here is the pattern of land preparation is done by local people in the Doulu village.

3.3. Monoculture

The farmers in the Doulu village have knowledge managed to cultivate the monoculture or intercropping. Although done monoculture, but the farmer tends to chosen of different plant species on land adjacent. This is done to cut off or limit the spread of pests/ diseases and to stabilize the prices of agricultural products. The plant what chooses to monoculture are celery (*Apium graveolens*) with leek (*A. porum*).

Celery is a main agricultural commodities in the Doulu village, because its regarded as a plant that suitable to be planted in highland (Figure 1a). The respondens said that to maintenance of celery relatively easy compared with the other plant. The celery can be harvest repeatedly in a long time.

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Harvesting celery in the Doulu village done with taking a leaves that mature have a lenght more than 25 cm and colored dark green. The young leaves of celery allowed to keep growing. The harvesting celery in this research different from to farmers in West Java which conducted by depriving whole plant parts. Intake of mature leaves from plants resulted that shade plants that will reduce the flow aeration around the plants to be well and also provide an opportunity leaves that are easier to develop better. Harvesting is done about 1-2 weeks for 2-3 months.

Allium porum (leek) also of a plant that have been used in monocultures. Nevertheless, any of farmers who chosen *A. porum* in monoculture (Figure 1b). Harvesting leeks are once times suspected the factor that make farmers rarely use in monoculture. The morphology structure of *Allium porum* leaves are linearis that does not interfere with the shade to the other plant so that are more widely used in intercropping. The land plot that monoculture cultivate were covered with plastic which made holes with distance (30 cm x 30 cm) will be made perforation as a place to grow plants (Figure 1b). The purpose of land cover with plastic is to reduce weed growth as well as to maintain soil moisture, especially when the plants are young. The land cover with plastic is also considered to be practiser and cheaper in the field of process.

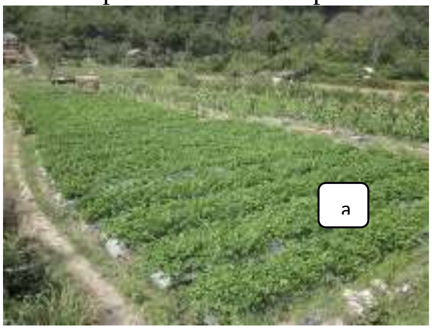

Figure 1. The monocultures cultivate in the Doulu village, Karo District, North Sumatra.

3.4. Intercropping

Intercropping cultivated the two or more of the plants types at the field in a time. The farmers in Doulu village modified of land to be plots which a smaller with size 0.8-1.0 m x 15-20 m. The number of the plots of land owned by the farmers varies depending on the farmer's capital. Plots are equipped with a small trench as limiting each plot. Empirically seen the moat serves to accommodate the excess water when the rainy season and also the weeds from the weeding.

Types of plants selected by farmers in intercropping vary among others celery, leeks, peppers, tomatoes, and cabbage. The model of intercropping uses two types of plants are: cabbage (*Brassica* sp.) with tomato (*Solanum lycopersicum*); celery (*Apium graveolens*) with leek (*Allium porum*); cayenne (*Capsicum annuum*) with lettuce (*Lactuca sativa*); leek (*Allium porum*) with cabbage (*Brassica* sp.) (Figure 2).

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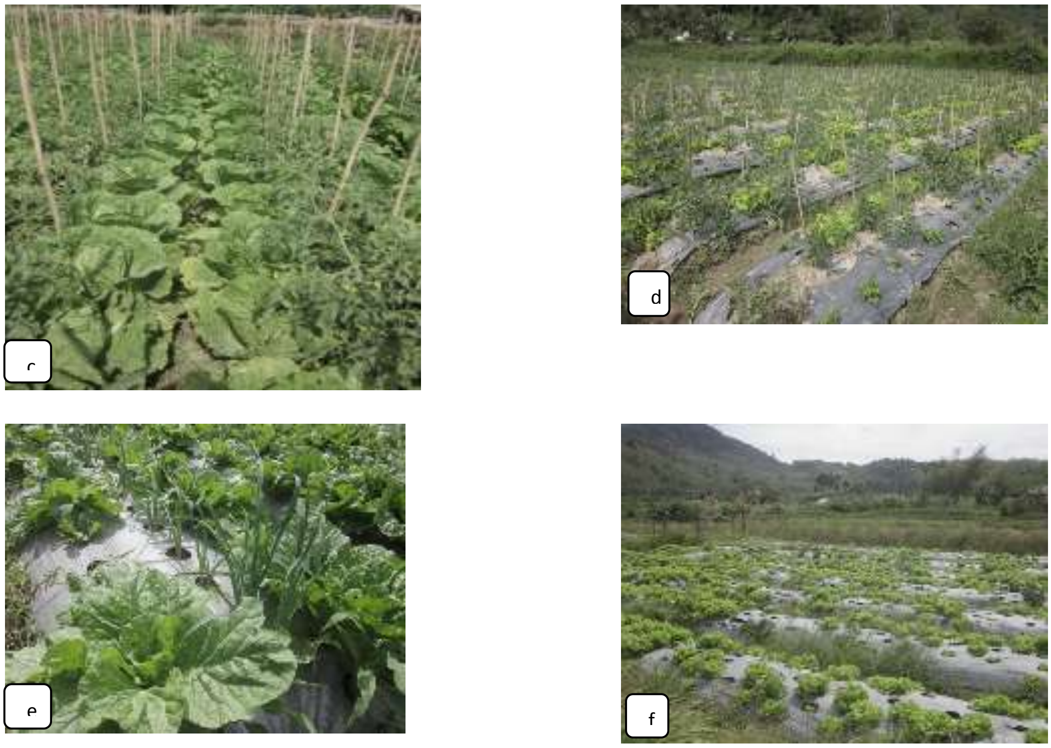

Figure 2. The pattern of intercropping by cultivate two types of plants by local ethnic in the Doulu village, Karo District, North Sumatra.

a. Celery (*Apium graveolens*) with leek (*Allium porum*)
b. Celery (*Apium graveolens*) with tomato (*Solanum lycopersicum*)
c. Tomato (*Solanum lycopersicum*) with cabbage (*Brassica* sp.)
d. Chili (*Capsicum annuum*) with lettuce (*Lactuca sativa*)
e. Cabbage (*Brassica* sp.) with leek (*Allium porum*)
f. Lettuce (*Lactuca sativa*) with leek (*Allium porum*)

When analyzed in the further selection of plants in intercropping by farmers conducted concerning morphology and structure of the leaves canopy. The plants that intercropping are the plants with leaves relatively distinct morphology are the plant with linearis or small-leaves. For example, cabbage (*Brassica* sp.) has broad leaves intercropping with leek (*Allium porum*) which has leaves that liniearis. Those are alleged the consideration by the farmers in the efficiency of absorption of sunlight to support the growth and production. The efficiency in the absorption of sunlight, some of the respondents to reduced of leaves especially the mature leaves so that aerasi can be optimal and ovoid fungal attack. Fungal attack characterized by the occurrence of decay in the roots which followed withered leaves and death of plants.

Intercropping can be done by planting two types of plants at the same time or by planting one plant beforehand. For example by some farmers, in the beginning of land cultivated with celery (*Apium graveolens*), and than followed by other plant (tomato/ *Solanum licopersicum* or Chili/ *Capsicum annuum*) when the celery to be harvest. If the farmer's cultivation two types of plants from the beginning, so the farmers to choose two types of plants with different a time of harvesting. The farmers in the Doulu village was also done intercropping by the cultivation of three types of plants in a land and a time. The species are celery (*Allium porum*), tomato (*Solanum lycopersicum*) with chili (*Capsicum annum*) (Figure 3). To maximize production of cultivating plants by farmers done regularly of time cultivation and space in intercropping.

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Figure 3. The pattern of intercropping by local communities in the Doulu village through the cultivation of three of plants types are celery (*Allium porum*), tomato (*Solanum licopersicum*) with chili (*Capsicum annuum*) a time.

The plants that are intercropping by farmers in Doulu village are annual plants with at harvest about 3-4 months. Those resulted that farmers can earn income in each month. The plant that intercropping have different in height. For example: the height of celery, chili, and tomato are 25 cm, 100 cm, and 150 cm respectively. Those showed that the farmers in the Doulu village have understood of characters and growth of plants which they choose in intercropping. Intercropping used three types of plants in this research has not been found in the other local communities.

4. Discussion

The land tenure patterns through intercropping are the local knowledge that developed the vary of groups ethnic in Indonesia and the other countries for efficiency in land use and to increase agricultural production. In this study, the farmers in the Doulu village used the land through rotating between wetlands and drylands. The wetland used to cultivate of paddy (*Oryza sativa*). The farmers only used dryland that management with intercropping. The farmers of done intercropping in the flat land while the land is sloping relatively undisturbed. It shows that local wisdom in preserving nature and the environment. Sumantri and Sukiyono [8] stated that in essence, farmers have had local knowledge of the ecology, agriculture, forestry has been formed hereditary and evolve over time. Local knowledge to mangement of land be affected by cultural, social, economic, political and developmental fulfillment [9,10] and market demand.

The plants types are cultivated by farmers in the land are celery, leek, tomatoes, chili, cabbage, and lettuce. Cultivation of vegetable (annual plants) by local communities in highland is found in the local communities in Bengkulu Rejang Lebong [8]. Selection of plant is cultivated by farmers dependent on the climate and topography. Stirlin et al. [7] reported that the local communities in Sri Lanka cultivating of rubber (*Hevea brasiliensis*) in lowland area but no in highland.

Intercropping patterns were found in the Doulu village are varies with cultivate by 2-3 types plants in a field. The farmers have done intercropping with two types plants more than two types plants. The intercropping pattern were found which used three plants types in this research different from in other communities. The intercropping were used two plant types are sugarcane (*Sacharrum officinarum*) and soybean (*Glycine max*) [3], corn (*Zea mays*) with peanuts (*Arachis hypogea*) [2,5], upland rice (*Oryza sativa*), corn [4]. The plant in intercroping are competition or complementary (Wibomo 2009). Competition of plants in intercropping includes nutrients, water, oxygen and sunlight, which caused inhibition the growth of plants, whereas the caused growing and produvties of plants better than monocultures. In this study, respondents said that the productivity of land through intercropping greater than monocultures. Rifai et al. [3] found that the Value of Land Equality (VLE) through intercropping by sugar cane and soya greater than monocultures.

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The pattern of intercropping by in this study is various in early planting. The some of the farmer cultivated simultaneously of the all of the plant, but some of them cultivated a gradually for the second and the third of plants types. Nurma [2] founded that the delay of cultivated of corn (*Zea mays*) in the land with early planting with peanuts (*Arachis hypogea*) resulted in the difference in intensity of light received in peanut, which effects to growth and yield of peanut (*Arachis hypogea*), and vice verse.

5. Conclusion

1. Local communities in the Doulu village done intercropping to the efficiency of land and to improve productivity.
2. Intercropping by local communities done through cultivating 2-3 types of plants, such as: celery (*Apium graveolens*), leek (*Allium porum*), chili (*Capsicum annuum*), cabbage (*Brassica* sp.), and tomato (*Solanum lycopersicum*).
3. The main factors considered by the farmers in the selection of plants intercropping are age, canopy, and productivity of plants.

6. Acknowledgment

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Influence of Type Mastery and Performance Goal Orientation on Learning Result at SMAN 64 Jakarta

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Abstract. Goal orientation is the reason for an individual doing the task to achieve the final result in learning. In general, mastery and performance divided by goal orientation. Differences in goal orientation of learners can lead to different learning outcomes, not least in the coordination system subject. study aims to determine influence of mastery and performance to learning of Coordination system subject at High school 64 Jakarta. This research was conducted by at High school 64 Jakarta in April to May 2017. The research type used was quantitative with ex- post facto method. Sample that was used by 52 and 44 students with mastery and performance goal orientation taken by simple random sampling. The technique of collecting data was using test instrument of learning result of Coordination System subject and instrument of goal orientation mastery and performance type. The analysis prerequisite test was using the normality test with Kolmogorov-Smirnov Test and homogeneity test with F-Test. Based on the calculation, the result was obtained by normal and homogeneous distributed data. Hypothesis testing was done by through t-test. The result t-test that there is the difference of learning result of Coordination System between learners type mastery and performance goal orientation.

Keywords: coordination system, learning outcomes, **mastery and performance goal orientation**

1. Introduction

Education has an important role in the development of Human Resources quality. Aims to develop the potential of learners to become human beings who believe and piety to God Almighty, have a noble character, healthy, knowledgeable, capable, creative, independent and become a democratic and responsible citizens (Sisdiknas, 2003). To achieve this can be done by improving the quality of education such as curriculum development, the learning process of learners and improving the quality of teachers and facilities and infrastructure learning support (Daud and Son, 2011).

The purpose of education, mastery of science and technology, facilities and infrastructure are very instrumental in determining the quality of education. Improving the quality of it in society must be accompanied by the development of educational institutions. It is the basis to achieve good learning outcome as a product of education.

The success rate of learners in learning the subject matter in the school can be interpreted by learning outcomes which is expressed in the scores obtained from test results (Susanto, 2013). Learning outcomes are determined by various factors, both internal and external factors. Internal factors including physical, psychological factors, and fatigue factors, while external factors including family environmental factors, school environmental factors, and environmental factors (Slameto, 2010). Among the internal factors that affect the learning outcomes of learners the psychological factor that is goal orientation (goal orientation).

Goal orientation is the reason for an individual doing the task to achieve the result in learning (Pintrich, 2000). In general, mastery and performance divided by goal orientation. Students with mastery goal orientation focus on tasks for learning, improving competence and understanding, gaining new knowledge and skills. Conversely, performance goal orientation will focus on the task of blowing up other friends, demonstrating ability and want to be acknowledged by others.

Ong (2014) shows that learners with mastery goal orientation have higher learning result level than performance goal orientation. Barron and Harackiewicz, (2001) argue that performance goal orientation can produce higher values, not lower, and do not affect intrinsic motivation.

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Differences in goal orientation that learners have can lead to different learning outcomes, not least in the Coordination System subject. Students with mastery orientation will stop learning when they feel they have mastered the subject well, while performance orientation will stop learning if they feel the value is good. Thus, the results obtained differ. Based on the description, it is necessary to do research "Influence of Type Mastery and Performance Goal Orientation to Learning Outcomes of Coordination System subject at SMA Negeri 64 Jakarta.

2. Research Method

The method used is survey method with the ex-post facto study. This research there are two variables that will be examined by the type of mastery goal orientation, and performance goal orientation is the independent variable (X) and the result of biology learning in the material of Coordination Systems the dependent variable (Y).The subjects of this study are students of class XI IPA SMA 64 Jakarta year teachings 2016/2017. The population used in this study were three classes of 108 learners, which are grouped by mastery and performance goal types orientation. Determination of sample of students is done by simple random sampling based on Taro Yamane's formula for each group, so that got 52 participants educate for mastery goal orientation and 44 learners for performance goal orientation.

The method used is survey method with the ex-post facto study. This research there are two variables that will be examined by the type of mastery goal orientation, and performance goal orientation is the independent variable (X) and the result of biology learning in the Coordination Systems subject is the dependent variable (Y).

The technique of data retrieval conducted in this research is by using questionnaires to classify learners type mastery and performance goals orientation. Retrieve data by using written test instrument to find outcomes of them on the Coordination System subject.

The research implementation is divided by three stages: stage, preparation, implementation stage, and the final stages of the study. Activities are undertaken in the preparation stage of making research instrument of goal orientation type mastery and performance goal orientation and learning outcomes of learners, carry out the instrument type goal orientation test mastery goal orientation and performance goal orientation. Implementation phase, Deliver learning material Coordination System by teachers and test result learning. Last final stage research that is processing data and analyze research data and then conclude the results research technique of data analysis is tested by doing test of Normality which used by test Kolmogorov-Smirnov. Homogeneity test is calculated by using F (Fisher) test. Hypothesis testing using the t-test analysis.

3. Result and Discussion

3.1 Research Results

Research data in the form of learning outcomes from each group that is the result of study group mastery goal orientation and result of learning group performance goal orientation. The average learning outcomes of the Coordination System of students in the mastery goal orientation group was 76.82 with the highest score of 92.31 and the lowest score of 61.54. The average learning outcomes of the Student Coordination System performance goal orientation of 73.89 with the highest score of 87.18 and the lowest score of 64.10. For comparison of mean result learners mastery type and performance goal orientation can be seen in the following picture.

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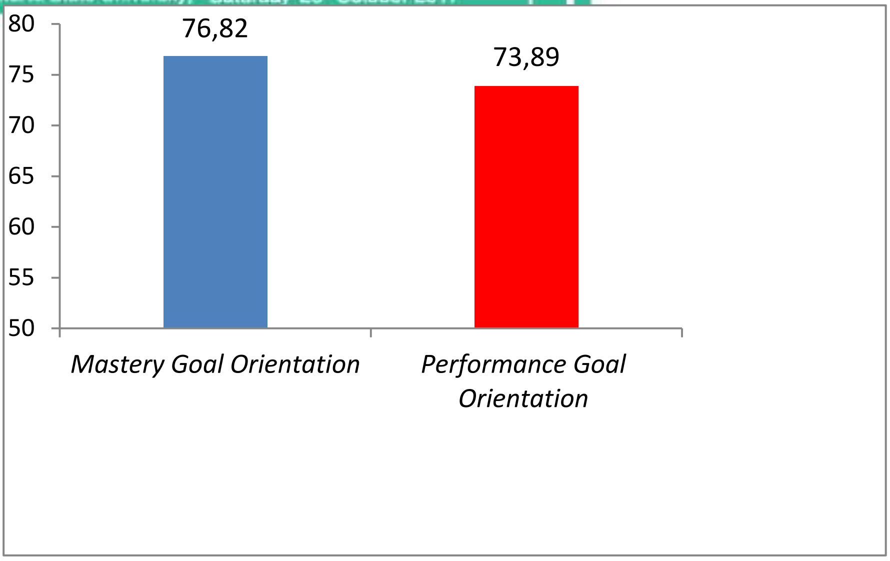

Picture 1.Average Comparison of Student Learning Outcomes Mastery Type and Performance Goal Orientation.

3.1.1 Normality Test

Normality testing was performed using Kolmogorov-Smirnov test using SPSS 21.0 program at α = 0,05. Based on the calculation obtained value significance for group learning outcome type mastery goal orientation is 0,510 and result of group learning type of goal orientation is 0,490 which means both have the significant value> 0,05 so concluded receive H0 which mean population data of normal distribution.

3.1.2 Homogeneity Test

Homogeneity test was done by using F test (Fisher test) using SPSS 21.0 program at α = 0,05. Based on the calculation obtained significant value is 0.339 which means having significance value> 0,05 so it can be concluded by accept H0 which means homogeny variance.

3.1.3 Hypothesis Testing

Hypothesis testing using t- test with significance level α = 0,05 using program SPSS 21.0. Obtained result of significance value 0,03<0,05. It indicates H0 reject which means there is difference learning result of Coordination System between learners type mastery and performance goal orientation.

4. Discussion

Based on the result of research, there has been an influence in mastery type and performance goal orientation toward learning the result of coordination system. The influence of learning type of mastery and performance goal orientation can be seen by the difference in the average value of learning outcomes in the coordination system subject. The average result of learning material of Coordination System of mastery goal orientation higher learners that is equal to 76,82 compared with the mean result of learning material of Coordination System of student performance goal orientation which equal to 73,89. The condition is in accordance by the theory that goal orientation mastery type and performance are affecting the learning outcomes of learners (Pulkka and Niemivirta, 2015), because the goal orientation mastery type and performance are orientation, which represent represents the desire to develop, achieve, demonstrate competence and over so that it can be motivated by the goals or outcomes they expect (Schunk, 2008).

Learners who have a tendency mastery goal orientation, have better learning outcomes because it has an active effort to master the subject matter well. He will not easily despair, give up or stop in the middle of the road if faced with difficulties, this is in accordance with the statement Tumanggor (2015). He perceives a difficulty as a challenge that keeps him positive thinking to

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overcome the difficulty. For example when being met with difficult questions at the time of the exam, he will earnestly answer it, because he has mastered the material and is confident in their own ability. In addition, he will think carefully and remember the strategies that worked in the past (Santrock, 2009).

However, learners who tend performance goal orientation are characterized by striving to achieve tasks or outcomes that sometimes were achieved without learning effort. For example, if the learner is facing difficult questions, then he or she is likely to feel fearful, unconfident and easy to desperate so that he or she would try to cheat on his or her friend's work, or commit other fraudulent acts. It is because learners with Performance goal orientation were expected to always look smart by getting a high score. Being clever usually means an attempt to show something better than someone else who is sometimes accomplished without learning efforts (Tercanlioglu and Demiröz 2015).Also, it usually learns solely to get good grades or compliment teachers, friends, and parents (Puspitasari, 2013). When they discover barriers, learners with performance goal orientation tend to be fearful and discouraged when their efforts to perform achievements become inhibited (Slavin, 2011).

Differences in learning outcomes of learners based on the type of mastery and performance, this is in agreement with the results of Ong (2014) study that shows that they with mastery goal orientation have higher learning outcomes than performance goal orientation. It indicates that the students mastery goal orientation is better when associated with cognitive process involvement than performance goal orientation. The cognitive process in question is to improve skills from one field of learning to another, solving a problem, and transfer knowledge (Kaur, 2014). It will ultimately result in a good achievement in their academic endeavors.

Nevertheless, differences in learning orientation in learners can be addressed wisely. In any direction their orientation in learning, learners still need to be guided to get good learning outcomes. It is belied or not that high learning results can satisfy individuals and the people around them. Moreover today the results of learning have become a benchmark of success in learning someone. Also by knowing the goal orientation, we can understand learning, strategy, achievement behavior and patterns, so goal orientation mastery and performance types become important components that represent their direction in pursuit of good results.

5. Conclusion

Based on the results of research and hypothesis testing it can be concluded that there has been an influence in the type of mastery goal orientation and performance goal orientation to the learning result of Coordination System subject at SMA Negeri 64 Jakarta.

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An Analysis Of *Ability To Create* (C6) Of Biology At Eleventh Grade Of Senior High School Students In Indonesia

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Abstract. This study aimed to determine *the ability to create* of Biology of senior high school students in Indonesia, on the subject of excretion system, the subject of coordination system, subject of reproduction system, and subject to the immune system. This research was a descriptive survey research. The population was senior high school students in Indonesia who are in 5 different areas, namely Yogyakarta, West Nusa Tenggara, East Nusa Tenggara, East Java, and Lampung. The sampling technique used purposive sampling technique. The Technique of collecting data used essay test form which was the instrument of the research. Descriptive analysis was used to analyze the test instrument to determine the achievement level of *the ability to create* (c6). Based on the survey, the results obtain in "good" category with a range of scores of 50≤ 56.18 <75.

Key Words: Create, Senior High School, Indonesia

1. Introduction

The Urgency of developing higher order thinking skills to pursue the information age well has been delivered by experts, among others Eggen & Kauchak (1996); Trilling & Hood (1999); and DeGallow, 1999). Along with that, human resources in Indonesia are expected to have High Order Thinking Skills (HOTS) to compete in the global era. In the future, the high-order thinking skills will be very important in winning the job competition, find problems solution in the workplace and establish good cooperation with others so that it will support the success of their career (Suprapto, et al. 2017).

The achievement of Indonesian students in the Programme for International Student Assessment (PISA) from year to year is still far from satisfactory. In the field of Science, according to data from Research and Development (R & D) of Kemdikbud (2016), the achievement / ranking of Indonesian students in the PISA program as follows: 1) ranked 38 out of 41 participating countries (2000), 2) ranked 38 out of 40 participants (2003), 3) ranked 50 out of 57 participating countries (in 2006), and ranked 60 out of 65 participating countries (in 2009). Likewise, the results of international assessments through TIMSS-R and TIMSS, according to data from the R & D of Kemdikbud (2016) and IEA (2011), showing achievement students in science which is still far from satisfactory; 1) ranked 32 out of 38 countries (TIMSS-R, 1999), 2) ranked 37 of the 46 participating countries (TIMSS 2003), 3) ranked 35 of 49 participating countries (TIMSS, 2007) and 4) ranked 41 of 43 participating countries (TIMSS 2011).

The achievement of Indonesian students according to HDI, PISA, and TIMSS suggests that to pursue the 21st century, the global era, the era of MEA, and the information age, understood and perceived as an era of competition, Indonesian human resources are in dire need of strengthening thinking skill. Through education, learning is deemed necessary to train the ability to think.

Preparation of curriculum in Indonesia both *Kurikulum Tingkat Satuan Pendidikan* (KTSP) and Curriculum 2013 has emphasized the development of students' thinking skills as one aspect of competence. The competition has been implemented for many years in schools, including in biology subjects in high school. According to Permendikbud No.23 of 2006 on *Standar Kelulusan Sekolah* (SKL) or Graduate Competency Standards at SMA / MA / SMALB education level stated that through the learning process students are expected to build and apply information and knowledge

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logically, critically, creatively and innovatively and show logical thinking skills, critical, creative, and innovative in decision-making.

Graduates Competency Standards Curriculum 2013 Permendikbud No. 54 of 2013 stated that every graduate of elementary and secondary education units have competence in the three dimensions of affective, cognitive, and psychomotor. In the aspect of students' knowledge or cognitive domains are expected to know of factual, conceptual, procedural, and metacognitive in science, technology, art and culture with insights into humanity, nation, state, and civilization-related causes and effects of phenomena and some cases study.

In line with the regulation in 2016 through Permendikud No. 20 of 2016 on Competency Standards Graduates of Primary and Secondary Education firmly stating the need for high school students trained to perform cognitive processes that include six process categories (C1-C6) from recalling, understanding, applying, analyzing, and evaluating to master of conceptual knowledge, procedural knowledge, and metacognitive knowledge.

Cognitive theories or thinking skills that are still used as a reference to the practice of national education is the theory of Benjamine Samuel Bloom. The development of Bloom's taxonomy was revised to Anderson and Krathwohl states that learning outcomes can be grouped based on three domains: cognitive, affective, and psychomotor. In the cognitive domain includes six categories C1-C6 that is remembering, understanding, applying, analyzing, evaluating, and creating.
Krathwol (2001) states that the indicators for measuring high-order thinking skills include analyzing, evaluating, and creating. Creating categories is the most complex cognitive process. This process includes the process of generating ideas, planning or designing, and producing.

However, so far there has been no comprehensive information on the achievement of the ability to create in the learning that accommodates the cognitive processes in schools in Indonesia, both favorite schools in urban areas, and schools far from favorites; both schools with KTSP Curriculum as well as with the Curriculum 2013, especially through biology subjects. Therefore, it is necessary to research the analysis of *the ability to create* (C6) of Biology subject an eleventh grade of senior high school students in Indonesia.

2. Materials and Methods

2.1 Materials

2.1.1 High Order Thinking

The high order thinking skills is a thinking activity involving the high hierarchy cognitive level of Bloom Taxonomy. Hierarchically, Bloom taxonomy consists of six levels: recall, understand learned the facts, apply what has been learned to the new situations, analysis ("take apart" information to examine different parts), synthesis (create or invent something; bring together more than one idea), and evaluation (consider evidence to support conclusions).

Furthermore, Anderson (2001) revise the Bloom taxonomy as the following: remembering, understanding, applying, analyzing, evaluating, and creating. The revision is found easier for many scientists to understand and accept it to be referred to learning theory development. This research uses Bloom Taxonomy as the main theoretical reference. In its development, remembering, understanding, applying are categorized as low order thinking skills. So, the high-order thinking skills are the result of cognitive learning at the level of analysis learning result, evaluation, and creating.

Create (C6)

Creating categories is the most complex cognitive process. This process includes the process of generating ideas, planning or designing, and producing (Anderson, 2001).

2.2 Methods

2.2.1 Research Design

The type of this research is descriptive research with survey method. This research was conducted in NTT, NTB, East Java, DIY, and Lampung Provinces. The data were collected on May 4th to May 23rd, 2017, on the second semester of the academic year 2016/2017, by the academic calendar of the school, related to the subject matter used in the study. The samples in this study were the students of class XI in NTT, NTB, East Java, DIY, and Lampung Provinces respectively as follows:

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Tabel 1. List of Research Sample

Provinces	Number of Samples
NTT	323
NTB	453
East Java	309
DIY	394
Lampung	348

Research Instrument

The data were collected through the test technique which is performed to measure the achievement of *the ability to create* (C6). The test instrument used is a matter of essay consisting of immune system material, reproduction system, coordination system, and excretion system. The instrument has been compiled and validated.

Data Analysis

The analytical technique used to analyze data of research result that is statistics description. Statistics description refers to the calibration of raw data into a scoring form which can facilitate the readers in understanding and interpret it. From the result of analysis by using statistics description hence obtained students' maximal score, minimum score, average students score and standard deviation. The determination of the level of creative thinking using the formula range contained in Table 2.

Table 2. Range of *the Ability to Create* Formula (C6) in Biology Subject

Range of Mean Comparison	*The Ability to Create* (C6)
(Mi + 1,5 SDi) ≤ M ≤ (Mi + 3,0 SDi)	Very Good
(Mi + 0 SDi) ≤ M < (Mi + 1,5 SDi)	Good
(Mi - 1,5 SDi) ≤ M < (Mi + 0 SDi)	Fair
(Mi - 3 SDi) ≤ M < (Mi – 1,5 SDi)	Bad

Description :
Mi : mean (average) ideal score = 1/2 (ideal maximum score + ideal minimum score)
= ½ (100 + 0)
= 50
SDi : standard deviation ideal score = 1/6 (ideal maximum score – ideal minimum score)
= 1/6 (100-0)
= 16,67
M : mean (average) actual score
Thus, the final range for determining *the ability to create* (C6) capability in Biology subject contained in Table 3.

Table 3. Range of Achievement of *the Ability to Create* (C6) in Biology Subject

Range of Mean Comparison	*The Ability to Create* (C6)
(75) ≤ M ≤ (100)	Very Good
(50) ≤ M < (75)	Good
(25) ≤ M < (50)	Fair
(0) ≤ M < (25)	Bad

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3. Result and Discussion

3.1 Result

The results of this study were the form of an essay test of the students of class XI high school on materials consisting of immune system material, reproductive system, coordination system, and excretory system. Based on the results of the research, obtained the data that the achievement of the ability to create (C6) IPA class XI students in Indonesia average of 56.18. It is a good category when the average score is 50≤ 56.18 <75. The minimum scores obtained by students were 10 and the maximum score of 95. The standard deviation obtained by 14 indicated the diversity level of the students' *ability to create* (C6) scores were high.

Table 4. Average Score Result of *the Ability to Create* (C6)

Provinces	Average Scores (Mean)
NTT	50,82
NTB	53,09
East Java	67,69
DIY	56,34
Lampung	52,14

Based on the table shows each region has different scores. The highest average is in the province of East Java with an average value of 67.69 Subsequently followed by DIY (56,.4), NTB (53.39), Lampung (52.14), and NTT (50.82) respectively.

4. Discussion

High Order Thinking Skills (HOTS) is a thinking activity involving the high-level hierarchy cognitive level of Bloom Taxonomy. High-order thinking skill includes critical, logical, reflective, metacognitive, and creative thinking. They are activated when individuals encounter unfamiliar problems, uncertainties, question or dilemmas (King, 2013). One of the domains of high order thinking skills according to Bloom's taxonomy revised by Anderson and Krathwol is *the ability to create* (C6). *The ability to create* is the most complex cognitive process. This process includes the process of generating ideas, planning or designing, and producing. This study aimed to see the achievement of *the ability to create* (C6) of high school students of class XI in Indonesia taken from several regions. The instrument in this study was an instrument designed to see the ability of students in generating ideas related to biological material such as on the material of immune system material, reproduction system, coordination system, and excretory system. Based on the results of the research, it found that the achievement of *the ability to create* high school students in Indonesia was 56,18 which included in a good category.

Activities using high-order thinking skills have discovered that students remember the concept longer and show a greater enthusiasm for learning (Chancellor, 1991). To improve students create ability (C6), a teacher should use learning models that support develop the ability to create. According to the result Indonesian students have the ability to compete in a global era. Tankresley (2005) states students could create automatically that they can analyze, synthesize, evaluate, and interpret the text they are reading at complex level. They can process text at deep levels, make judgments, and detect shades of meaning. They can make critical interpretations and demonstrate high level of insight and sophistication in their thinking. They will indeed be prepared to function as outstanding workers and contributors in a fast-paced workplace where the emphasis is on using information rather than just knowing fact.

5. Conclusion

Results of this study can be concluded that the achievement of *the ability to create* (C6) students of class XI high school in Indonesia included in the good criteria of the average value obtained in the

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range of 50≤ 56.18 <75. So hopefully students in Indonesia can compete in a global world that demands the development of high-level thinking.

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Effectiveness Of Question Student Have Strategies And Macromedia Flash Ecosystem On Student Learning Outcome

Lady Rahmawati, Rama Cahyati, Aminatun Wakhidah, M. Sukandi Hamzah, Wahyu Oktamarsetyani

Abstract. This research aims to examine the effect of using QSH strategy, flash, and a combination of both and which is more optimal treatment used in the ecosystem. This research was Pre-Experiment Design, using pretest-posttest group design. The population in this research was all students X SMA PGRI 2 Kayen, while samples in this study were class X-1 as first-class experimental, class 2 X5 as second-class experimental, and X7 as third class experimental. Samples were taken using purposive sampling. The results showed 60% of students experimental class 1, 82% students experiment 2, 100% of students pass KKM (72). N-gain result of third class experiment reached medium criteria, and affective learning outcomes reach high category. Hypothesis results obtained value of F 7.67> 3.11 continued with LSD test showed that treatment of experimental class 3 was the most optimal in the learning ecosystem than the other two classes.

Keywords: *Question Student Have, Macromedia Flash, Students Learning Achievement, Ecos*

1. Introduction

Learning is a process by which a person undertakes to obtain a whole new behavioral change, as a result of his own experience in interaction with his environment (Slameto, 2010). Based on the prerequisites required for learning, each student strives to be active, learning activity referred to by experiencing, practicing, so that emotional and their skill and learning activity is increasing (Riswani&Widayati, 2012).

Efforts to improve the quality of education is now being developed by involving the participation of student to be active in the learning process. Learning will be more meaningful when the student participating in learning activity directly with the teacher as mentor and facilitator, so learning process is not monotonous. The teacher's role is to generate the student interest and bring student to participates in learning and teaching activities and ask question for everything that is not yet understood in the learning process. One of the characteristics that student participate actively in a learning is to ask question. An Active student during the learning process is one indicator of the desire or motivation of students to learn.

Based on observation 2015 in SMA PGRI 2 Kayen learning process is conventional. During learning process student getting material from the teacher by extracurricular lecture. Submission of learning material is done by giving the theory through Power Point (PPT), so that learning in the class takes place theoretically. In a class of 39 students, less than 25% of student participate actively in learning activities by asking question about unfamiliar material. Based on the questionnaire dissemination, the student participation in questioning is caused by several things, such as being embarrassed to ask question, being lazy to ask question, not interested in the material, and being afraid of the inappropriate question. Based on the result of learning on ecosystem material of 39 students, 25% of students got score above KKM (≥ 72), 62% of student got average score of KKM (≥ 72), and 12% student got score below KKM (≥ 72).

Ecosystem material is one of the biological material that requires student to play an active role in the learning process by exploring nature to understand the concept of ecosystem that exists in the environment directly. Ecosystem learning should involve student directly observe the ecosystem in the surrounding environment, because of the limitation of space and time this learning only takes place theoretically without involving the experience of students directly. The application of flash is

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used to complement the lack of space and time of ecosystem learning by way of analogizing processes that occur in ecosystem where the process can’t be directly observed by student.

Based on these problems, teacher should be able to select and apply learning model and strategies that can attract student 'attention, stimulate active participation of student and improve student ability to understand lesson. Question Student Have (QSH) is an active learning strategy that uses a technique to involve the student participation through writing. This strategy will be more effective when combined with the discussion method. QSH is expected to solve the learning problem with student participate to ask question, because basically this strategy used to learn about the wishes and expectation of student as a basis to maximize their potential.

Yusuf et al. (2012) on the biology learning that students' learning outcomes increased in the first test of 11.89% in the second test of learning results increased by 2.49% so that the total increase in student learning outcomes reached 14.38% with the completeness rate reached 83.78% . This increase in learning outcomes is caused by QSH students' questions generating understanding and understanding or eliciting reactions or answers that can be understood and accepted by reason. With strategies that directly involve students in this learning process makes students feel motivated to learn and experience meaningful learning.

Nursofi&Budiyono (2011) study on weathering and corrosion material, said that the students' learning outcomes experienced an increase of 28.75% when students were given treatment using flash. The use of flash helps students visualize the material in an abstract ecosystem.

This study aims to determine how the influence of the use of QSH learning strategies, interactive media ecosystems, and combinations of student learning outcomes on ecosystem materials and the three treatments are more effective to use.

2. Method

This research was conducted pre-experimentally with pretest-posttest group design in three classes. The independent variables in this study are the students' response to the treatment that is learning with Question Student Have, Macromedia Flash, and a combination of both. The dependent variable is the result of student learning. The population in this study is all the students of class X second semester of academic year 2014/2015 in SMA PGRI 2 Kayen. Sampling in this study was conducted using purposive sampling technique of class selection based on the number of students evenly obtained by X-7 class with treatments in the form of QSH and PPT media as experimental class 1, X-5 class with Flash treatment and conventional strategy as experiment class 2, and X-1 classes with a combination of QSH and Flash as experiment class 3.

The implementation of this research consists of preparation, implementation, analysis and final phase. This study was designed in 3 meetings. Data collection techniques used are test methods, observations and questionnaires. The test method is used to get the students' cognitive learning outcomes after learning. Observation methods are used to assess student activity. Questionnaire method for obtaining student and teacher response data. The data were analyzed by quantitative method in the form of score. While the influence of independent variable to the dependent variable is analyzed using t-test.

3. Results And Discussion

3.1 Student Learning Results

The students' cognitive learning outcomes are indicated by the final values (NA), classical completeness, and n-gain. Based on the analysis, the final value data indicates that the combination class has the highest average end value compared to the three experimental classes. This can be seen in Table 1.

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Table 1. Results of Student Endpoints

Class	Average grade of mean Discussion value	Average *Posttest Value*	Final Score
QSH	78,1	70,3	74,2
Flash	74,6	75,7	75,1
Combination	85,6	75,9	80,1

The average score of combined learning outcomes was higher compared to the other two experimental classes (Table 1). Furthermore, to know the difference between the average of student learning outcomes of three experimental classes used ANOVA and BNT test which showed that the result of decision test f arithmetic> f table (7.67> 3.11) and t arithmetic.t table so that Ha accepted and Ho rejected , meaning that there are significant differences between the learning outcomes in the three experimental classes and the three experimental classes have the highest average of the others. Hypothesis testing is supported with classical completeness and n-gain.

The QSH class uses PowerPoint media containing lessons and pictures to make the material presented clear and understandable for the students. Supporting Elements such as animation, video, chart, and music can also be inserted to the PowerPoint Slide (Taradipa, et al., 2013). The slides that had been presented in class already uses charts and pictures have not accompanied by videos and animations yet. The lesson about Ecosystem Component is the initial material that is delivered in the learning process, and in this material the students are required to understand various kinds of abiotic and biotic components of the ecosystem. The slide shows the material connected to the student discussion sheet, the definition of ecosystem component it self is not written in the slide but; instead, it displays the pictures of the ecosystem component. Students are expected to discuss among themselves to understand the definition of ecosystem component based on the pictures that had been shown through the slide.

The result of the analysis proves out of three experimental classes, the combination class has the highest grade of classical completeness that is 100% of KKM complete students, and the other two classes are the QSH class that is 60% and the flash class that is 82%. The result of classical completeness showed that the class of QSH had not completed the classical completeness because the percentage of classical mastery has not reached the target. The results obtained by QSH class are not accord with the research conducted by Khasanah et al. (2013) According to research about the use of QSH strategy and PPT media on learning about plant tissue, it is stated that this strategy is used effectively in the learning process with classical achievement value reached 90.9%. Supported by the research of Yusuf et al (2012) stated with the using of the QSH strategy, the learning outcomes and student activities has increased about two cycles – fair category to very good category. Several factors that cause the QSH class did not reach the expected classical completeness. QSH questions made by students are expected to improve students' understanding through answers sought by the students themselves, but during the learning process some students would only copy the questions in the book and only some groups of students actively provide the answers so students lack personal experience in making a question.

The flash class has a classical mastery of 82%. The using of flash that contains motion pictures and animation has increased the number of students who pay attention to the lessons, but the number of students who pay attention was not followed by the number of students who takes note about the material. This caused some students did not get the maximum grade because the material only goes into the short-term memory of the students. Unlike PPT, there are motion picture elements in a flash. This motion picture showed the lessons systematically, where the processes of biogeochemical were

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displayed sequentially, so the students could get a real picture of the processes in the biogeochemical cycle (Smaldino et al., 2004).

Biogeochemistry cycle is the part of difficult material to study in biology. In this part you will find several cycles of biogeochemistry like water cycle, carbon cycle etc, so that the students need interactive media to gain their motivation to study this part. This Flash, have a moving animation that can clarify the processes. For example on food chain, there is moving animation like mouse (first consumer) eating grass (produced) and then prey by snake (second consumen), and the snake was prey by hawk (third consumer) on the field background. When this motion picture finished, there is a question on the dekstop. This question stimulate students to make a similar question based on the material. The combination class has highest passing grade among the others and successfully pass the passing grade. It is because use of interactive media made the student interested in learning and then the student give their question and ask the question their self. This excellent passing grade supported by n-gain value from the other three classes. With flash, nitrogen cycle present start with N_2 changes into NO_3^- by *Nitrosomonas, Nitrosococcus,* and *Nitrobacter.* And then, symbiotic of *Leguminocae* and *Rhizobium* and the whole nitrogen cycle. When the motion picture finished, there is a question on the screen. What happened when nitrogen microorganism doesn't present? This question, stimulate students to think logically. Because student cannot find the answer from the textbook directly. The students should read and understand the process and have a discussion to know the answer.

When the time to make a question (QSH) has come, the student has to make a question on the paper, so that students should read the textbook again. The previous question leads the student to make a similar question and match with the topic. The objective of this flash is to develope the quality of students question through the motion picture. And the *QSH* is the facilitator for the student to write their question. To solve the question they have, students need to read the textbooks again and again. From the comparison of the classes gain, the combination class has the highest score of three classes. Using interesting media and strategy cause the combination class gains highest score on the test. Support by Nurhayati *et al*. (2009), on her research tell that *QSH* is effective in the learning process when this strategy combined with match learning media.

Tabel 2. N-gain result of three classes

Class	*N-gain* average	Category	Persentase
QSH	0,53	medium	66%
Flash	0,52	medium	64%
Kombinasi	0,56	medium	76%

The combination class has 76% of *n-gain* value. One example of the material presented using *motion picture* in an interactive medium is nitrogen cycle, this process has a difficult cyclical sequence to interpret because it can't be seen clearly nature. The class of *flash* has 64% of *n-gain* value not much different from the QSH class with 66% of *n-gain* value.The acquisition of n-gain is supported by the research by Suwarsono (2014), *QSH* strategy can increase the average of pretest-posttest score of students compared with conventional learning, n-gain achieved in this study is in the medium category of 0.63. The percentage of acquired *n-gain* has reached the indicator set so that although the *QSH* class has not finished its classical completeness but seen from n-gain value reaching medium category *QSH* strategy with PPT media have positive effect on learning. The acquisition of classical and *n-gain* is supported by hypothesis test analysis using variance analysis. Before test using Anava, students' posttest data were first tested for normality and homogeneity. Normality and homogeneity test results showed that the three experimental classes had normal and homogeneous distributed data. Then the variance analysis was performed as a hypothesis test with the result that there was a significant difference in learning outcomes from the three experimental classes based on the treatments given to each class followed by further testing using BNT, the mean comparison of the three classes stated that the optimal combination

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class was used in learning with the highest average of the other two classes. The treatment used in the *QSH* class is not more optimal than the treatment used in the flash class and vice versa seen from the average acquisition that is not much different. Based on the hypothesis test, classical completeness, and *n-gain* of the three experimental classes gave a positive effect on the students' learning outcomes and the most effective combination classes were used seen from the BNT test the combination classes had the highest average, the *n-gain* reached the medium criterion, and the classical completeness 100%.

Students' Affective Learning Outcomes

The students' affective learning outcomes are presented in Table 3.

Table 3. Students' affective learning outcomes

Internal Score	Criteria	Experimental Class					
		I		II		III	
		Amount	%	Amount	%	Amount	%
80% <%s≤100%	A	3	10	5	20	6	20
60% <%s≤ 80%	B	17	56	16	64	24	80
40% <%s≤ 60%	C	6	20	4	16	0	0
0% <%s≤ 40%	D	4	14	0	0	0	0
The number of students	-	30	100	25	100	30	100

The result of calculation of the student character of the combination class is the highest compared to the other two experimental classes (Table 3). Differences in attitudinal values in the three experimental classes were caused by differences in learning atmosphere in the three classes. The combination class doing the learning activity by using *QSH strtategy* with *flash* media.*QSH* is used to improve student's understanding and activeness through questioning activities, student activeness is expected to increase by seeking answers from questions posed by classmates. Of the three experimental classes, 14% of the students get less criteria caused by less communicative students in learning and fewer active in paying attention to the material presented.

4. Conclusion

Based on the results of data analysis and discussion of research results, it can be concluded that the use of QSH strategies, interactive media ecosystems, and combinations provide a positive effect on student learning outcomes. The QSH strategy combined with *flash* is the most effective to be used in learning process.

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Survey Of Medicinal Plants In Pangandaran Nature Reserve

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Abstract. Research has done at Nature Reserve and Nature Tourism Park (TWA) Pananjung Pangandaran which has a high diversity of flora and fauna, especially medicinal plants. Medicinal plants used to help the community in maintaining physical health. This study aims to determine the types of medicinal plants located in the Nature Reserve Pangandaran seen regarding species diversity and utilization of medicinal plant by the community. This research conducted on 25-29 April 2016 in Pangandaran Nature Reserve, West Java by using the descriptive method with survey technique through the interview, observation, and documentation of plant samples. The results of this study indicate that people know and utilize 24 types of medicinal plants that exist in the Nature Reserve Pangandaran. Plant parts used include leaves, stems, roots, sap, fruit, flowers, and bark. Type of treatable disease from minor ailments such as diarrhea, fever, toothache, to severe illnesses such as high blood pressure, hepatitis, and cancer.
Keywords: efficacious flora, traditional medicine, TWA Pananjung.

1. Introduction

Biodiversity is collected in various types of forest ecosystems, is Indonesia's natural wealth and supporting the nation's economy. Forests provide a variety of human needs, including wood as the main forest products and leaves, fruits, wildlife, honey, sap, dye and raw materials of drugs as forest products follow-up. Until now, most of the medicinal plant material has been harvested from nature. This situation indicates that the role of scientific institutions in efforts to preserve the use of medicinal plants still need to be improved in the future.

Pangandaran is one of the districts in West Java which inaugurated in 2012. Pangandaran Regency has an area of 168,509 ha with a sea area of 67,340 ha and has a beach length of 91 km [1]. One of the privileges of this district is the existence of Nature Reserve and Nature Park Pananjung Pangandaran. The Pangandaran Nature Reserve and Nature Reserve are located between 108 ° 40 'EL (East Longitude) and 7 ° 43' SL (South Latitude) with coordinates 7 ° 42.366'S 108 ° 39.332'E with the average topography of 100m in above sea level annual rainfall of 3,196 mm. The conditions caused the diversity of flora lies in abundance [2].

Pangandaran Nature Reserve and Nature Reserve is an old secondary vegetation, and the rest is primary forest consisting of 80% flora. The trees that dominate them include *Vitex pubescens* Vahl., *Dillenia excelsa* (Jack) Gilg, and *Cratoxylum formosum* Jack. There are also other tree species such as *Buchanania arborencens* Blume, *Ficus variegata* Blume, Benda in Indonesian (*Artocarpus elastica* Reinw. Ex Blume), nyamplung in Indonesian (*Callophylum inophylum* L.), waru laut in Indonesian (*Hibiscus tiliaceus* L.), ketapang in Indonesian (*Terminalia cattapa* L.) and butun in Indonesian (*Barringtonia asiatica* L.). Also, in the lowlands there are also exotic plants consisting of mahogany plants (*Swietenia macrophylla* King), *Acacia auriculirformis* A.Cunn., and jati in Indonesian (*Tectona grandis* L.f.). The diversity of this flora is efficacious as a medicine. These plants are used by the community as traditional medicine and have the commercial potential [3].

Medicinal plants contained in the Pangandaran Nature Reserve area are expected to have considerable potential so that they can be utilized as a source of germplasm and the cultivation of medicinal plants themselves for the development of Pharmaceutical Industry of traditional medicinal plants in Indonesia [4]. To examine in more detail about the types of medicinal plants, the potential, diversity and how to use and the benefits that have been utilized by the community around the Pangandaran Nature Reserve, it is necessary to do research. The purpose of this study is to understand

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the types of medicinal plants located in the Pangandaran Nature Reserve area in terms of species diversity and its usage by the local community.

2. Materials and Methods

This research was conducted on 25-29 April 2016 at Pangandaran Nature Reserve, West Java. This study used descriptive method [5] with design or survey technique through interview, observation, and documentation of plant samples.

2.1. Tools and materials

The tool used in this research is stationery, camera, and interview list. While the materials used are various types of medicinal plants contained in Pangandaran Nature Reserve, West Java.

2.2. Population and Sample

The population in this study is all respondents both from rangers and residents around Pangandaran Nature Reserve. The sample in this study consists of 12 rangers and 55 residents around Pangandaran Nature Reserve. Sample was taken at random.

2.3. Data Retrieval Techniques

Techniques of data collection conducted by interviewing rangers and residents around Pangandaran Nature Reserve, West Java. Then do direct observation at Pangandaran Nature Reserve and documenting the medicinal plant. Data obtained from this research is presented in tabulation form percentage, then analyzed descriptively.

Table 1. Grid about the types of medicinal plants in Pangandaran Nature Reserve

No.	Aspect	Aim	No. Question
1	Types of medicinal plants	Know the types of medicinal plants in Pangandaran Nature Reserve.	5
2	The medicinal plant part used for medicine	Know the part of medicinal plants used for medicine.	8
3	Benefits of medicinal plants	Knowing the benefits of medicinal plants that exist in Pangandaran Nature Reserve.	6,8
4	How to use medicinal plants	Knowing how to use medicinal plants.	8
5	Place of origin obtained medicinal plants	Know where to get medicinal plants	7
6	Time of use of medicinal plants (often / not)	Know the time of use of medicinal plants	1, 2, 3, 4

3. Results and Discussion

In this study the sample of respondents taken at random (random). Interviews conducted using questionnaires submitted to respondents. This interview was conducted in the form of open questions. After an interview with 67 respondents, 12 rangers and 55 people around Pangandaran Nature Reserve obtained the following results:

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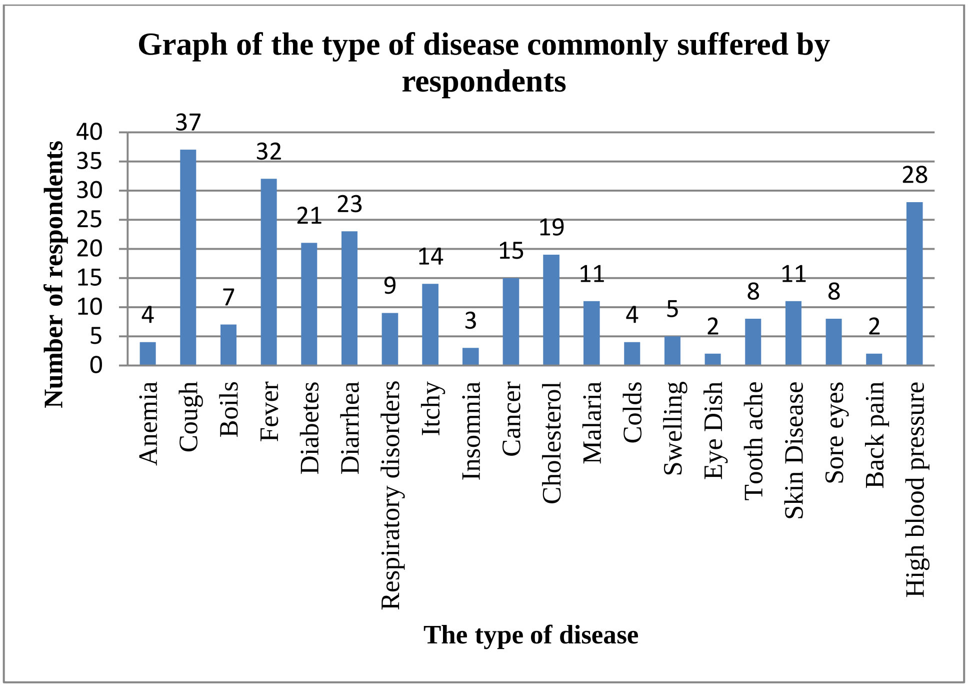

Figure 1. Graph of the type of disease commonly suffered by respondents

According to the results of the analysis that have been done as shown in Figure 1 above is known that there are 20 types of diseases commonly suffered by respondents. The five most common diseases were coughing 37 respondents, fever 32 respondents, high blood pressure 28 respondents, diarrhea as many as 23 respondents, and diabetes 21 respondents. According to information from respondents, some of these diseases are experienced in seasonal, and there are some genetically inherited diseases.

The number of plant species used is 25 species. Plant parts used include leaves, stems, roots, sap, fruit, flowers, and bark. Usage doses use a simple size such as a handful, strands, a piece, finger size. The compilation of medicinal plant data used by the community is presented in Table 2.

Table 2. Types of medicinal plants used.

Number	Local Name (Indonesian)	Latin name	Parts used	Benefits	Number of Respondents
1	Jati	*Tectona grandis* L.f.	Leaf	Treat high blood pressure, cholesterol, anemia, diabetes	4
2	Salam	*Syzygium polyanthum* (Wight) Walpers	Leaf	Treat high blood pressure, cholesterol, diarrhea, cough, sore skin	6
3	Kunyit	*Curcuma longa* L.	Rhizome	overcome menstrual pain, treat diabetes	8

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4	Singadepa	*Apama tomentosa* Wild.	Leaf	Treatthe decrease in vitality	2
5	Alang-alang	*Imperata cylindrical* L.	Rhizome	Treat the heat inside, pee stones	3
			Flower	Treat lung pain	
6	Bungur (Laban)	*Lagerstroemia speciosa* Pers.	Leaf	Treat diabetes	1
			Tree bark	Treating diarrhea	2
7	Sirsak	*Annona muricata* L.	Leaf	Treat cancer	3
8	Jambu biji	*Psidium guajava* L.	Leaf and Fruit	Treating diarrhea	8
9	Waru laut	*Hibiscus tilliaceus* L.	Leaf	Overcoming fever	3
			Root	Overcoming menstrual pain	
10	Sirih	*Piper betle* L.	Leaf	Treat diarrhea, toothache, and overcome body odor	5
11	Meniran	*Phyllanthus urinaria* L.	Leaf	Overcoming urinary stones, hepatitis	1
12	Buni	*Antidesma thwaitesianum* Müll.Arg	Fruit	Treat ulcers and itching	1
13	Bayur	*Pterospermum javanicum* Jungh	Bark and seeds	Treating diarrhea and itching	1
14	Rukem	*Flacourtia rukam* Zoll. & Moritzi	Leaf	Treating sore eyes	1
15	Huru batu	*Litsea cassiaefolia*	Root	Treat diabetes	1
			Leaf	Treat cancer, diarrhea, skin diseases	
16	Suweg	*Amorphophallus campanulatus* Decne.	Tubers	Treating wounds, cholesterol	1
17	Kebutul	*Cratoxylum formosum* Jack.	Leaf	Eyewash	1
18	Kateng-kateng	*Ipomoea pes-caprae* L.	Leaf	Overcome the itching, boils, inflammation	1
19	Ketapang	*Terminalia catappa* L.	Leaf	Overcome the itching, diarrhea,	2

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				respiratory disorders, high blood pressure, insomnia	
20	Nyamplung	*Calophyllum inophyllum*L.	Leaf	Overcoming eye disease	4
			Sap	Overcoming swelling	
			Seed	Treat cancer	
21	Kirinyuh	*Euphatorium odoratum* L.	Leaf	Overcoming inflammation, coughing, diarrhea, swelling, malaria	3
22	Mahoni	*Swietenia macrophylla* King	Seed	Treating high blood pressure, diabetes, fever, colds, skin diseases	4
23	Kiciyat	*Ficus septica* Burm. F.	Leaf	Treat skin diseases, boils, shortness of breath	1
			Root	Overcoming asthma, nausea vomiting	
24	Patma	*Rafflesia patma* Blume	Flower	Abdominal pain medication	1
			Sap	Treat wounds	

Based on the results of the analysis that has been done as seen in table 2 above is known that there are 24 types of medicinal plants used by respondents. The types of plants vary widely from herbs, grasses, lianas, to trees. Of the 24 types of medicinal plants is the most frequently used of turmeric (*Curcuma longa*) and guava (*Psidium guajava* L.) as much as 8 respondents; Indonesian bay leaf (*Syzygium polyanthum*) as many as 6 respondents; betel (*Piper betle*) counted 5 respondents; teak (*Tectona grandis*), *Calophyllum inophyllum*, and mahogany as many as 4 respondents. Of the several types of medicinal plants there are types that are categorized rare namely *Rafflesia patma* with IUCN Endanger status, so included into the protected and conserved flora [6]. So *Rafflesia patma* is not widely used community.

According to respondents, turmeric rhizome efficacious in treating diabetes. According to Ghaisas et al. (2009) turmeric rhizome has a compound that can reduce insulin resistance because the blood glucose content can be controlled so that the risk for type 2 diabetes will decrease [7]. Also, turmeric rhizome can help decay during menstruation so that menstruation becomes smooth. How to process it by extracting turmeric rhizome without using any mixture then extract it as a herbal drink.

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Guava leaf as a nutritious antibacterial in the healing of diarrhea by using decoction of its leaves that can inhibit the growth of bacteria, especially those causing infections such as *Salmonella typhimurium* [8] and *Escherichia coli* [9]. The way of processing this guava leaves is usually by boiling some young guava leaves then the boiled water is drunk, some respondents are mixing boiled water with a solution of flour. Indonesian bay leaf (*Syzygium polyanthum*) to cope with high blood pressure, cholesterol, cough, and skin diseases. Processing by boiling some bay leaves then boiled water mixed with additional ingredients such as lemon juice, honey or salt, and then drunk. Betel leaf as a nutritious antibacterial agent to overcome diarrhea, toothache and body odor. The way of processing by boiling a few leaves then boiled water taken or used for bathing. For toothache is usually boiled water used by gargling-gargle. According Sastroamidjojo (2001) on betel leaves contain tannins that are useful as antibacterial [10].

Teak leaf nutritious for Overcoming high blood pressure, cholesterol, anemia, diabetes, the use of young teak leaves brewed with hot water or by boiling it. Beauty leaf (*Calophyllum inophyllum* L.) leaves efficacious as an eye sore medicine, by soaking the leaves beauty leaf during the night, sap beauty leaf efficacious to overcome the swelling, and the seeds can overcome the cancer. According Sumardika (2016) beauty leaf seed skin extract there are compounds that correlate as an anti-cancer substance [11]. While mahogany seeds as a nutritious antifungal to cope with high blood pressure, diabetes, fever, colds and skin diseases. The way of processing this mahogany seeds by pounding the seeds until smooth then powder seeds mixed with warm water and can be consumed. But there are also those who consume directly, but it tastes bitter.

From the survey results, it can be noted that most people use medicinal plants from generation to generation. The community recognizes that knowledge of the use of medicinal plants is from parents or from their ancestors. This medicinal plant is obtained from Pangandaran Nature Reserve. Use and utilization of plants without any cultivation efforts will cause disruption of plant sustainability. In addition, various types of medicinal herbs taken directly from nature have a very low natural regeneration capabilities. Slow regeneration should get human intervention for conservation and development, such as in Pangandaran Nature Reserve.

4. Conclusions

Based on the results of research conducted in Pangandaran Nature Reserve about the survey of medicinal plants in Pangandaran Nature Reserve can be concluded that there are 24 types of medicinal plants in Pangandaran Nature Reserve. Of the 24 types of medicinal plants are the most commonly used are turmeric, guava, salam, betel, teak, nyamplung, and mahogany. The types of diseases that can be treated using these medicinal plants from minor ailments such as diarrhea, fever, toothache, to severe illnesses such as high blood pressure, hepatitis, and cancer.

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The Effect of Project- Based Learning and Problem-Based Learning to Thinking Skills in Learning Biology

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Abstract. The study aims at finding the effect of project-based learning and problem-based learning on student's creativity and critical thinking and the difference effect of project-based learning and problem-based learning on student's creativity and critical thinking. This study is quasi experiment using non- equivalent control- group design. Research population of this study was all classes in eleventh grade of mathematics and natural science program of SMA N 1 Temanggung. This study used three classes as research sample which implemented three different kinds of learning models. Data was collected using two instruments to measure student's creativity and student's critical thinking. Data was analyzed using t- test, multvariate analysis, and univariate analysis. The results reveal that project-based learning and problem-based learning affect student's creativity and critical thinking, there is a difference effect of project-based learning and problem- based learning on student's creativity, whereas there is no difference effect of project-based learning and problem-based learning on student's critical thinking.

Key words: *project- based learning, problem- based learning, creativity, critical thinking, respiratory system*

1. Introduction

The changing times that require individuals to master 21st century skills have an impact on education. Theimpact is a change in the learning activities. Learning in the 21st century should ensure students to have 21st century skills including skills, work habits, and characters that are believed to be essential to achieve successful life. Learning activities must ensure that students have (1) learning and innovation skills including critical thinking skills and problem solving, communication and collaboration,creativity and innovation, (2) information, media, and technology skills and (3) life and career skills (Trilling &Fadel, 2009, p.48). To achieve these skills, students require an educational program that is capable in developing human resources in order to become a competitive personal.

In response to the changes in learning due to the demands of 21st century skills, the Indonesian government develops the 2013 curriculum. The 2013 Curriculum adapts concepts of 21st century skills, scientific approach, and authentic assessment. One concept adapted in the curriculum is the concept of a scientific approach that includes several learning models. The learning models recommended by the 2013 Curriculum are project-based learning, problem-based learning, discovery learning, and guided inquiry. The application of these learning models is expected to develop student's skill especially student's thinking skills; creativity and critical thinking.

Learning in schools should be able to develop student's skills, one of which is the development of creativity. Creativity development aims to prepare students in facing the challenges of the working world (Kind & Kind, 2007, p.2). In fact, student's creativity development in schools is still not optimal. Lack of attention to the development of creativity is caused by the notion that creativity cannot be learned and measured. Trilling &Fadel (2009, p.57) states that creativity can be learned in a learning environment that supports questions, patience, openness to new ideas, high trust, and learning from mistakes and failures. Creativity can be developed with continuous practice. One of the most effective ways to develop creativity is by learning through projects in order to find solutions to real-world problems.

The development of science curriculum especially Biology curriculumaims to develop student`s thinking skills, specifically critical thinking. Critical thinking skills is the ability to interpret data, make inferences, explain information clearly, analyse, and evaluate. However,student's critical thinking skill is not yet fully developed. Therefore, based on the demands of the 21st century, especially creativity and critical thinking, it is necessary to develop learning activities in schools that are able to enhancestudent's skill in order to achieve 21st century skills.

Learning activities that are relevant to learning in the 21st century are project-based learning and problem-based learning. Both models of learning are equally presented issues brought from the real world. Authentic issues presented at the beginning of the lesson are made into problems that must be solved by students either individually or groups.

Implementation of project-based learning in Biology learning can be done by conducting project-based learning syntax written in lesson plans. The syntax of project-based learningby Bender (2012, pp. 65-66) are 1) introduction and team planing the project, 2) initial research phase in term of gathering information, 3) creation, development, initial evaluation of presentation, and prototype artifacts, 4) second research phase, 5) final presentation development, and 6) publication of product or artifacts.

In addition, project-based learning and problem-based learning models can be used to develop 21st century skills. Problem-based learning is a teaching model using problems as a main focus for developing problem-solving skills, materials, and self-organization (Kauchak&Eggen, 2012, p.307). The problems usedin this model of learning are real world problems (Arends, 2007, p.41; Fogarty, 1997, p.2). Problems encourage students to share knowledge,negotiate alternative ideas,seek information, and construct arguments to support established solutions (Sawyer, 2014, p.298).

Problem-based learning can be applied in learning Biology by following syntax of the learning model. Problem-based learning begins with 1) problem orientation, 2) organizing students to conduct research, 3) assisting independent and group investigations, 4) developing and presenting artefacts, 5) analysing and evaluating problem solving process(Arend, 2007, p.57). During the learning activities, teachers play a role in providing problems, asking questions, and facilitating investigations and dialogue.

The material used in this research is respiratory system including competence 3.8 and competence 4.8. Competence 3.8 mentioned that students are required to analyse the relationship between the structure of the respiratory system and its relation to bioprocess and disfunction that can occur in the human respiration system. In competence 4.8, it is added that students are also trained to present the analaysis result from the effect of air pollution to the respiratory disorder based on literature review.

Respiratory system material is choosen as a material in this research, because it is adjusted to the research context which is located in SMA Negeri 1 Temanggung. According to data from Directorate General of Plantation in 2014, Temanggung Regency is one of the largest regency that has tobacco (*Nicotianatabacum*)plantation in Central Java Province. Temanggung Regency has 15,730 Ha of tobacco plantation. Harvested reaches 12,587 Ha. Tobacco production reached 6,923 tons and productivity reached 550 Kg/Ha. Aside from being a tobacco producer,

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data from the Central Java Provincial Health Office (2014: 15-16) shows that in 2014, there are severalrespiratory system disease caused by bacteria or infection, such as tuberculosis and pneumonia.

Problems used in project-based learning and problem-based learning are associated to respiratory system. By learning using project, students are faced with the essential question of how activities affect human lung capacity and how to reduce smoking habits. Based on information obtained by students from various sources during the learning activities, students are asked to design and test tools to measure the lung capacity and also make posters to reduce cigarette consumption.

In problem-based learning, students are faced with problems in the respiratory system associated with smoking habits. Students will investigate the influence of cigarette smoke and cigarette content by doing a simple experiment. After investigating and analysing the results of the investigation, students discuss diseases that may infect the respiratory system and seek a preventive solution from respiratory disease and then present the solution obtained. Therefore, students are expected to develop creativity and critical thinking skills by learning through project-based learning and problem-based learning.

After the observation, there were some problems found such as project-based learning and problem-based learning were rarely implemented in learning Biology at school. In addition, empirical evidence of the influence of project-based learning model and problem-based learning on the ability of students was limited. Moreover, student's creativity ability was low, shown by high tendency of similarity in doing tasks given by teacher. The critical thinking ability of the students was low, it was shown by the lack of analytical skills in answering questions asked by teachers during the learning activities. Furthermore, the development of student`s creativity was low because of lack of encouragement . Learning activities in schools has not yet developed student's critical thinking optimally. More importantly, the development of creativity and critical thinking of students on learning Biology has not been a serious concern in the learning activities. Moreover, based on the previous research, learning biology using project- based learning can enhance learning activities and student's creativity (Yahya, 2014). It is also able to develop three learning domain namely cognitive, affective, and psychomotor (Sumarni, et. al, 2016).

The study aims to find (1) the effect of project-based learning and problem-based learning on student's creativity and critical thinking and (2) the difference effect of project-based learning and problem-based learning on student's creativity and critical thinking in respiratory system at SMA N 1 Temanggung.

This research is expected to provide benefits either directly or indirectly to teachers, students, and other researchers. Teachers can enrich the learning model such as project-based learning model and problem-based learning in Biology learning. Students can improve thinking skills, such as creativity and critical thinking, and also can apply the knowledge gained during the learning activities in everyday life. In addition, other researchers can get information about the effectof project- based learning and problem- based learning to student's creativity and critical thinking, so that it can be beneficial for further research.

2. Method

This research is quasi-experimental research using nonequivalent control-group design (Gall, Gall, & Borg, 2007, p.416). The quasi experimental design used in this research is non-equivalent control-group design. The research was conducted at SMA Negeri 1 Temanggung, Temanggung Regency, Central Java from January to February 2017. The population of this research is the entire class of IX grade of Mathematics and Natural Sciences Program which is

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divided into 7 classes. The sample of this research is 3 classes taken randomly from IX grade of Mathematics and Natural Sciences Program. XI MIPA 3 implemented project-based learning model, class XI implemented problem-based learning model, and class XI MIPA implemnted 5M learning model as a control group.

Data collected in this research consists of learning implementation data, student's creativity data, and student's critical thinking data. Learning implementation data were obtained from the observation sheet which was developed based on the lesson plan. The project-based learning model begins withintroduction and team planing the project, initial research phase in term of gathering information,creation, development, initial evaluation of presentation, and prototype artifacts,second research phase,final presentation development,publication of product or artifacts.Problem-based learning model begins withproblem orientation,organizing students to conduct research,assisting independent and group investigations,developing and presenting artefacts, andanalysing and evaluating problem solving process.

Student's creativity data and student's critical thinking data were obtained using the instruments of creativity and critical thinking. Aspects measured in creativity consist of unusual uses, sensitivity to science problems, the ability to develope the product, the ability in scientific imagination, creative problem-solving skills, experimental design abilities, and the ability to design products. Aspects measured in critical thinking consist of the ability to make interpretation, analysis, inference, evaluation, and explanation.

To know the effect of project-based learning model and problem-based learning model to student's creativity and critical thinking, data were analysed using paired sample t-test. The test was conducted on two paired samples. Furthermore, to analysis two groups of data simultaneously, data were analysed using MANOVA. Before data were analysed using MANOVA. Data had to meet the assumptions test which consists of normality and homogeneity test

3. Result and Discussion

This research was conducted on respiration system material in XI grade. It was divided into 6 mettings. Based on observation, project-based learning and problem-based learning model were implemented accordingly to lesson plan.

The learning activities was started with pre-test and ended with post-test. Pre-test was conducted to obtain student's creativity and critical thinking data before the treatment. In the end of learning activities, post-test was conducted to obtain student's creativity and critical thinking after the treatment. Both pre-test and post-test were implemented using the creativity test and critical thinking test that have been developed. Table 1 shows the results of descriptive statistics of students' pre-test and post- test of creativity

Table 1. The Results of Descriptive Statistic on Student's Creativity

Descriptive Statistic Result	Experiment				Control	
	PjBL		PBL		5M	
	Pre-test	Post-test	Pre-test	Post-test	Pre-test	Post-test
Mean	44,01	70,38	46,85	59,77	35,40	59,45
STDV	11,45	11,38	11,69	16,05	14,46	17,07

Based on the data presented in the table, it can be concluded that the average on student's creativity increase in project-based learning class, problem-based learning class, and 5M class.

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Student's critical thinking ability datawas obtained from pre-test and post- test of student's critical thinking. Figure 1 shows the results of descriptive statistics of pre-test and post-test of critical thinking of students

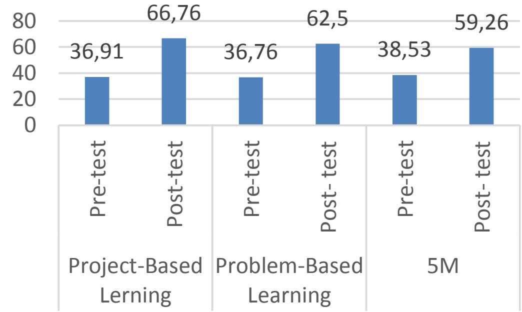

Figure 1. The Results of Descriptive Statistic on Student's Critical Thinking

Based on the results of descriptive analysis, it can be concluded that the average critical thinking ability of students has increased after following the learning activities with project-based learning model, problem-based learning model, and 5M.

Data analysis was conducted by comparing mean of each dependent variable measured in terms of student's creativity and critical thinking skills. The comparison of mean data before and after treatment aims to test the mean equality between experimental class in project-based learning and problem-based learning, and control class by using 5M learning on student's creativity and critical thinking simultaneously. The mean comparison is also conducted only on the mean post-test of student's creativity and critical thinking skills. The comparison of post-test mean aims to test the hypothesis of the effect of each learning model on each dependent variable; creativity and critical thinking skills. The mean comparison aims to determine the comparison between the effect of project-based learning model and problem-based learning, the comparison between project-based learning and 5M, and the comparison between the problem-based learning model and 5M to the student's creativity and crtitical thinking skillls on the learning of Biology especially regarding respiratory system.

To know the effect of learning models; project based learning model, problem-based learning, and 5M to creativity and critical thinking skill of students, paired-sample t-test was conducted. This test was performed in order to know the difference between studen't creative and critical thinking skills before and after the treatment. Table 2 shows the result of paired sample t-test

Table 2 The Result of Paired Sample T- Test

Dependent Variable	Learning Model	Sig.
Creativity	PjBL	0,000
	PBL	0,000
	5M	0,000
Critical Thinking	PjBL	0,000
	PBL	0,000
	5M	0,000

Based on the results of paired sample t test, the result, both creativity and critical thinking skills in project-based learning model, problem-based learning model, and 5M show significant difference, which was indicated by significance value 0,000 (Sig. = <0.05). This

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means that the average value of pre-test with post-test is different. It can be concluded that both project-based learning and problem-based learning affect student's creativity and critical thinking.

To investigate the difference of learning effect using project based learning, problem-based learning, and 5M model on student's creativity and thinking skill, multivariate test was conducted and continued by univariate test to determine which variables contribute to the overall difference. Prior to the multivariate test, a prerequisite test was conducted including normality and homogeneity tests.

Based on the results of normality test with Kolmogorov-Smirnov on pre-test creativity and critical thinking results, it showed that the data of pre-test creativity result of the three groups is distributed normally showed by significance value above 0, 05. Based on homogeneity test results based on Box's Test of Equality of Covariance Matrices shows that pre-test data has homogeneous population data variance indicated by a significance value greater than 0.05.

Multivariate test was conducted to know the effect of learning model that was project-based learning, problem-based learning, and 5M to creativity and critical thinking ability of students simultaneously. Multivariate tests were performed for post-test value of creativity and critical thinking. The multivariate test used was Hotelling's Trace statistics. Hotelling's Trace was used for two groups of dependent variables. In this research there were two dependent variable, such as creativity and critical thinking. Table 3 presents the results of multivariate statistics with the Hotelling's Trace test

Table 3. The Results of Multivariate Statistics

Effect	Value	F	Sig.
Learning Model	0,126	3,052	0,018

The result of multivariate analysis using Hotelling's Trace test showed value equal to 0,126, and $F_{Calculate}$ equal to 3,052. The value of significance showed the number 0.018 which is smaller than 0.05 so that H_0 is rejected. Based on the results of the analysis it can be concluded that there is an average difference between project-based learning model group, problem-based learning model, and 5M toward creativity and critical thinking ability. After doing multivariate test on result of post-test of creativity and critical thinking ability, then conducted univariate test.

Univariate test is conducted on post-test value of student's creativity and critical thinking skills in order to analyse each variable. Table 4 shows the result of univariate test

Table 4. The Result of Univariate Test

Test of Between-Subjects Effects			
Source	Dependent Variable	F	Sig.
Learning Model	Creativity	5,812	0,004
	Critical Thinking	1,885	0,157

Univariate test analysis on post-test value shows that for dependent variable of creativity show $F_{Calculate}$ equal to 5,812 and significance value less than 0,05 (Sig = 0,004). These values indicate that the three models of learning have an influence on the creativity of students positively and significantly. As for the ability of creative thinking, univariate test results show $F_{Calculate}$ value of 1.885 and significance value greater than 0.05 (Sig = 0.157). These values indicate that the three learning models have no significant effect on creativity in a positive and significant way.

After conducting univariate test, the effect of each model of learning to student's creativity and critical thinking was tested. The tests were performed on each mean of the creativity and ability of the students' post-test by using the Tukey test. The result shows that the significance value of project-based learning model and problem based learning model is smaller

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than 0.05 (Sig = 0.012) which means that there is a significant difference of creativity average on both learning models. The result of the analysis for the project based learning model and 5M shows the significance value less than 0.05 (Sig = 0.010) which means that there is difference of creativity average of both learning model. The test results on the model of problem-based learning and 5M shows a significance value above 0.05 (Sig = 0.996) which means that there is no difference in the creativity average of the two learning models.

Based on the results of Tukey's test analysis for the effect of learning model of critical thinking, it is also known that the significance value for project-based learning model and problem-based learning model is greater than 0.05 (Sig = 0.516). The significance value means that there is no difference in the average of critical thinking of both learning models. The significance values greater than 0.05 also occur for project-based learning and 5M (Sig = 0.134) and problem-based learning and 5M (Sig. = 0, 682) models. The value of significance means that there is no difference in the average of critical thinking in the learning models.

Project- based learning is one of the suggested learning models to be implemented inlearning Biology. It can encourage students to create project whether individually or in groups. Other learning model such as problem- based learning are also proposed to be implemented in Biology learning. These alternative learning models provide opportunities for teachers to choose a model of learning accordingly to the characteristics of students and materials.

The questions for measuring creativity is included into divergent thinking questions. Divergent thinking questions tend to ask for varied or non-fixed answers rather than only one alternative answer. In this research,questions are arranged based on the local issues. According to Runco (Kaufman & Sternberg, 2011, p.422) contextual questions are able to illustrate the behavioural habits of students on the actual conditions.

Based on the data, student's creativity skills in project-based learning class has a higher average post-test than students in problem-based learning class and 5M class. The higer average is influenced by the experience of learning activities experienced using project-based learning model. Creativity in the context of learning begin with the process of sensing and observing problems, making conjectures about problems, assessing, and testing allegations or testing hypotheses. The next process is to change and conduct the testing, and then deliver the results (Torrance, 1979, pp.233-234).

Project-based learning begin with 1) introduction and team planing the project, 2) initial research phase in term of gathering information, 3) creation, development, initial evaluation of presentation, and prototype artifacts, 4) second research phase, 5) final presentation development, and 6) publication of product or artifacts (Bender, 2012, pp.65-66).The learning of project-based learning that is carried out refers to the driving question (Bender, 2012, p.46, Thomas, 2000, p.3) which is closely related to the respiration material. Driving question helps students to develop the ability to find solutions actively. The driving question used was how human activities influence the performance of the respiratory system and how efforts can be made to encourage people to reduce smoking habits. Driving questions in the begining of the lessons are broad and not specific, so that students need to make discoveries and innovations by adding questions to make the project more specific.

At the beginning of learning with project-based learning, there is an anchor that is used to be an introduction to the project and also attracts students to the project (Bender, 2012, p.31). The anchor used in this lesson was a journal and article as references to make a simple instrument to measure the lung capacity and also posters.During project-based learning, students were encouraged to identify problems that affect lung frequency and lung capacity. After identifying

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problems, students developed and designed solutions by designing simple instrument to measure lung capacity. The instrument was made to prove that human's lung capacity was influenced by several factors. Students worked and conducted experimentto measure lung capacity in a group. After conducting experiment, student made report and also presentation. All of those activites were student- centered, students determinedamd created their own projects in group.

During the learning activities, the role of the teacher is as a facilitator and accompanies the students (Thomas, 2000, p.3). Teacher gives advice and feedback in order to improve the projects. Feedback is also obtained from other students or other groups when the project design is presented. Peer-evaluation and feedback from teachers provide opportunities for students to make reflection and improvemnet on their projects (Bender, 2012, p.31; Kean &Kwe 2014, p.192). Students work together in groups to complete the project design (Bender, 2012, p.31, Mioduser&Betzer, 2007, p.61). Students also create a schedule to finish the planned project. After product had been finished, students present the product and also the posters.

The first project in project- based learning was making simple instrument to measure lung capacity. During the process of making instrument, students were trained to be sensitive to the problem that every person gas differnt lung frequency and lung capacity. The differences are caused by various factors. Students were trained to find out and prove the differences of lung frequency and lung capacity. Teacher guideed students in designingthe instrumet. Students were also trained to design products using simple materials and apply scientific principles to obtain accurate measurement results.

The second project was making poster regarding to the danger of smoking. In the second project the students were trained to be sensitive to the smokers in the community. Students were encouraged to create posters as a preventive effort in order to invite the community to avoid the habit of smoking. Poster was made by considering some aspect such as originality, poster component, language, andinformation accuracy displayed in the poster.

Projects can be very beneficial in developing cooperative skills (Collette &Chiappeta, 1989, p.264). Peer- assessment shows that the students can work together with the group well. This is indicated by the value given to the questionnaire distributed to the student. In addition, project work actively encourages students to gather more in-depth knowledge of respiratory material and sharpen skills in research (Kean &Kwe, 2014, pp.191-192).

Project-based learning and problem-based learning have different characteristics from various aspects. According to Savin-Baden & Major (2004, p.7) differences in project-based learning and problem-based learning can be assessed based on knowledge organization, the form of knowledge, the role of students, the role of the teacher, and the type of activity undertaken during the learning activities. In project-based learning the assignment has been arranged in such a way by teachers (tutor-set or structured tasks), while on problem-based learning the problem is presented openly (open-ended situations and problems). In project based learning knowledge formand practical, while in problem-based learning in the form of contingent and constructed.

The role of teachers and students during the learning activities with project-based learning and problem-based learning are also different. In project based learning the role of teacher as tasks setter and project supervisor and the role of students as completer of project or member of project team that develop solution and strategy. In problem-based learning the role of students is as active participants and inventors and have their own learning experience, while the role of teachers is to provide opportunities for students to learn.

Activities during the learning activities between project-based learning and problem-based learning can also be distinguished. In the project based learning, learning activities focus on

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problem solving activities and problem management. In problem-based learning, learning activities focus on developing strategies to facilitateteams and learning.

Project-based learning conducted in this research was the representation of ideational learning. Ideational learning is a learning that relying on the aspirations of students. Learning is open-ended developing domain that supports uniqueness and expects different learning outcomes (Dettmer, 2006, p.73). Projects assigned to students give students the freedom to design and develop products accordingly to their expectation, so that one group and another have different results.

Project-based learning is a constructivistic learning that students can learn maximally if able to construct artefacts so that students can be more involved in learning activities (Grant, 2002, p.2). Students learning in project- based learning class were able to make a good report which consists of title, purpose,theory, tools and materials, procedure, results, discussion and conclusion. In addition, students are able to collect information about the dangers of smoking and put in into the poster as well.

Student's creativity can be developed through learning that develops the imaginations by providing opportunities for creative writing and also problem solving that offers a variety of different perspectives. Learning process provides enough time for students to seek and explore the information needed during the learning activities by utilizing the technology (Burke, 2007, pp.58-63). Thus, learning process is expected to enhance aspects of scientific creativity that include aspects of unusual use, sensitivity to science problems, the ability to improve usability and product value, the ability of scientific imagination, creative problem-solving skills, experimental design skills, and designing products.

Students learn using problem-based learning have lower creativity average than students in project-based learning class. Learning problem-based learning models are effective when used for long-term learning and improving student's performance, so students show less than optimal results when tested on tests for short term knowledge retention (Strobell& Barneveld, 2009, p.55).

Science learning can be used to develop student's higher-order thinking skills such as critical thinking. Critical thinking is a complex thinking process that consists of interpretation, analysis, inference, evaluation, explanation, and self-regulation (Facione, 2011, p.5). Critical thinking is referred to as higher-level thinking (higher-level thinking/ higher-ordered thinking), which includes the top three capabilities in Bloom's Taxonomy: the ability to analyse, synthesize, and evaluate (Bookhart, 2010, p.3; Moore & Stanley, 2010, p.6). Development of critical thinking ability can be conducted by open- ended question or divergent question. Open- ended questions are questions that expect many possibilites of correct answers (Collete&Chiappetta, 1994, pp.142-150; Subali, 2013, p.13). One of the learning models that develops critical thinking skills especially on science is problem-based learning. Problem-based learning presents issues that encourage students to not only thinking about the cause but also thinking about how to solve the problem (Strobel &Barnevel, 2009, p.45).

Result shows that there is no significant difference in the studen's critical thinking skills in project-based learning, problem-based learning, and 5M. The results can be caused by many factors, such as learning activities. The learning activities implemented in Biology learning using problem-based learning are conducted accordinglyto problem- based learning by Arends (2007, p.57). Learning begun with the first phase of learning, which was problem orientation. The second phase was organizing students to research. Students made group and distributed learning tasks according tothe issue. The third phase was an independent or group investigation. Teachers

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encourage dstudents to get the information needed to find solutions to problems by carrying out experiments.

After conducting the experiment, students developedpresentation about the investigation result and also presented the results of discussions about smoking-related diseases and its prevention. During the discussion, teacher guided student to discuss and give the clarification. At the end of the learning process,teacher helped students to make a reflection about learning activities that had been done.

In problem-based learning, students presented the problem about the effect cigarettes content on human's health. Students were asked to find the cause why the cigarette ingredients are dangerous by investigating and seeking information from various sources. Students then discuss one of the diseases caused by the content in a cigarette that consists of causes and efforts to overcome and prevent the disease. The problems used during the learning activities was an authentic problem. The issues raised in this study was issues related to the impact of substances contained in cigarettes to health.

Problem-based learning is one of the learning models that able to develop student's critical thinking skills. At the beginning of learning, students are faced with incentive problems (Arends, 2007, p.42). In this research, problems were presented in the form of articles and video. The problems presented were related to real life problems regarding to problems caused by smoking. The problem isill-structured that expect more than one solution (Tan, 2009, p.63).

During the learning activities the student is guided by the teacher to carry out authentic investigations (Arends, 2007, p.42). Investigation is conducted by carrying out a simple experiment. Investigation aims to seek information from the problems presented, because the information presented at the beginning of learning is still limited (Tan, 2009, p.63). A simple experiment conducted by students consists of two kinds of experiments conducted at the fourth meeting. The first experiment was an experiment simulating the danger of cigarette smoke against the respiratory organs. Studentsused three kinds of cigarettes which were filtered cigarettes, unfiltered cigarettes, and homemade cigarettes. The lungs were simulated using white cotton. Students burnt cigarettes and observe the yellowish stain on cotton. Students then assumed that the more yellow stains on cotton, the more substances in the cigarette that will enter the human lungs.

The second experiment was the effect of tobacco content on the embryo. The embryo used in this experiment was the green bean embryo. Experiment was conducted by growing seeds on a medium that has been previously given tobacco water. In addition, students also grew the seeds in water as a control. Students then observed the growth of seeds for 4 days in a row and saw the difference.

After conducting group investigations conducted by experiment, students made report and conducted the discussion to find out the relationship between the experimental results and the issues. The results of group discussions were presented. Students worked together in groups during learning process (Arends, 2007, p.42, Hmelo-Silver, 2004, p.235), while teacher played a role as a facilitator (Strobel &Barnevel, 2009, pp.45-46).

During problem-based learning, student's critical thinking skills can be trained and developed. Mergendoller, Maxwell, &Bellisimo (2006, p.50) states that in problem-based learning teachers train students to carry out further research and discovery, but their assignment is not determined by the teacher, so students are freed to design and develop experiments through investigation. During the process of designing the experiment, students are trained to construct questions in order to construct the objectives of the experiment, determine the independent variables and the dependent variables in the experiment, write down the experimental results, and draw conclusions from the experiments. Students who participate in project-based learning have the opportunity to construct their own knowledge, compare it with other students and also select their knowledge while other students collect learning experiences. In addition, students who participating in problem-based learning are able to store knowledge longer, identify causal relationships, and transfer the concept to new problems (Savin-Baden & Major, 2004, p.30).

4. Conclussion

The results reveal that project-based learning and problem-based learning affect student's creativity and critical thinking, there is a difference effect of project-based learning and problem-based learning on student's creativity, whereas there is no difference effect of project-based learning and problem-based learning on student's critical thinking.

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Implementing *Jelajah Alam Sekitar* Teaching Approaches On Animal Ecology Course

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Abstract. This action research aimed to improve student achievement and learning activities on Animal Ecology, by engaging students in '*Jelajah Alam Sekitar*' (JAS) teaching approaches, through which they explored the nature and used learning resources from their nearby environment, conducted from May to July 2015, at UNNES Department of Biology. A group of 20 six^{th} semester students was involved in three cycles of study, each of which is consisted of planning, acting, observing and reflecting. Results showed the average scores of cognitive learning achievement was increased from the first cycle (63.9) and the second cycle (74.9), but then decreased at the third cycle (73.2). However, the average scores of classical learning mastery were more likely to be increased, from 30% at the first cycle to 75% at the second cycle, and to 90% at the third cycle). The cognitive test scores of Animal Ecology were higher than that of the preset value, i.e. 85%. The student exploration activities, as recorded by "student activity sheets", were improved from 80% at the first cycle, to 90% and 100% at cycles II and III, respectively. Similarly, the examination of factual data showed 95% at the first cycle, and an increased score to 100% at both II and III cycles. However, based on the examination of the discussion activities, student activity scores varied. From the first to the second cycles, discussion activity was increased from 80% to 95%, while from cycle II to III, they were decreased from 95% to 90%. In conclusion, that the implementation of JAS approach could increase the student activities and achievement on Animal Ecology.
Key Word: Animal Ecology, Implementing**,** JAS teaching approaches,

1. Introduction

Animal Ecology the compulsory subject for biology students at the Unnes Biology Study Program. An initial observation on the students' participation in this Animal Ecology course (2015) indicated that in general the students were very interested in this subject, but in fact the material rather difficult to understand. The reason was that students were intimidated by ecological modelings quite complicated with mathematical calculations. Due to their lack of understanding, the student's activity during the learning was quite passive. As a result, many students did not achieve their optimum learning scores.

During the lecture course in Semester 2013/2014, it was found that 42.9% (28) students of Animal Ecology got the final score of CD or C. There were several reasons for the poor exam result. First, students were unable to analyze the data as the course implemented many mathematical expressions. Second, students were often unprepared when attending Animal Ecology class and facing sets of data to analyze. There was also fewer activities in the discussion. To address the various issues of Animal Ecology course, JAS approach was implemented.

JAS approach is an exploration of surrounding environments either directly or indirectly, and there are always be such activities as forecasting, observation, and explaining, as well as reporting in the form of oral or written communication, with the use of images, photos, and audiovisual. By applying the JAS approach on each scientific process, students are expected to be more easily understand the data, and thus easily analyze and interpret it. The activities also include the preparation of the reports and presentations, the teacher assistance to students in expressing their opinions so that the lecture becomes livelier, and in turn it will have a positive impact on the learning outcomes.

JAS teaching approaches brought significant effects on learning.JAS teaching approaches brought significant effects on learning. Riyanto, Ngabekti, and Sukaesih (2005) implemented the JAS approach in *Micro Teaching* course. The results showed there a variety of strategies, and learning methods, chosen by students to prepare a Lesson Plan. The *Micro Teaching* course was not only

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conducted in the classroom, but also outside the classroom by using the environment as a learning resource.

The JAS approach was also implemented in combination with the Ecosystem Role Playing method on the material at *Pondok Pesantren Modern Selamat Kendal* (Ngabekti, et al., 2006). This study was triggered by the fact that most students were somnolent in almost all subjects. The busy activity at the boarding school started at 4:00 a.m. and end at 9:00 p.m. was the major cause of somnolence students. With the implementation of the JAS approach combined with role play methods, there was no longer somnolent students. Utilization of boarding environment as a learning resource in JAS approach also increases the activity and student learning outcomes.

JAS approach implementation in the Biostatistics course wes carried out by Budiyanto and Ngabekti (2007). The results showed an increased motivation and learning outcomes. Approximately 78% of students got score B, AB, and A, while the rest were C and CB. Based on several studies above, it is clear that the JAS approach with six characteristics has positive effect on the activity, motivation, and learning outcomes.

Sugiyo, et al., (2008) implemented *Team Game Tournament*(TGT) model and JAS approach was also portfolio evaluated in Colloidal System can increase the learning outcomes. Mastery learning percentage is 97.37%. The students' psychomotor average score is taken from the student's demonstration score of 71.58; while the average value of student discussion is 76.20. The activity of students increases with the treatment (demonstration, discussion, tournament). Percentage of activity in Cycle I was 70,13%, in Cycle II was 72,70% and in Cycle III was 75,20%. Those results indicate students are getting more active and are happy to learn chemistry.

Auliaty, (2010), in a study that utilized grass as a source in learning component of living and environment indicated that applying the model of Group Investigation study and JAS approach at SDN Pulogebang 08 Pagi could improve students' mastery learning. Sari, et al. (2012) stated that the use the UNNES educational garden as a source of learning living creature classification by applying JAS could optimize the activity and learning outcomes of Teuku Umar Junior High School students.

Wahyuni (2012) concluded that the application of JAS in digestive system topic had a positive effect on the mastery of science process skills of students of SMAN 12 Semarang. The result of the correlation test of misery showed the correlation coefficient was bigger 0,31 and the coefficient of determination 10%. Testing significance of RB result was calculated using t-test, obtained t count>t table that is 4,68>1,993. Experimental class learning outcomes> control class outcomes (100%>57%). About 97% of the learners responded 'very good' and 'good' to the application of the JAS approach in digestive system topic in helping them enhanced science process skills. The teacher showed positive response as well.

Alimah, et al., 2014, through her study about the Meksint Korefsi Model with JAS Approach on Animal Body Structure Learning that has been developed through three stages of planning, design and development and through three evaluations of alpha test, beta test and field test, stated that JAS was suitable for use as choice in STH course. Alimah (2014) furthermore explained that Experiential Jelajah Alam Sekitar (EJAS) could be used to enhance student's critical thinking ability. The application of EJAS model in designing learning activities in classroom both indoor and outdoor could develop the critical rational thinking ability of students in biology.

The results of Pratama et al (2015) study on the application of the JAS approach concluded: (1) the development of Javanese culture integrated with JAS based-module in Earth Movement and the Moon topic was using the 4D model (defining, designing, developing and disseminating) (2) the achievement of the students' learning outcomes had a significant improvement in the "moderate" category, (3) there was different result in student learning outcomes, before, and after used the module, (4) teacher and student showed 'good' response in module development. Meanwhile, Palisoa and Wali, tt. Stated that the adoption of JAS approach helped 32 students (94.11%) to reach mastery learning.

Based on the above background, the still unsolved problem was the lack of understanding of Animal Ecology subject, presumably as a result of the monotonous course. To address the problem, JAS approach would be implemented before and during every students' discussions. And thus, the research question was as follows, whether applying the JAS approach could increase student's

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activities and achievement in the Animal Ecology class. The purpose of study was to improve the student's activity and achievement in the subject of Animal Ecology through the application of JAS approach.

2. Research Methods

This study was conducted from May to July 2015 with a learning group 1 of sixth semester students, a total of 20 Biology Department students. Their academic ability and activity in the learning process were comparably good, but their activity learning results were not satisfied. The sample selection was based on criteria by which the classes were administered by Lecturers of Animal Ecology. This study was conducted after the Mid-Semester Exam, with three cycles and in 8 meetings, duration of each meeting was 2 x 50 minutes. Material discussed was the animal population with activities by the characteristics of JAS approach.

This research was a classroom action research (CAR). Total cycles were undertaken to suit for the available time for completing the course material. The steps of the implementation of each cycle consisted to planning, action, observation, and reflection.

Planning, consist to five steps: preparing learning tools such as syllabi, Lecture Units and teaching materials through problem-solving (by lecturer team). Designing and compiling Student Activity Sheets (SAS*)* for exploration of the concept (by the students); observation sheets to observe the student opinion on the impact of JAS approach (by lecturer team). Preparing a questionnaire, to know the student opinion to the JAS-approached lecturing (by lecturer team), and developing an evaluation tool in the form of test items to measure the student's cognitive learning outcomes (by lecturer team).

The implementation JAS, began with prayer and singing (bio edutainment), and each student independently explored the concepts by implementing Underlines Skills and Creating Questions in an SAS. The ability to understand the concepts can be seen from the ability to create concept maps.Students in groups of four students explore the environment in to obtain factual data (contextual). Data to be collected were to be handled according to the deal of members of each group (bio edutainment). To facilitate the understanding of the actions implemented in each cycle. JAS implementation in three cycles (topic: density, factors affecting and the growth of animal populations): students can calculate the density of the "Capture mark Recapture" marking using "Removal Method".

Exploration concepts by underlining, developing skills, make inquiries, and preparing concept maps. Data exploration using animals in the environment (fish, rice fleas / flour beetles), as the object of observation to calculate the density, Life Table, and the population growth. Once the data were obtained, then the report was made in full (the scientific process). The report were presented in class discussion to confirm the accuracy of the analysis and to arrive at a conclusion. In this discussion, lecturer reinforced so that students better understood the material (authentic evaluation). Evaluation of learning outcomes was conducted at the end of each cycle (authentic evaluation)

Observation the implementation was taken by using observation sheet in an exploration activity and discussion. The observation was done by the lecturers as observers, each observer observed one (1) group. The object of the observation was as follows. Student's positive activities during the data exploration (measuring/ calculating, taking notes, discussion, cooperation); and negative activity (inactivity). Student's positive activities during the discussion (paying attention, asking, arguing), and negative (silent / preoccupied), perform other tasks). Observer will give score A (very good: >85, B (good: 70-84)), C (medium: 60-69), D (less: <60) for each student, to obtain a group score in positive activities. For negative activity, the scoring was the reversal of the above. Reflection was did either by the lecturer or from student's input for improvement in the next cycle.

Data analysis was presented in Quantitative Descriptive Analysis. Student outcome data was presented in Percentage Descriptive Analysis. The student's ability to argue was analyzed narratively. JAS approach implementation was considered 'successful' when the predetermined standard score was satisfied. The four indicators were: (1) JAS approach implementation was considered 'successful' if the student's cognitive score reached the standard score that is student has achieved the competence level of >70%, and as member of a group, has achieved the competence level of >85% in Animal

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Ecology course with a minimum grade of CB; (2) As much as >80% of students active and could work in groups to solve problems through the exploration of the environment, and respect the other member's attitudes and opinions in the discussion about the issues either in the discussion forum and classical groups; (3) As much as >80% of students were actively involved to express opinions in the discussion and adoption of the approach found in the course JAS Animal Ecology; and (4) As much as >80% of the students showed a caring attitude to the environment during the exploration and observation (to treat animals well, did not kill animals, clean up the site after the completion of the observation, dispose of waste in place etc.)

5. Results and Discussion

Implementation of the action cycles was running without hassle. Exploration concept with SAS required coaching for students to read in advance the night before the lecture. This can be seen where students who did not yet ready to collect their individual work when entering the classroom. This means that students did not prepare the exploration concepts.

For the time effectiveness, the data exploration material was prepared in advance due to the use the animals as object (fish, fleas rice, flour beetles) and this requires acclimation time in the laboratory. With this effort, the factual data exploration could be carried out when the exploration of the concept has been understood. Activities of students when exploring the concepts, the factual data, and the discussion on the three cycles can be seen in Table 1.

Table 1. Student activity (n = 20 students) for 3 learning cycles

Cycle	Activities	Score	Reflection
I	Concept exploration	Four students (80%) have not satisfied the LKM	Need the motivation to improve reading habit, ability to summarize, and to ask the questions.
	Factual data exploration	95%	One student were absent with permission
	Discussion activity	80% students were active, in all aspects 20% students were less active	Given a chance (appointed) to present their views in the discussion.
II.	Concept exploration	90%	Getting used to preparing the lecture
	Factual data exploration	100%	There were fears if not joining exploration there would be individual exploration
	Discussion activity	95%	5% somnolent students due to too many other tasks.
III.	Concept exploration	100%	10% somnolent students due to too many other tasks to be completed.
	Factual data exploration	100%	
	Discussion activity	90%	

The Table 1 showed that in the exploration activities by completing LKM, showed a score improvement from 80% in the first cycle, to 90% and 100% in cycles II and III, respectively. Similarly, the examination of factual data showed 95% in the first cycle, and increased to 100% in

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both cycles II and III. However, the examination of the discussion activities, showed that student activities was varying. In the first cycle to the second cycle, discussion activity increased from 80% to 95%, while on the cycle II to III, it decreased from 95% to 90%.

Evaluation of cognitive aspects was conducted at the end of each three cycles. The evaluation results are shown in Table 2.

Table 2 Evaluation Result of Each Cycle (N = 20)

Cycle	Average	Classical Mastery Learning (%)
I	63.9	30
II	74.9	75
III	72.3	90

Table 2 shows that on average the cognitive learning of first cycle (63.9) has increased in the second cycle (74.9), but decreased in the third cycle with an average of 73.2. However, the classical completeness showed an increasing trend, from 30% in the first cycle to 75% in the second cycle, and to 90% in the third cycle). This suggests that the cognitive test results of Animal Ecology was higher than the pretest value, i.e. 85% (Figure 1).

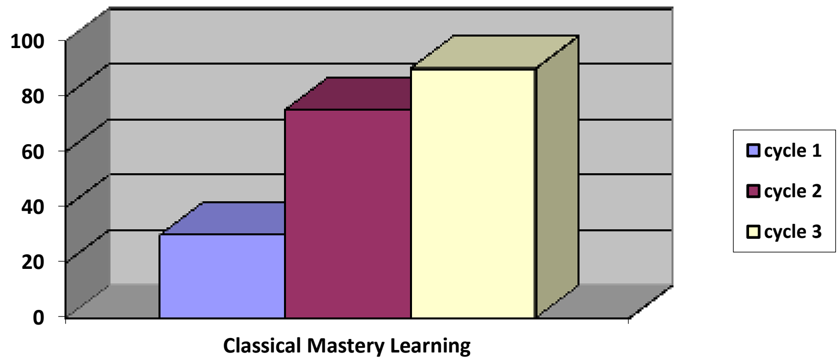

Figure 1. Classical Mastery Learning in Cycles I-III

Based on observations of the learning process, JAS approach implementation in Animal Ecology course could run well. Students were more enthusiastic and active (80% -95%) in doing concept exploration and factual data exploration from the environment. This activity generated a less intense and more enjoyable learning condition. It was proven from the improved performance of the students who often ignored the fact that the course was already over. The result on the implementation of JAS approach by Ismartoyo Indriasih (2014), showed that 84% of primary school students were very active during the learning process. JAS approach contributes to the student activity (Hidayah, 2014) as much as 41.3%. This is by the opinion of Marianti and Kartiyono (2005), who stated that the essence of learning using JAS approach were, among others: The activity is considered more important than the result, and the activity is student centered, so that students were active.

The JAS approach implemented cognitively could increase the average a score and the completeness of students reached 30% (in the first cycle), 70% (in the second cycle), and 90% in the third cycle. Marianti et al. (2013) stated that JAS approach used in a project-based learning could increase the score i.e. 70% of students scored B in Animal Physiology subject, and none got score of D and E.

The questionnaire revealed student’s opinion, it can be stated that the application of JAS approach in the Animal Ecology course could motivate and made the student not stressful in the class. Sartika (2012) stated that student's response to the JAS approach was as high as 85.22%. While Hidayah (2014) reported that 80% of students responded to JAS learning, and this has been categorized as good. This is by the opinion of Djamarah and Zain (2002) who stated that the method was a mean to improve extrinsic motivation. As one component of teaching, method plays important

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role just like other components in learning activities. The use of appropriate and varied methods could be used to enhance extrinsic motivation in learning activities at school.

Students were also pleased with their tasks when working with SAS because this way was good for nurturing individual responsibility, and at the same time could improve the understanding of the material being studied. Looking for important concepts in the material being pushed the students to read carefully. By careful reading, students can also find a variety of questions from the material being studied. Questions posed can show the quality question, because it begins with the word "why" and "how". Evaluation questions can also arise with a beginning phrase of "Which is better / effective". Students can smoothly make concept map with steps of Rose and Nicholl (2003) model. However, students were not examined for their usage of symbols, pictures, or other images to make the learning more attractive.

Learning in groups in laboratory activities were also favored because in addition to duties it could be accomplished in cooperation, and peer explanation could be useful to help understanding the materials much better. The main advantage of the grouping was the better social relationships with friends and group participation. In the groups, the nuance of cooperation, mutual opinion and respect the other's opinions were more visible. However there was still the dominance among the group members. Usually this was showed by the group leaders or students with higher aptitude than the other members in the group.

Based on the above discussion, the JAS approach cognitively in Animal Ecology course was considered successful with 100% student's achievement, which was greater than the predetermined score of 85%. The significant difference between students lied in social relationships and individual participation in the group. It was a characteristic of the learning group of unintelligent members, in that the level of interdependence among members of the group was higher. It required different learning strategies so that cognitive ability can be improved, for example, by reducing the number of members of a group from 4 to 2 people only, also a more detailed explanation of the material. Ridlo *et al.*, (2013) reported that application of the JAS approach in the biological learning process is suitabel to combine contecstual teaching learning, inquary learning, and participative learning. Ngabekti *et al*., (2017) was tracer studies on the JAS approach showed that methode centered learning students are very relevant to implementation this approach.

JAS approach implementation of Animal Ecology course was very successful in increasing the motivation and improve student performance. Observation showed that more than 90% of students are active and can work in groups to solve problems through the exploration of the environment, respect the other member's attitudes and opinions in the discussion about the issues either in the discussion forum and classical groups. High student activity in learning means students are directly involved in finding concepts, so that learning is better. More than 90% of students stated that JAS approach implementation of Animal Ecology course could increase significantly their motivation and thus improve their performance (Figure 2)

Figure 2. Students are Active and Can Work in Groups to Solve Problems

Implication of the result application of JAS approach research for science could be described as described by Ridlo (2005), JAS approach essentially adopted the concept of "iqra" i.e. "read" what

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God created. As explained in the Holy Qur'an, everything in nature is a creation of God that must be considered and contemplated.

By exploring the surrounding nature, humans will acquire knowledge about the beginning of the universe, of day and night, the creation of the heavens and the earth, water pouring from the sky, and the water will live the earth, and spread all kinds of plants and animals throughout the earth. Humans as a earth caliphs can enjoy and take advantage of all the creation. But in its activities, the use of excessive nature has caused damage. This has been described in Surah Ar-Rum 41, which means "has visible the damage on land and on the sea because of human actions. God will that they felt some of the consequences of their actions so that they return to the right path". This verse shows the importance of science to manage the nature in order to continue to provide pleasure for humans.

6. Conclusion

It can be concluded that the implementation of JAS approach could increase the student’s activity and achievement in the subject of Animal Ecology course. The application of the JAS approach in the biological learning process was expected to generate knowledge about the living things along with all the biological characteristics, their benefits, and the consequences if they are used excessively. The knowledge gained will shape the environmental-caring attitude which embodied in the wise behavior to create environmental conservation.

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Developing Module Integrated Multimedia With Laboratory Guidelines For High School Students On Human Circulation System

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Abstract. The result of data collection by using requirement analysis showed that Circulation System had been one of the most complex material. This is due to the high material complexity and abstract of the material. So it takes a learning resource that can concretize the material one of them the through multimedia such as Module Integrated Multimedia equipped Laboratory Guidelines. Module Integrated Multimedia such as Flip Flop Book can concretize something abstract. Through research design of Borg and Gall made the development of digital books on the material Circulation System was made. The research held during April until August, with the Feasibility of one to one experts (materials, media, and language), small group testing (one to one learner), whole group testing and testing of digital book-based effectiveness in learning. The results showed that the value of the feasibility test and material test get the category of Good (B) to Very Good (SB) (80-86.00), of the subjects found the module was interesting, has brief explanation, and the instructions is easy to follow and was really helpful for them in studying the material both at school and at home. Furthermore, in can strenghten and maintain students' understanding.
Keywords: Circulation Systems, Module Integrated Multimedia

1. Introduction

The development of computerized technology today in all lines provides many changes in many areas (Nadiyah and Faaizah, 2015). Now the entry of the era of computerization and gadgets (Kapenieks, 2013). Emerging various multimedia-based computerized technology one of them in the field of education. Many theories that multimedia-based learning media have a good effectiveness in improving the understanding of learners (Shah, Arthur, and Zdanowicz, 2013). Multimedia can to visualize abstract concepts to be concrete well. based on research results Namsoo Shin and Steven McGee (2002).

Learning biology in the classroom or during lab, a learning guide is needed to support learners in understanding the material, one of the learning guides is the module and practice manual. This is based on the analysis of the needs obtained, as many as 52.24% of students said the school does not provide the module. The developed modules are equipped with practical guidelines to help learners in the practicum. This is based on data of 93.75% of schools do not have practice guidelines (Suprapto, 2016).

So far, the material and the workings of the practicum only comes from the teacher's explanation while the class XI material demands a lot of practicum. The module developed is class XI module, it is based on requirement analysis as much as 36.36% learners declare class XI material difficult to comprehend. In the selected class XI material is a chapter of blood circulation, it is based on the needs analysis of 25.25% of learners do not understand the material circulation (Suprapto, 2016).

Based on the above exposure, the researchers wanted to lift the title of research entitled "Development of Integrated Modules Multimedia Based Practical Guidelines on Circulatory Material System".

2. Literature Review

2.1 Module

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"The module is a book written with the aim that learners can learn independently without or with teacher guidance, so the module includes: (1) instructional guidance; (2) the competence achieved; (3) supporting information; (4) exercises; (5) work instructions or worksheets; (6) evaluation "(Majid, 2008). Meanwhile, in the Big Indonesian Dictionary (Language Center, 2000), "Modules are activities of teaching and learning programs that can be learned by learners with the minimum assistance of advisory teachers, including planning goals that will be achieved clearly, provision of learning materials, tools which is needed, as well as tools to measure the success of learners ". "The module has learning guide components and supporting information. These components are the advantages possessed by the module compared to the book "(Dikmenum, 2005). According to Sudjana and Rivai (1989), "the learners can follow the teaching program according to their own speed and ability, more self-study, can know their own learning result, and emphasize the optimum learning mastery learning with mastery of 80 %

2.2 Multimedia

There are many concepts that refer to the term multimedia. Hard (2009) reveals that, initially from the perspective of media experts, before the development of information and communication technology, multimedia is defined as the use of 'many' media for the purpose of delivering messages, information / content of the subject matter to the audience or learners.

However, as the development of information and communication technology, and its use is increasingly prevalent in the world of education understanding of the meaning of multimedia is now shifting. Multimedia meanings are now more likely to be associated with the integration of systems and networks and communication procedures in a specialized device, such as radio, computer, and netbook (Wang and Tsai, 2016).

3. Research and Development

According to (Suryasubrata, 2009), "research and development or in English are Research and Development is a research method used to produce a particular product, and test the effectiveness of the product."

"In essence development research is not research that is intended to find theory but research that aims to produce or develop a product. Products about education and learning may be curricula, models, management systems, learning systems, materials or instructional media and others "(Waldopo, 2002).

3.1 Circulatory System

Circulatory System Blood transport or blood is a system that works to circulate the blood that contains nutrients and oxygen for the cells in the body. The circulatory system also functions in transporting the remaining metabolism in the body transported to the expenditure organs (Ganong, 2002).

The Circulatory System is composed of the organs of the heart, blood vessels, and blood tissues. The heart is a blood pumping organ. Blood vessels are divided into three types namely the veins, arteries, and capillaries. Blood is composed of blood plasma which is the main component of water and blood cells. There are three types of blood cells namely erythrocytes, leukocytes, and platelets (Campbell, 2002).

4. Method

The research method used is research and development Method (development and research). In this method is done to create a product and see the effectiveness in the use of products that have been used. The model used in this research is Borg and Gall model.

5. Result

Filling of the Feasibility Test Instrument using written instruments. The result of feasibility test by the material expert can be seen in the following bar chart.

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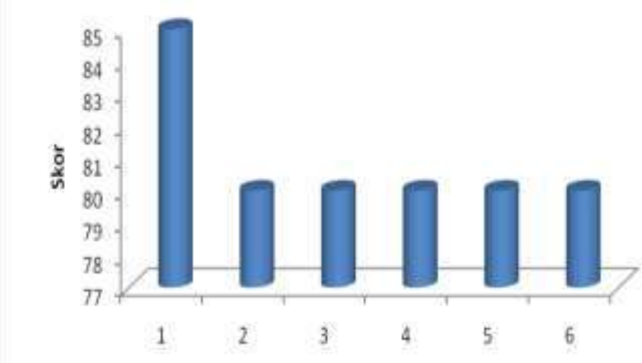

Picture 1. Feasibility test of Material Experts

Based on data obtained from the material expert's feasibility test can be described as follows (appendix 16):

a. Indicators (1) Conformity of Matter with Curriculum, the average percentage is 85% with good interpretation (B) consisting of 4 questions.

b. Indicator (2) Systematic Presentation of Material, the average percentage of 80% with good interpretation (B) consisting of 3 questions.

c. Indicator (3) Clarity of Delivered Material, the average percentage is 80% with good interpretation (B) consisting of 2 questions.

d. Indicator (4) Difficulty Level Material, the average percentage is 80% with good interpretation (SB) consisting of 1 Question.

e. Indicator (5) Material Actualization, the average percentage is 80% with good interpretation (B) consisting of 1 guestion

f. Indicator (6) Material Accuracy, the average percentage is 80% with good interpretation (B) consisting of 2 questions.

Based on data obtained from the media expert feasibility test can be described as follows:

a. Consistency indicator, the average percentage is 86% with excellent interpretation (SB) consisting of 3 questions.

b. Indicator Format, the average percentage of 86% with excellent interpretation (SB) consisting of 3 questions.

c. Image Indicator, the average percentage is 80% with a good interpretation (B) consisting of 4 questions.

d. Color Indicator, the average percentage is 80% with excellent interpretation (SB) consisting of 1 guestion

e. The Maintenable Indicator, the average percentage of 80% with excellent interpretation (SB) consisting of 2 questions.

f. Navigation indicator, the average percentage is 80% with excellent interpretation (SB) consisting of 1 guestion

Based on data obtained from the language expert's feasibility test can be described as follows

a. Readability Indicator, the average percentage is 80% with excellent interpretation (SB) consisting of 1 guestion

b. Language Clarity Indicator, the average percentage is 80% with excellent interpretation (SB) consisting of 1 guestion

c. Communicative indicator, the average percentage of 80% with excellent interpretation (SB) consisting of 1 guestion

d. The indicator is straightforward, the average percentage is 80% with good interpretation (B) consisting of 2 questions.

e. Grammar Accuracy Indicator, the average percentage is 80% with a good interpretation (B) consisting of 2 questions.

f. Indicators of Language Use Match With Mental Development Learners, the average percentage is 80% with good interpretation (B) consisting of 1 question

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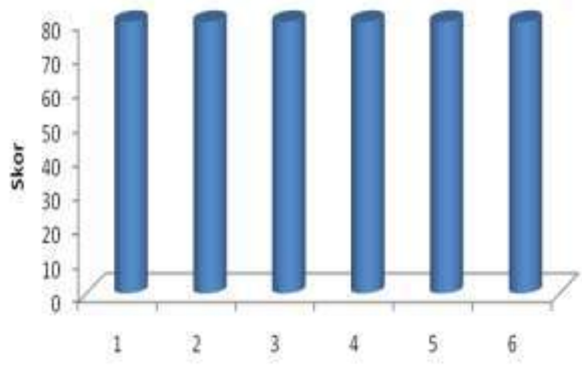


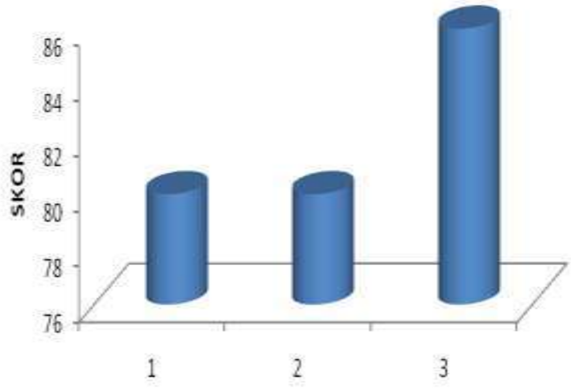
Picture 2. Feasibility Test of Language Experts

Based on data obtained from small group trials Learners can be described as follows:

a. Concept or material indicator, the average percentage is 80% with good interpretation (B) consisting of 10 questions.

b. Grammar indicator in presentation, the average percentage is 80% with good interpretation (B) consisting of 4 questions.

c. The display indicator, the average percentage of 88% with a good interpretation (B) consisting of 12 guestions



Picture 3. One to One Learner

In large group students, from a conceptual point of view, grammar in both presentation and display gets excellent interpretation. From the results it shows the module is made good. This indicates that the module has fulfilled aspects regarding consistency, format, organization and attractiveness that have been made by the Directorate of Vocational Higher Education, 2003. The module has also fulfilled the requirements of the instrument of graduation and linguistics that have been established by the National Education Standards Agency (BSNP) in 2006. All indicators made refer to indicators made by Hilmi (2009); BSNP (2006); and Dikmenjur (2003).

Based on data obtained as many as 20 samples will be analyzed using t-test to test the hypothesis, the calculation results can be seen that the value of $p < .05$ value $p = .000$, reject H0 which indicates that there is an increase in value before learning and after learning with Multimedia Learning.

The developed module is a multimedia-based module that modules with a computer-based technology called PTechLS module, just like a flip flop book. This type of module will be more effective in learning and can increase student interest in learning (Alias, 2015). High student interest will have an impact on the desire to learn and ultimately can improve student learning outcomes. The advantages of this module is that the module has a high appeal because it is now the computerized era. With a module that is easy to access, attractive will attract students to learn. Flip flop book module is a multimedia module, in which we can insert video, power point and image. The flip flop book mods can be converted to HTML form, and can be accessed using android, and Ipad.

However, this development research still has some limitations, among others:

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1. Multimedia-shaped module, it can only be used in schools with facilities laptop, tablet, and android. Not accessible at some schools with the inability of the facility.
2. Trials are conducted only in two schools, and represent only regular schools with flagship counseling schools. Not tested in other schools such as pre-eminent schools, as well as international schools.

6. Conclusion

This development research produces modules for biology learning with Circulation Systems subject through several stages: needs analysis, product development, feasibility test by material experts, feasibility test by media expert, feasibility test by linguist, teacher test, small groups of students, and large group student trials. The results of feasibility tests and trials show good to excellent interpretation.

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An Innovation In Developing Module Integrated Multimedia For High School Students On Metabolism Material

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Abstract. Biology is a subject field which has several complicated materials and is often considered difficult for students. Data obtained through questionnaires reveal the fact that metabolism is one of the difficult materials due to its complexity. That is why development in creating module integrated multimedia is strongly needed to strengthen and maintain students' understanding. The purpose of this study were to find out whether a new developed module integrated multimedia can help the students in understanding materials in Biology subject, especially on Metabolism Subject. The method used in this study were research and development method. The subjects were Biology teachers and XI grade students of Science in SMA Taruna Andigha. Questionnaires was used to analyze students' need to understand on Metabolism Material. The module had passed feasibility test by materials, media, and language expert, before was given to the research subjects. The result showed the average percentage of 82.00 of the subjects found the module was interesting, the brief explanation, and the instructions were easy to follow and was really helpful for them in studying the material both at school and at home. Furthermore, it can strengthen and maintain students' understanding and increase cognition analysist.
Keywords: Metabolism Material, Module Integrated Multimedia, Research and Development

1. Introduction

Learning of the 21st century is computer-based learning (Computer Mediated Communication) (Nadiyah and Faaizah, 2015). Computer-based learning emerges as a new paradigm in modern education (Kapenieks, 2013). The progress of computer-based learning (CMC courses) contributes to the emergence of various media and computer-based learning resources that support the learning process (Erlich, Philip, and Ezer, 2005). Today's learning will shift the role of teachers to facilitators and enhance the active role of students (Priyanto, 2009).

Computer-based learning is a technology of the future, where learning will further increase student engagement (Schunk, 2012). Not just media, with the advancement of computer-based technology produces many variations in assessment tests that have an impact on student satisfaction in learning (Sen, Ray, and Glen 2008). With the advancement of computer-based technology makes it easier for teachers to deliver materials. Computer-based learning can also improve students' cognitive and psychomotor values (Cevher-Kalburan, Yurt, and Ömeroglu, 2011). Fast access to information through the internet provides the ease of enriching or updating new knowledge. Computer-based learning trends today is a trend of computerization, students easily learn wherever and whenever (Fuchs, 2012).

According Susanto in 2012 learning by using media, learning resources vary, and teaching materials will be more effective than without using the media and variations of learning resources or learning in conventional way. Selection of appropriate learning resources will show different effectiveness. The use of multimedia-based learning resources in particular, has a good effectiveness in improving students' understanding (Hoven, 2006). Multimedia can visualize abstract concepts into concrete well. The combination of drawing, video, and writing with an eye-catching design will

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attract students and simplify explanations or abstract concepts more easily understood (Zhang et al., 2006).

Biology has a range of materials ranging from macro to micro. Some coverage of materials such as nerve cell structure, neurological physiology, hormonal physiology, immune system physiology, metabolism, and protein synthesis are abstract and difficult materials, based on needs analysis or need assessment in five cities, is found that Metabolism is one of the most difficult materials. Based on requirement analysis, there are 48% data that learning comes from power point and module provided by teacher and school and 89.65% of students do not pass on Metabolism summative test.

The current learning shifts from teacher-centered learning to student-centered. In a study showed that learning with a variety of learning resources 95% of students assisted with learning using interesting learning resources (Suprapto, 2016). Learning with multimedia-based learning resources such as multimedia-based modules helps students learn actively and independently compared to traditional learning (Shah, Arthur, and Zdanowicz, 2013). The use of module is a good alternative in improving student self-reliance because centered on student (student center).

We have now developed a combination of modules with computer-based technology called PTechLS module, just like Flip Flop Book. This type of learning resource will be more effective in learning and can increase students' interest in learning (Alias, DeWitt, and Rahman, 2015). Flip Flop Book is a multimedia-based module, like other multimedia-based modules, Flip Flop Book will improve between text and video and web links in it. Students will learn in various ways not only in the form of text and images but also equipped with video, also connected to the internet through the web, so that will be many sources obtained by students. This will increase student interest and can also improve student learning outcomes (Wang and Tsai, 2016). Flip Flop Book is a learning resource in the form of multimedia-based digital module. Multimedia-based because in the Flip Flop Book is not just a module in the form of text and images, but also can insert video, website links if connected directly online, animation that other modules do not have it. Flip Flop Books can also be converted in iPad, phone, and attachment media on the website (Walsh, 2015).

In the level of Bloom's knowledge revised by Anderson, the level of knowledge starts from knowing to create, analytical skills are at the C4 level. Where at that level is included in High Order Thinking (HOT) (Anderson and Krathwohl, 2001). Students who have analytical skills should be able to explain each case or case from an easy to complex with attention to various aspects of the theory. In supporting the formation of student's analytical skills, the learning should be set in such a way that the explanation of a material can be delivered properly. Use of appropriate media and models will be able to support in honing students' analytical skills (Anderson and Krathwohl, 2001). Analytical skills can be enhanced through multimedia learning paths (Politsinsky, Demenkova, and Medvedeva, 2015).

Based on the above description, it is necessary to research in the development of multimedia-based module (Module integrated multimedia) to improve students' analytical skills.

2. Literature Review

2.1 Module

The module is a module written with the aim that students can study independently without or with teacher guidance, so the module includes: (1) instructional guidance; (2) the competence achieved; (3) supporting information; (4) exercises; (5) work instructions or worksheets; (6) evaluation "(Majid, 2008). Meanwhile, in KBBI (Language Center, 2000), "Module is a teaching-learning program activity that can be learned by the students with the minimum assistance from the supervising teacher, including the planning objectives to be achieved clear, the provision of learning materials, needed, as well as tools for measuring student success.

The module has learning guide components and supporting information. These components are the advantages of the module compared to the module "(Dikmenum, 2005). According to Sudjana and Rivai (1989), "students can follow the teaching program according to their speed and ability, more self-study, can know their learning result, and emphasize the mastery learning with 80% .

2.2 Multimedia

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Learning biology of students experiencing many difficulties in learning. Therefore, teachers should be able to find a solution to improve the quality of learning. Can use some techniques in learning or by considering the four basic components in learning conditions of learning, characteristics of students, materials, and test results learning. Materials include the proper use of learning sumbel (Dunlosky, et al., 2013).

Learning by electronic or computer is a new paradigm in a modern education. The increase in electronic-based learning increased to 35.6%. Learning with electronic learning resources is a learning or the latest trend of the present. With this type of learning students will gain more satisfaction (Sun et al., 2008).

2.3 Analysis Competence

In 1956 Bloom's development made only one dimension of the cognitive process dimension (Structure of Cognitive Process Dimension), then developed by Krahtwohl 2002 into 2 dimensions namely the cognitive process dimension (structure of cognitive process dimension) and the Structure of Knowledge Dimension divided into 4 dimensions of Factual, Conceptual, Procedural, and Metacognitive. In the revision of the cognitive process dimension (cognitive process dimension) 6 cognitive levels developed by Bloom from using a noun to a verb, and the highest level is creating (creating).

2.4 Multimedia to Increase Analysis Competence

The main purpose of learning is to improve learning outcomes. The development of web 2.0 technology contributes to the progress of learning. Learning done face-to-face and mixing with web usage provides improved student learning outcomes (Liu, 2016). Multimedia-based learning such as multimedia-based modules can improve student learning outcomes (Wang and Tsai, 2016). Learning with the web can improve learning outcomes than without using the web (Taradi et al, 2005). Learning and testing by applying technology will show a b.ter student performance than without computer technology (Hosseini, Abiding, and Baghdarnia, 2014). Multimedia-based learning can also be an animated form, the use of animation in learning will have a positive impact on learning (Kidman, 2015).

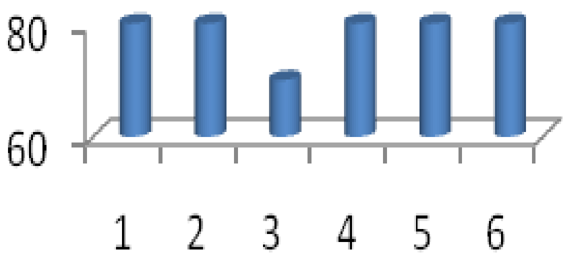
3. Method

The research method used is research and development Method (development and research). In this method is done to create a product and see the effectiveness in the use of products that have been used. The model used in this research is Borg and Gall model.

4. Result

Based on the results of needs analysis conducted in several cities found data that as many as 39% of students said that the material Metabolism is a difficult material. After that, feasibility test by expert and effectiveness testing in learning.

Filling of the One to One Experts, Test Instrument using written instruments. The result of feasibility test by the material expert can be seen in the following bar chart.



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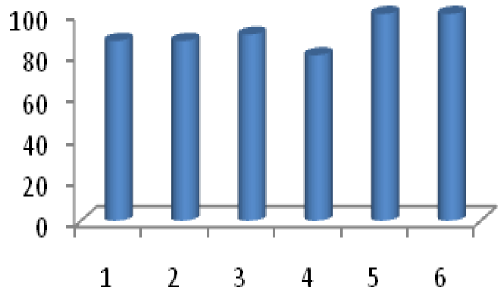
Picture 1. Feasibilty test of Material Expert

Based on data obtained from the material expert's feasibility test can be described as follows:

a. Indicators (1) Conformity of Matter with Curriculum, the average percentage is 80% with good interpretation (B) consisting of 4 questions.
b. Indicator (2) Systematic Written of Material, the average percentage of 80% with good interpretation (B) consisting of 3 questions.
c. Indicator (3) Clarity of Delivered Material, the average percentage is 70% with good interpretation (B) consisting of 2 questions

Based on data obtained from the media expert feasibility test can be described as follows:
a. Consistency indicator, the average percentage is 87% with excellent interpretation (SB) consisting of 3 questions.
b. Indicator Format, the average percentage of 87% with excellent interpretation (SB) consisting of 3 questions.
c. Size and Letters Indicator, the average percentage is 90% with excellent interpretation (SB) consisting of 2 questions.
d. Image Indicator, the average percentage is 80% with a good interpretation (B) consisting of 4 questions.
e. Color Indicator, the average percentage is 100% with excellent interpretation (SB) consisting of 1 Quetions.
f. The Maintenable Indicator, the average percentage of 90% with excellent interpretation (SB) consisting of 2 questions.
g. Navigation indicator, the average percentage is 100% with excellent interpretation (SB) consisting of 1 quetions.



Picture 2. Feasibility Test of Media Expert

Based on data obtained from the language expert's feasibility test can be described as follows
a. Readability Indicator, the average percentage is 100% with excellent interpretation (SB) consisting of 1 quetions.
b. Language Clarity Indicator, the average percentage is 100% with excellent interpretation (SB) consisting of 1 quetions
c. Communicative indicator, the average percentage of 100% with excellent interpretation (SB) consisting of 1 quetions
d. The indicator is straightforward, the average percentage is 80% with good interpretation (B) consisting of 2 questions.
e. Grammar Accuracy Indicator, the average percentage is 80% with a good interpretation (B) consisting of 2 questions.
f. Indicators of Language Use Matching Mental Development Students, the average percentage of 80% with good interpretation (B) consisting of 1 quetions

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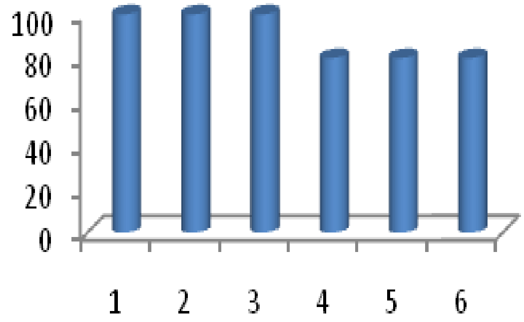


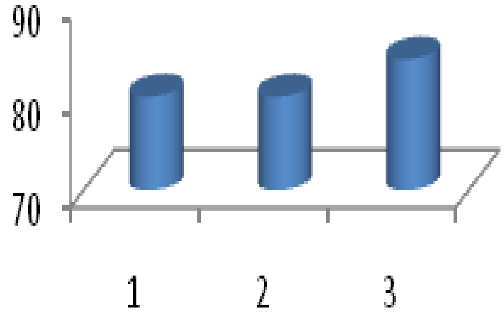
Picture 3. Feasibility Test of Language Expert

Based on data obtained from Small Groups Student test (One to One Learners) can be described as follows:

a. Concept or material indicator, the average percentage is 80% with good interpretation (B) consisting of 10 questions.

b. Grammar indicator in presentation, the average percentage is 80% with good interpretation (B) consisting of 4 questions.

c. The display indicator, the average percentage of 84% with a good interpretation (B) consisting of 12 questions.



Picture 4. One to One Learner

Based on data obtained as many as 30 samples will be analyzed using t-test to test the hypothesis, the calculation results can be seen that the value of p <.05 value p = .000, reject H0 which indicates that there are an increase in value before learning and after learning with Multimedia Learning.

The developed module is a multimedia-based module that modules with the computer-based technology called PTechLS module, just like a flip flop book. This type of module will be more effective in learning and can increase student interest in learning (Alias, 2015). High student interest will have an impact on the desire to learn and ultimately can improve student learning outcomes. The advantages of this module is that the module has a high appeal because it is now the computerized era. With a module that is easy to access, attractive will attract students to learn. Flip flop book module is a multimedia module, in which we can insert video, power point and image. The flip flop book mods can be converted to HTML form, and can be accessed using android, and iPad.

However, this development research still has some limitations, among others:

1. Multimedia-shaped module, it can only be used in schools with facilities laptop, tablet, and android. Not accessible at some schools with the inability of the facility.

2. Trials are conducted only in two schools, and represent only regular schools with flagship counseling schools. Not tested in other schools such as pre-eminent schools, as well as international schools.

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5. Conclusion

This development research produces a multimedia-based flip flop module for biological learning with genetic material subjected to several stages: needs analysis, product development, feasibility testing by material experts, feasibility tests by media experts, feasibility testing by linguists, teacher trials , small group student trials, and large group student trials. The results of feasibility tests and trials show good to excellent interpretation.

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The Effect of Scientific Approach to High Order Thinking Skill (HOTS) of Student at 10th Grade

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Abstract. The objective of this research is to analyze the effect of scientific learning approach to students' high order thinking skills (HOTS). The research includes a pretest-postest control design. The population of this research consists of 180 students at 10thgrade, with 59 students as a sample of the research.The sampling technique is cluster random sampling.The variables of this research are; scientific approach as an independent variable and students' high-order thinking skill as a dependent variable. Data collection techniques were conduct using the test instruments, while the data analysis techniques used parametric statistics t-test. As a result of the research shows that there is the effect of scientific learning approach to students'high order thinking skills. The result is known based on Sig value (2-tailed) model that showed a difference ability of students'high order thinking skills on the students who learn uing scientific approach and not.
Keywords: High Order Thinking Skills, Scientific approach.

1. Introduction

The government of Indonesia has made many reforms to improve the quality of education. One of the efforts have been made is to revise the curriculum according to the demands of the times. Currently, Indonesia uses the revision of the 2013 curriculum in 2016. This isaccording to Permendikbud Number 21 of 2016 on Content Standards, through Chemistry in Senior High School is expected to have some competence in the learning process. Learners are expected to analyze and solve the problems related to the concepts and applying their knowledge to the various fields of science and technology.

The international world also seeks to improve the quality of education. Efforts to assess and measure education internationally continue to be develop. One of the efforts is to organize The Trends in International Mathematics and Science Study (TIMSS). TIMSS measures the ability of science and mathematics by dividing the cognitive domain into three levels, namely knowledge, application, and reasoning. Until this year, TIMSS has been held 5 times, but Indonesia still ranks below. TIMSS 2003 study results, Indonesia ranked 35th of 46 participating countries with an average score of 411, while the international average score is 467. The results of the 2007 TIMSS study, Indonesia ranked 36th out of the 49 participating countries with an average score of 397, while the international average score is 500. The results of TIMSS 2011 study, Indonesia is ranked 38th of 42 countries participants with an average score of 386, while the international average score is 500[1].

The most of the Indonesian students have the high level of knowledge and application. But, when at an advanced level (high), Indonesian students have the difficulty. Indonesian students are not used to high-level thinking, so their High Order Thinking Skills (HOTS) is still low. HOTS is a high order thinking skills that used widespread thinking to discover new challenges. High order thinking requires a person to apply the new information or knowledge to acquired and manipulate the information to reach possible answers in new situations [2].

Students' high order thinking skills can improve by applying proper learning. One way to create a non-directional learning is through a constructivist learning approach. The scientific approach as one of the approaches in the curriculum that categorized as a constructivist approach. In the scientific approach, students are given as much as possible to play a role in the every learning stage. The learning stage of scientific approach can be seen from the syntax (learning step) there are; observing, questioning, trying (experimenting), associating, and communicating[3].

A scientific approach is an approach that refers to the scientific method. The scientific method is the method used by scientists to discover new facts or theories, which are expected to be able to

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change students' paradigm and thinking skills. Because in finding the facts or the theory, a scientist is unlikely to use low order thinking skills[4]. The stages in the scientific method are very similar to the scientific approach carried in the 2013 curriculum. The lesson plans in the 2013 curriculum require students as investigators, starting from the process of observing to communicating. As for the process, students do not only silently to accept what is conveyed by the teacher, but they have to play an active role [3]. The scientific approach encourages students to investigate and discover the facts of a phenomenon or event. Through the process is expected to improve the students' high order thinking skills. Indicators for measuring high-order thinking skills include analyzing, evaluating and creating. These are revised indicators of Bloom's cognitive ability taxonomy from C4 to C6 [5].

In Senior High School, chemistry is a study about substances that include the composition, structure, properties, and the energy changes of substances. This matter involved theability of students on reasoning skills. There are two things that related to inseparable chemistry, chemistry as a product (chemical knowledge in the form of facts, concepts, principles, laws, and theories) and the findings of scientists and chemists as a process (scientific work). Chemistry learning and chemical learning outcomes should take into account the characteristics of chemistry as a process and product. Indirectly the learning of chemistry can lead students to have high-order thinking skills [6].Therefore, the objective of this study is to find out how the influence of scientific learning approach to chemistry lessons, especially the subject of stoichiometry, to the students' high order thinking skills.

2. Research Method

This research is a quasi-experiment research with pretest-posttest control group design. The quasi experiment studies that have control groups but can not function fully to controlling the outside variables that influence the conduct of research [7]. In this study the external variables that influence the process of research implementation can not be fully controlled. The population of this study is students of MAN Wonokromo, with a sample size of 59 students. The samples were divided into two randomly selected research groups, there are the experimental group and the control group. Before the treatment, pretest used to determine the initial condition of each group. The learning activities in the experiment group were using a scientific approach, while the control group learned using direct instruction approach. The variables in this research consist of scientific approach as an independent variable, and students' high order thinking skills as a dependent variable.

The technique of collecting data used exam technique. The test using an essay instrument. The cognitive dimension of questions according to Bloom taxonomy revision C4, C5, and C6 [5]. Instruments to be used have to require of validity and reliability. Validity indicates the extent of an instrument to a measuring what should be measured [8]. The empirical validation of the instrument is classified by the r interpretation on the correlation product moment test. The classification is presented in Table 1.

Tabel 1. Instrument's Validity Category

Correlation Category	Category
0.800 rxy 1.00	Very high
0.600 rxy 0.800	High
0.400 rxy 0.600	Middle
0.200 rxy 0.400	Low
0.000 rxy 0.200	Very low

An instrument is said to be reliable when it gives consistent results when used in multiple times [7]. In this study, the reliability of the instrument was determined by the Alfa Cronbach technique. Category of instrument reliability is present in Table 2.

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Tabel 2. Instrument's Validity Category

R-Value	Category
0.80-1.00	Very high
0.60-0.79	High
0.40-0.59	Middle
0.20-0.39	Low
0.00-0.19	Very low

Based on the instrument test, ten questions that have been made, six questions were valid. The reliability of an instrument is in the high category with a value of 0.79.

Normality test and homogeneity test, performed as a prerequisite for hypothesis testing. The normality test, tested by skewness and kurtosis statistic test. Skewness and kurtosis test is a normality test by looking at the distribution chart. If the distribution graph ratio is at -2 to +2, the data is normally distributed [8]. The homogeneity test is conducted to determine the sample is homogeneous or not. If the sample is homogeneous, the results of the study can be generalized to the whole population. Hypothesis test, is tested by t-test. The t-test is used to analyze the significance of the difference between two pieces of the mean derived from two distributions. H_0 is accepted if the significance value obtained $\geqslant$ 0.05 (Sig. $\geqslant \alpha$) [8].

3. Result and Discussions

This research uses pretty pretest and posttesdesign. An instrument that used was tested. Pretest is performed to determine the initial ability after treatment. The high-order thinking skills that analyzed are the C4, C5, C6 levels in Bloom's taxonomy revision, which are the ability to analyze, evaluate and create.Before the hypothesis test, prerequisite analysis test by using the normality is tested. Based on the normality test, the results of the pretest and posttest using skewness and kurtosis obtained the ratio value in the range (-2) to (+2), it is indicated that the data is normally distributed. After that, the hypothesis tested using parametric statistics.The first hypothesis test is the difference of pretest result. The analysis has been done by independent sample t-test. The result of the analysis shows that in the pretest between experiment and control class there is no significant difference. This is evidenced by a significance value of 0.161 where this value is greater than the level of significance α (0.05). It is indicated that students' initial ability both of experiment and control class in the same category.

The next analysis is the results of the student's test to see the difference between the experimental class and the control after the treatment. To determine the effect of treatment given to the experimental and control class, one right-side test is performed by dividing the Sig (2-tailed) value. As for the proposed hypothesis, H_0 the average value of the experimental posts is smaller or equal to the control class, H_a the mean value of the experimental posttest is greater than the control class. From the calculation done got that sig value (1-tailed) is 0.015, which means smaller than level significance α 0.05. Therefore, it can be concluded that the treatment given to the experimental class has a positive effect on students' high order thinking skills.The scientific approach that used to the experimental class proved to have a positive effect on the students' high order thinking skills. This is caused by the experimental class is given learning by a scientific approach, and the control class is direct instruction. Scientific learning demands students to be more active, with networking in groups, breaking down problems from observation, solving problems with shared discussions, finding out by asking teachers or friends for discussions, gathering information from existing literature and exchanging information gained. This thing will further sharpen students' cognitive abilities. In contrast to the control class, direct instruction tends to make the students passive. The steps that have been done in the experimental class are as follows.

1. In the observing process, students used the knowledge they already know to the object that given by the teacher. One of the objects that observed is the periodic table of elements. Students are asked to find out why the mass of each element is different. Also, to observe the objects such as the

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periodic table of elements, students are given a sample problem, then they have to analyze the solution. In this stage, students will be more focused to follow the lessons that learned. Observing an object necessarily requires the thinking ability to find out the object being observed.

2. The observation stage will raise some questions in the mind of the students. This stage will give a chance to the students find out by several methods, such as asking their friends or teacher. The questions that arise in the learning process are "how the scientist measure the atomic mass," "how the formula that used for finding the number of atomic mass particles," and "how to determine the mole gas volume in STP condition." A question arises when one is thinking, and then asking questions will gain the students' higher-order thinking skills.
3. The questions that arise are not answered by the teacher, but the students are asked first to look for them, in groups or individual using the available literature. In this stage, students looking for the questions that are still not understood or finding the right answers to the questions that have been given. The questions that given such as finding the number of particles, finding the molar mass of the atomic mass and relative atomic mass, finding the composition of a compound in the molecules. The activity was raising the students' thinking skills, as it requires a literature understanding.
4. After the process of seeing information from the existing literature, then students have been formed to process information. This stage is prepared students to represent the group presentation in the front of the class. Usually, students take a note on a sheet of paper. The process of associating is no less important in training students' thinking skills. Because, in this process, students exchange their opinions with the others, and try to unite their opinion. It is not possible to run well without the good thinking skills.
5. The last process in a scientific approach is communicating. Communicating is a way to see the students' understanding of the process that has been implemented. In this stage, each group is represented by two students to present in the front of the class. They have to explains the results of their group discussion. This stage will raise the students' cognitive process. The students who present in the front of class certainly will not be able to convey their discussion result to other friends if not through the process of thinking how to convey in front of the class.

Based on the learning stage of the scientific approach, we can know that in every stage of the scientific approach there are several things that can help students to achieve their high order thinking skills. Logic, if in the result of this study shows that the experimental class gives better results of the control class. Where the scientific approach affects the students' high order thinking skill, they can criticize and provide another answer if they do not agree with the presenter.

Conclusion

Based on the results of research that has been done, it can be concluded that learning with a scientific approach is more effective than learning with a direct instruction approach seen from the effect size of 0.062.

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Metacognitive Knowledge in Chemical Equilibrium Problem Solving: Students' Judgment vs. Teachers' Judgment

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Abstract. This research was conducted to reveal the metacognitive knowledge in chemical equilibrium problem-solving skills of students by comparing between the students' judgments and teachers judgments. This research was a descriptive study of 92 bilingual private high school students (51 males and 41 females). Students' judgments about their metacognitive knowledge in chemical problem solving were collected by self-assessment metacognition questionnaire, while the teachers' judgments were collected by three chemical equilibrium problem-solving questions. Data would be analyzed by trend analysis of data and description of causal relationship of every aspect of metacognitive knowledge. Comparison between the students' judgments and the teacher's judgments would be determined by a calibration of judgment accuracy. The results indicated that students tended to judge themselves higher than the actual performance of their problem-solving skills. In this study was also found that male students were more overconfidence than female students in their chemical equilibrium problem solving skills.
Keywords: calibration, chemical equilibrium, metacognitive knowledge, problem-solving

1. Introduction

Metacognitive knowledge is the knowledge about cognition [1], [2], [3].Dimensions of metacognitive knowledge consist of declarative knowledge (knowledge about what), procedural knowledge (knowledge about how), and conditional knowledge (knowledge about why)[1], [2], [3], [4], [5]. Metacognition is so important to help students evaluate how they arranged the ideas and to take a clear structure of more complex ideas [6]. On the contrary, if one has a problem in his/her metacognition, they would estimate his/herself too high called overconfidence without balanced with the self-quality [7]. The more increasing the memory capacity or metacognitive aspects, the better the retention and understanding of one self [8]. This case made that metacognitive was important in chemistry learning, especially in chemical equilibrium problem solving.

When a problem solving was conducted to students, investigated there were two errors in chemical equilibrium problem solving: systematic error and random error [9]. Systematic error was due to learning difficulty in understanding the theories, concepts, or processes, or often mentioned as alternative conception or misconception, like about equilibrium characteristic, constant, stoichiometry, equilibrium changing, and gas law [9], [10], [11].Random error was due to the lack of relevant knowledge as the fixedness of reasoning such as hastiness, thoughtlessness, over capacity of the memory, or the dependently tests, like about arithmetic relationship, reaction rate relationship, equilibrium approach, Le Chatelier application, the constant of equilibrium constant, and heterogeneous equilibrium [12], [13], [14].

Problem solving skill was a general researched metacognitive activity [15], [16], [17], [18] even in chemistry education. In this activity, one will judge to decide for his/her ownself and calibrate self-ability measured as judgment accuracy [19], [20], [21], [22], [23]. There were two judgment accuracies, they are relative accuracy or resolution and absolute accuracy or calibration [1]. Calibration was expressed by differences between actual performance and perceived performance [1], [23]. Resolution showed prediction about one's metacognitive judgment on onething to something that was usually expressed by correlation coefficient [1]. These judgment accuracies can classify self-calibration degree, what one was too overconfidence/overestimate) confidence-realistic, and underestimate [20], [23], [24].

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Through this metacognitive judgment, the implementation of metacognitive knowledge can be controlled [25]. This research conducted to rethink again in another perspective about chemistry problem solving. Especially in the chemical equilibrium which was marked as a difficult topic for chemistry students. This study aimed to reveal the metacognitive knowledge in chemical equilibrium problem solving skills of students by comparing between the students' judgments and teachers' judgments.

2.Method

2.1 Participant

This was a descriptive study of 92 bilingual private high school students (51 males and 41 females)in XI grade. All participants were usually guided by their teacher especially in chemistry lesson to have a guided problem solving in every task or assignment. All participants were given the tests and the questionnaire sequentially.

2.2 Data Collecting

Data of chemical equilibrium problem solving were collected by three chemical equilibrium problem solving question and data of metacognitive aspects were collected by a self-assessment metacognition questionnaire. This instrument arranged with combination between the items of metacognitive knowledge dimension adapted from General Metacognitive Strategy Inventory planned by [4] and problem solving steps MIDEALS (motivation – identify – define the context - enumerate the choice – analyze - list reason - self correct) that was planned with combination between [26] and Facione in [27].Perceived performance based on the metacognitive knowledge: declarative knowledge (DK), procedural knowledge (PK), conditional knowledge (CK). Actual performance based on the problem solving steps: motivation (M), identify the problems (I), define the context (D), enumerate the choice (E), analyze options (A), list the reasons (L), self-correct (S). There were 20 indicators measured in this questionnaire as mentioned in Table 1.

Table 1. Indicator Measuring Perceived vs. Actual Performance

Perceived Performa	*Indicator*	*Actual Performa*
DK	Motivation to solve problem	M
DK	Anxiety control	M
DK	Identify similar problem model	I
DK	Belief in comprehension of problem	I
DK	Identify important information	I
DK	Target determination	I
DK	Think the possible strategy	D
DK	Know how organize the strategy	D
PK	Assumption determination	D
PK	Developing the plan from the strategy chosen	E
PK	Making chemical equation	E
PK	Analyze the factors engaged in chemical equation	A
PK	Use the other knowledge to solve the problem	A
PK	Analyze quantitative aspects	A
PK	Think any possible ways that could be done	S
CK	Check the progress of problem solving	A
CK	Effective time management	L
CK	Determining the assumption chosen has been correct	L
CK	Checking the method used has been correct	S
CK	Have a belief in problem solving that has done	S

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2.3 Data Analysis

Data would be analyzed by trend analysis of data and description of causal relationship of every aspect of metacognitive knowledge. The result of every dimension in metacognitive knowledge depended on their indicators. This attainment of metacognitive knowledge was classified into two part, good and poor categories. The good category was given as equal or more than half of indicators reached. The poor category was classified for less than half of indicators reached.

Comparison between the students' judgments and the teacher's judgments would be determined by a calibration of judgment accuracy.Confidence degree of students was a type of students' calibration in metacognitive judgment as a different (Δ) between their perceived performance and their actual performance. Every attainment of each indicator was score as one, so that the total was twenty for all indicators. Perceived performances were identified as students' judgment on self-assessment questionnaire while the actual performances were identified as judgments made from the students attainment of problem solving steps score.

Three categories of judgments were classified into underconfidence (UC), realistic (R), and overconfidence (OC). According to [23], the basic for classification was based on margin of error (m.e). The margin of error of the scale was determined as multiplying the standard error of indicators' score to z-score in significance five percent. Underconfidence categories were occupied by students having the calibration score of one scale under negative margin of error. These underconfidence categories were divided by four levels: UC1 (-5 m.e $\leq \Delta <$ -1 m.e), UC2(-10 m.e $\leq \Delta <$ -5 m.e), UC3(-15 m.e $\leq \Delta <$ -10 m.e), and UC4(-20 m.e $\leq \Delta <$ -15 m.e).Realistic students were categorized as range between one scale under to on one scale of margin of error(-1 m.e $\leq \Delta \leq$ 1 m.e). While the overconfidence students were classified if the score was above one scale margin of error. These overconfidence categories were devided by four levels: OC1 (1 m.e> $\Delta \geq$ 5 m.e), OC2 (5 m.e> $\Delta \geq$ 10 m.e), OC3 (10 m.e> $\Delta \geq$ 15 m.e), and OC4 (15 m.e> $\Delta \geq$ 20 m.e).

3.Result and Discussion

The result of chemical equilibrium problem solving of students, as a teacher's judgment, indicated that students had poor categories in so many indicators of problem solving. Teacher's judgment showed that all students could not solve the problem completely. They had problems in almost the steps: motivation, identify the problems, define the context, analyze options, list the reasons, self-correct.

In motivation, students had a problem in controlling their focus to maintaining their motivation to solve problems. This case was observed during the problem solving activities that some students could not maintain their attention to solve problems after several minutes tried to think the solution. According to students' judgment about their declarative knowledge in motivation and anxiety control, indicated that they had good motivation but they had poor anxiety control. It meant that students' judgment and teacher's judgment had similar judgment or the students had a good self-calibration to assess themselves.

In identifying the problems, teacher's judgments were lower than students' judgment in identifying important information. Students tended to trap themselves to focus on numerical data in the problems and they were puzzled to determine and decide the important data.

In defining the context, teacher's judgments were lower than students' judgment in thinking the possible strategy. Students tried to focus on phenomenological strategies. They tended to think the strategy about the effects of data such as temperature, volume, and mol of compound to the reaction in chemical equilibrium concept.

In enumerating the choice, teacher's judgments were a bit similar with the students' judgment. Students aware that they could not have developed the plan from the strategy chosen because they were incorrect to determine the possible strategy. This case effected the problem in making the chemical equation.

In analysis options, teacher's judgments were lower than students' judgment in analysis the factors engaged in chemical equation, using the other knowledge to solve the problem and analysis quantitative aspects. Students were too belief that they had a correct understanding in analysis the

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factors engaged in chemical equation which was the factors affecting the chemical equilibrium shift. Some students was not sure what the important of and the use of the data. Students did not use other knowledge to link and search the possible relationship to solve the problems.

In listing the reasons, teacher's judgments were a bit similar with the students' judgment. They did not had capability so manage the time given to solve the problems. Some students only focused on one step and could not continue the next step. Other students could reach the solution but did not determine the assumption they had before.

In having self-correct,teacher's judgments were lower than students' judgment in their belief about the solution possed. Students were too sure that they had conducted the correct ways and all determination considered in initial state before had reached the final state of problem. This case confirmed the overconfidence of students during the problem solving.

Table 2 showed us that both students who had poor and good metacognitive knowledge tended to be overconfidence. This result was confirmed by [23] that students tended to be overconfidence in chemistry. This trend was due to the belief of students about their capability that were higher than their performance. Students were sure that their memories about chemical equilibrium knowledge were enough and correct to use in arranging the solution. In fact, they had some false memories about the concept and use of meanings to solve the problem from the information given. They tended to think in simple but in incorrect assumption determined. This result strengthened the statement of [1] that the overconfidence appeared in adifficult test and the underestimate was in a relatively easy test.

Table 2. Number Students for Metacognitive Knowledge Level based on Confidence Degree

Confidence degree	DK		PK		CK	
	Poor	Good	Poor	Good	Poor	Good
UC	11	2	11	2	11	2
R	10	3	10	3	12	1
OC	31	35	40	26	49	17

Fig. 1 showed us that the trend of students was overconfidence passing close to the realistic thinking. In Fig. 2 found that the students tended to be more overconfidence, and the male students were more overconfidence than the female students. While there was a trend that the female students tended to be more underconfidence. This was because the differences between the characters between male and female students in learning chemistry. Results of research conducted by [28] indicated that epistemological beliefs contribute to students' purposeful choice of study strategies. These statements showed that a female always carried on her weakness by examined herself in everything she did. It supported by worked of her optimum brain in sensing and managing what she did to aware where was her position in the solving frame designed.

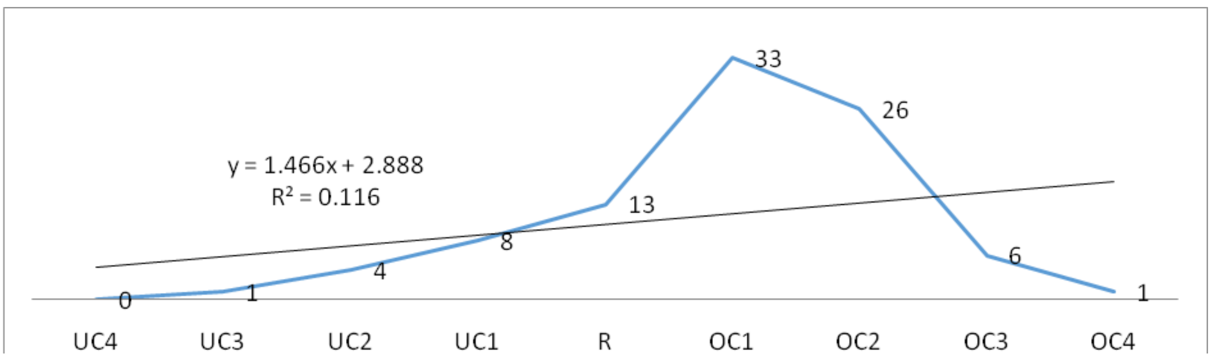

Figure 1. Margin of error scale in Students Self-Calibration of Chemical Equilibrium Problem Solving for total students

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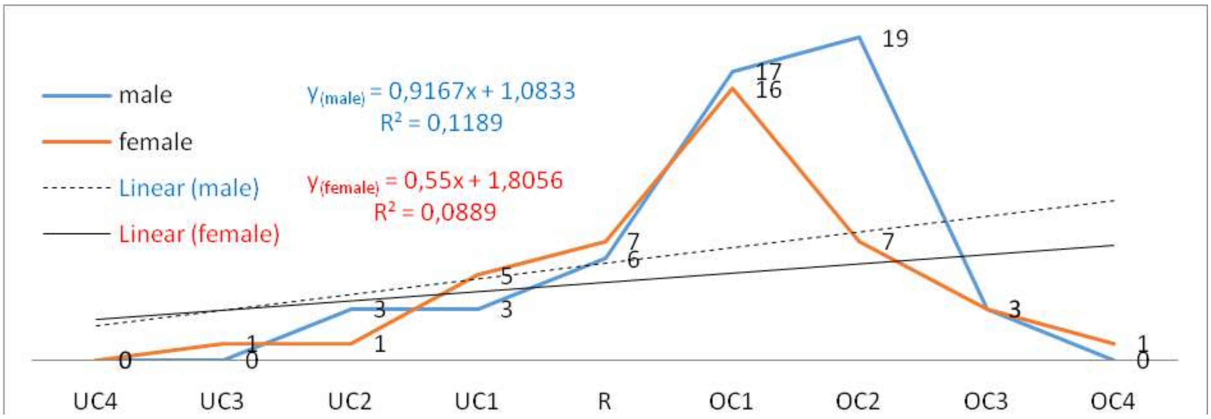

Figure 2. Margin of error scale in Students Self-Calibration of Chemical Equilibrium Problem Solving: for each male and female students

The male students tended increasing their confidence while their performance were lower than their expectation or their perceived judgment. This confidence became better when they had good conditional knowledge. The students having better conditional knowledge can making decisions better in the situation given, like limited time, the crowded of data, and new application problem. Thus, if their conditional knowledge was better, they would be realistic to judge themselves and can predict the correct calibration about themselves. Through the determination of check-recheck activity, balancing their self-belief in judging their certainty or confidence during solve the chemical equilibrium problem, and selecting the correct memories when they scanned for familiarity and recollecting between the knowledge they had before (like reaction rate and others), the students themselves would be better in realistic judgments.

4.Conclusion and Suggestion

By comparing the students' judgment and teacher's judgment about the metacognitive knowledge aspect in chemical equilibrium problem solving skill of students, we found that students tended to be overconfidence about their self-assessment to their actual performance especially in male students. As educators, we had to give our students feedback about their performance, with hope that they will know about their performance and they will calibrate themselves as actual as the fact they are.

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The Effect of Maternal Pre-Pregnancy Body Mass Index (BMI) on Initiation and Duration of Breastfeeding-Systematic Review

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Abstract. The obesity prevalence is globally increasing among women of reproductive age. Meanwhile, initiation and duration of breastfeeding had been associated with maternal pre-pregnancy BMI. The purpose of this study was to systematically review studies that assessed the effect of maternal pre-pregnancy BMI on initiation and duration of breastfeeding. A search of studies was conducted in 3 journal databases: Proquest, Scopus and Google Scholar on maternal pre-pregnancy BMI and breastfeeding. Based on these searches, there are 1213 studies were found, but only eight relevant prospective studies. Total of eight research journals from 2010 - 2016 was analyzed. The results of two of four observed papers on breastfeeding initiation found that obese women were less likely to initiate breastfeeding, the OR 0.63 and 0.84 respectively and for underweight odds ratio 0.87, compared than women with normal BMI.Two study of breastfeeding initiation assessed that obese women had a higher risk of non-initiation of breastfeeding, RRadj 1.26 and 5.39. Four journals of breastfeeding duration assessed that obese mothers had a shorter duration of exclusive breastfeeding and duration of breastfeeding, than normal and underweight women. This review shows that obese mothers are more likely to reduce lactation. Promotion of breastfeeding should be improved before and during pregnancy in overweight and obese mothers.
Keywords : BMI, breastfeeding, duration, initiation, obesity

1. Introduction

World Health Organization (WHO) states that breastfeeding is a way of providing an unequaled ideal food for healthy growth and infant development. As a global public health recommendation, infants should be given exclusive breastfeeding during the first six months of life then breast milk continues until age two years(1). Breastfeeding can reduce maternal and infant morbidity and mortality(2,3). Almost half of all episodes of diarrhea and one-third of respiratory infections can be prevented by improving breastfeeding practices in developing countries (3). If a mother is breastfeeding, the risk for invasive breast cancer is reduced about 6%(3).

Although breastfeeding is strongly recommended, now the coverage of early initiate breastfeeding in developing countries is 45%, exclusive breastfeeding coverage is only 43%, breastfeeding coverage up to age one year is 74% and breastfeeding coverage up to age two years is 46%(4). Exclusive breastfeeding coverage in Indonesia is 42% and early initiate breastfeeding coverage was only 34.5%(5). Many factors influence the success of breastfeeding. Lancet states that one of the factors that influence breastfeeding is the woman with overweight and obesity(3). WhileGuelinckxstates that the incidence of intention and initiation of breastfeeding was significantly lower in underweight and obese women compared with normal weight(6).

Currently, a woman who is obese and malnourished are increasing. According to WHO, in 2014, 39% of women aged 18 and over in the world were overweight. Also 15% of women aged 18 and over were obese. Also, among the 47 countries that measure body mass among younger adolescents, at least 10% of girls in 10 countries are underweight. Most of the countries with a high prevalence of underweight are in the Africa or South-East Asian regions. Therefore, the purpose of this study was to systematically review studies that assessed the effect of maternal pre-pregnancy BMI on initiation and a duration of breastfeeding.

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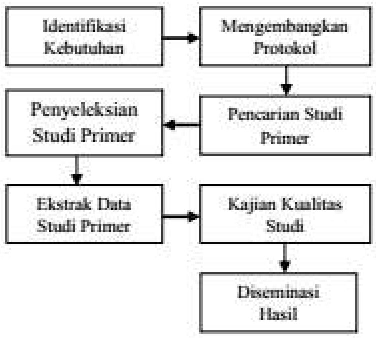
2. Methods

2.1 Review Methods

The literature used is searched using electronic databases The literature then analyzed following the PRISMA guidelines (Preferred Reporting Items for Systematic Reviews and Meta-Analysis Statement).

The Step of Review:



2.2. Search Primary

The literature used is searched using electronic databases such as The Oxford Journal, Scopus, Proquest and Google Scholar with keywords “pre-pregnancy BMI” and “breastfeeding”.

2.3. Select Primary Studies

All the studies were screened used the following inclusion criteria :

1. Published between 2010 an 2016
2. Specific studies on pre-pregnancy BMI
3. Relevant primary outcomes : initiation and duration of breastfeeding
4. Cohort studies
5. Published in English

Studies were excluded when met any of the following exclusion criteria :

1. Published before 2010
2. Non-cohort studies

2.4. Definition of Pre-pregnancy BMI

Pre-pregnancy Body Mass Index (BMI) used the WHO definition. It is classified into 4 categories : underweight < 18,5 kg/m2, normal range 18,5-24,9 kg/m^2, overweight 25,0-29,9 kg/m^2 and obese ≥30,0 kg/m^2.

2.5. Definition of Outcome

Initiation of breastfeeding is defined as the infant’s first intake of breast milk. Duration of breastfeeding is defined as the total of length of time an infant receives any breast milk at all. Duration of exclusive breastfeeding is defined as the duration the infant exclusively receive breast milk as the source of nourishment.

2.6. Critical Appraisal

The quality of the study methodology was evaluated using a listed quality checklist byThe Joanna Brigs Institute Critical Appraisal tools “Checklist for Cohort Studies”. Criteria analyzed included :population, exposed groups, exposure measured, confounding factors, outcome measures, follow up time reported and appropriate statistical analysis. Each review question will be marked ‘+’ when the criteria met, marked ‘+/-‘ when the criteria unclear and ‘-‘ when the criteria are not met. The evaluation result of the quality study are shown in Table 3.

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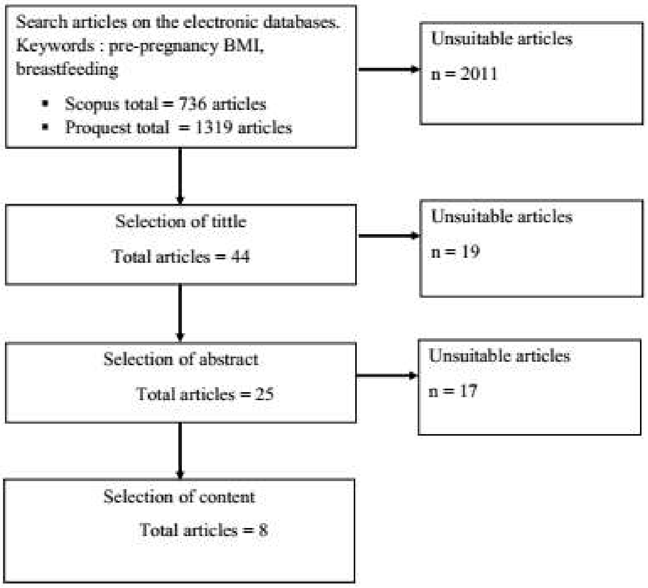
3. Result

3.1. Select Primary Studies

The authors include only longitudinal studies and limit the journal year from 2010to 2016. The study selected only journal version and written in English. The authors get 2055 search results consisting of 1319 articles from Proquestand 736 articles from Scopus. Manually, the authors chose articles that have tittle fit and got 44 articles. Furthermore, the authors choose the journal with the appropriate abstracts to get 25 articles. The next step the authors review all journals contents ranging from abstract, introduction, methods and conclusion which are relevant so that obtained eight articles accordingly. For more details can be seen in Chart 1 Data Reduction Flow.

Chart 1. Data Reduction Flow



3.2. Critical Appraisal

All the studies use a cohort design(7–14). Most of studies use a prospective cohort design (9,11–14)and others use a retrospective cohort design(7,8,10). Although almost all studies have inclusion and exclusion criteria, one study did not include inclusion and exclusion criteria(11).

All studies used the WHO standard in dividing BMI pre-pregnancy. But if almost studies divide BMI pre-pregnancy based on four classifications that are underweight, normal, overweight and obese, one study only divides into two classifications that are underweight/normal and overweight/obese(9).

To determine the height and weight of the mother before pregnancy, three studies used data on pregnancy recording(7,10,11)while five other studies used self-reported (8,9,12–14).

Three prospective cohort studies of the duration of breastfeeding have different understandings of exclusive breastfeeding, the first, exclusive breastfeeding is infants are given breast milk without other liquid and food except drugs(11,14), while the second, exclusive breastfeeding is the infants are given breast milk may given another liquid, except food(12).

Almost all studies identified confounding factors such as antenatal characteristics, place, year delivery and newborn characteristics, but only one study did not include confounding factors(13).Of the eight studies, five prospective studies stated about follow up(9,11–14). Seven studies have maximal score(7–12,14)

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3.3. Breastfeeding

All articles which are reviewed used the WHO definition of obesity: underweight < 18.5 kg/m2, normal range 18.5-24.9 kg/m^2, overweight 25.0-29.9 kg/m^2 and obese ≥30.0 kg/m^2. Table 1 shows the association between maternal pre-pregnancy BMI and initiation of breastfeeding. Two of four observed papers on breastfeeding initiation found that obese women were less likely to initiate breastfeeding than women with normal weight, the OR 0.63 and 0.84 respectively and for underweight odds ratio 0.87(7,10). Two study of breastfeeding initiation assessed that obese women had a higher risk of non-initiation of breastfeeding, RRadj 1.26 and 5.39 (8,9). One study also found that women with obesity were much more likely not to breastfeed compared to normal weight adjRR 5.77(14).

Table 2 shows the effects of maternal pre-pregnancy BMI on a duration of breastfeeding. Four journals of breastfeeding duration assessed that overweight and obese mothers had a shorter duration of exclusive breastfeeding and duration of breastfeeding, than women with underweight and normal BMI(14,11–13).One study reported that underweight women have a shorter duration of exclusive breastfeeding and duration of breastfeeding compared than women with normal BMI(14).

Table 1. Prospective studies on the association between pre-pregnancy BMI and initiate of breastfeeding

No	Reference	Sample	Design Study	Age (years)	Result
1	Thompson, et al. USA. 2012	1.161.949 women	Kohort	<21 - 40+	Underweight and obese women were significantly less likely to initiate breastfeeding than women with normal BMI, (adjusted odds ratio 0.87, 95% CI 0.85-0.89 for underweight woman; 0.84, 95% CI 0.83–0.85 for obese women)
2	Verret-Chalifour, et al. Canada. 2015	6592 women	Kohort	23+	Twenty percent (20%) of obese women didn't initiate breastfeeding at hospital compared to 12% for normal weight women. Obese women had a higher risk of non-initiation of breastfeeding compared with those having a normal pre-pregnancy BMI (RRunadj 1.69, 95% CI 1.08-1.46), even after adjustment for prenatal and sociodemographic factors (RRadj 1.26, 95% CI 1.08-1.46)
3	Mehta et al. USA 2011	550 women	Kohort	-	Women who have overweight or obese before pregnancy more likely to not initiate breasfeeding(RRR 5.39, 95% CI 2.41-1204)
4	Ramji, et al. Kanada. 2016	12.831 women	Kohort retrospective	-	Obese women were less likely to breastfeed than women with normal weight (60,0 % vs 71,7%) (aOR 0.63; 95% CI 0.55-0.71)

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Table 2. Effect of maternal pre-pregnancy BMI on duration of breastfeeding

No	Reference	Sample	Design Study	Age (years)	Result
1	Castillo, et al. Brazil. 2016	4.011 child under five	Kohort	0-48 months	The total breastfeeding and exclusive breastfeeding median durations were 7.0months and 1.5 months. There were no differences in duration of any breastfeeding or exclusive breastfeeding according to pre-pregnancy BMI or GWG categories. There was an increased predicted probability for weaning before the age of 3 months among infants from obese women, compared with those from mothers with normal pre-pregnancy BMI, with margins adjusted prediction of 0.36 (95% CI 0.31-0.41) and 0.23 (95% CI 0.21-0.25), respectively.
2	Makela, et al. Finland. 2013	848 child undertwo	Prospective follow-up study	13 months-2 years	Overweight women breastfed fully (2.2 vs 2.8 months , p<0,0001) and totally (7.4 vs 9 months, p<0,0001) for a shorter time than normal weight women.
3	Newby, et al. Australia. 2016	462 women	Kohort	-	Breastfeeding duration differed significantly (x^2 (2) = 7.21, *P*=0.007) between normal, overweight and obese women. Mean duration of breastfeeding with BMI <30 between 4.0-12.5 months and women with BMI >30 between 4.9-11.6 months.
4	Mehta. USA. 2010	550 women	Kohort	-	Women with overweight and obese have a higher risk of non breastfeed (Adj RR 5.77, 95% CI 2.45-13.55); while underweight (AdjRR 1.71, 95% CI 0.31-9.54); breastfeed less than 4 months (Adj RR 2.44, 95% CI 1.36-4.38) compared with those from mothers with normal pre-pregnancy BMI. Women with overweight and obesity have a duration of exclusive breastfeeding 2.5±2.3 months and duration of breastfeeding 5.8±6.1 months. Women with underweight have a duration of exclusive breastfeeding 2.8±2.3 months and duration of breastfeeding 7.1±5.2 months.

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Table 3. Critical Appraisal

Author and Year	Thompson, et al. USA. 2012	Verret-Chalifour, et al. Canada. 2015	Mehta et al. USA 2011	Ramji, et al. Canada. 2016	Castillo, et al. Brazil. 2016	Makela, et al. Finland. 2013	Newby, et al. Australia. 2016	Mehta. USA. 2010
Two groups similar and recruited from the same population	+	+	+	+	+	+	+	+
Exposures were measured similarly to exposed and unexposed groups	+	+	+	+	+	+	+	+
Exposure was measured in a valid and reliable way	+	+	+	+	+	+	+	+
Identify confounding factors	+	+	+	+	+	+	-	+
Strategies to deal with confounding factors	+	+	+	+	+	+	-	+
The outcomes were measured in a valid and reliable way	+	+	+	+	+	+	+	+
Follow up time reported and sufficient to be long enough for outcomes to occur	-	-	+	-	+	+	+	+

4. Discussion

4.1 Initiation of Breastfeeding

The result of review show the same pattern that obese women have less likely to initiate of breastfeeding compared than women with normal BMI(7,10,8,9). It can be caused such asdecreased breastfeeding initiation in obese women may reflect of a biological barrier, with a decreased hormonal response in lactation(7). Overweight/obese women had a lower prolactin response to suckling. This would be expected to compromise the ability of overweight/obese women to produce milk. Also there would be consistently higher progesterone concentrations in the early postpartum period among obese compared with normal-weight women because adipose tissue is an extraplacental source of this hormone(15).

Obese women will often have large breast and there are indications in the literature that large breast have been associated with breastfeeding difficulties. Overly large breast usually betrayed a true poverty of milk and may have practical/mechanical difficulties with attaching the baby to the breast.

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Some women with large breast have broad areolae with short nipples making it difficult to attach the baby (16). Obese and overweight women more likely to have medical conditions such us diabetes may be more likely to experience delayed lactogenesis or low milk supply(17).

4.2 Duration of Breastfeeding

Based on review, the result shows same pattern that women with obese have duration of breastfeeding shorter than woman with underweight and normal BMI(14,11–13). It can explain by previous studies. Some data indicate that polycystic ovarian syndrome (PCOS) may play a role in reducing breastfeeding duration and exclusivity in obese women. PCOS is associated with elevated androgens, metabolic abnormalities and hypothyroidism and PCOS often occur alongside overweight or obesity (18). Body image issues during pregnancy have been reported to involve both social and psychological issues. Breastfeeding is often seen as a socially awkward practice in spite of its importance to infants. Body image dissatisfaction related to obesity has been reported in women with high pre-gravid BMI. Breastfeeding duration in primiparous women related to a lack of comfort and confidence in their own bodies(13). Obese women also associated with depression postpartum. Obese women tend to have lower self-esteem and poorer mental health than normal weight women. Obese mother is more likely to have postpartum depression; depressed mother is less likely to continue breastfeeding than a non-depressed mother (17).

5. Conclusion

This review show that pre-pregnancy BMI associated with initiate and duration of breastfeeding. But only obese women have consistently effect to delayed lactogenesis and reduced duration of breastfeeding. Promotion of breastfeeding should be improved before and during pregnancy in overweight and obese mother.

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Chemistry Laboratory Equipment Inventory Media: An Alternative Media for Students' in Learning of Laboratory Management

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Abstract. Chemistry laboratory management is an activity to organize all chemicals and equipment in the chemistry laboratory. The media that can used to manage equipment in chemistry laboratory are computer software, log book, etc. This study is promoted a kind of MySQL-Android based media, called Chemistry Laboratory Equipment Inventory, as a media for students' in learning of chemistry laboratory management. The media used MySQL for laboratory equipment database. The information in database consists of the name of equipment, the specification of equipment, how to keep the equipment, how to use the equipment and also the picture of equipment. The android based smartphone is used as a reader of equipment barcode. The students fill out questionnaires about the learning process using this media in Laboratory Management learning.Based on this study, the students' of vocational school, especially department of analytical chemistry, are interested in using this media as a learning resource in chemistry laboratory management.

Keywords: chemistry laboratory equipment inventory, laboratory management

1. Introduction

The laboratory is a room or a place of experimentation and research. The laboratory is specially designed and equipped for science experiments, demonstrations and investigations in a safe environment[1].The laboratory in the learning process is used to achieve various goals, i.e. the cognitive objectives related to the concepts of scientificconcepts, the process of developing skills and increasing understanding of the scientific method[2].Laboratory should not only be a place to demonstrate the phenomena described in the textbooks and to verify principles and laws, but it should also be a place where students are given the opportunities to go through the processes of scientific inquiry on their own[1].

One of the common laboratories in school is chemistry laboratory. In the chemistry laboratory, students are able to see chemistry hands-on and they have the opportunity to act as scientists and observe chemical reactions taking place.Ithaslong been a belief in chemistry education that the laboratory has the potentialto be a place where theory and practice cancoalesce for students[3].All the students' activities in chemistry laboratory always connected with chemical and also chemistry laboratory equipment.

Chemistry laboratory equipment means the various tools and equipment used by scientists in the chemistry laboratory. Both of experiment and research in chemistry are used the laboratory equipment. Kinds of chemistry laboratory equipment are laboratory glassware (such as beaker, reagent bottle, etc,) and analytical device (pH meter, spectrophotometer, etc.)

Managing laboratory equipment consists creating, editing, and organizing data on these equipment or laboratory tools, the actual, the specifications and the locations where they are stored[4]. All of these activities are done by the head of laboratory. Laboratory equipment management is one of the essential elements of a quality management system in chemistry laboratory. Proper management of the equipment in the laboratory is necessary to ensure accurate, reliable, and timely testing.For a conventional system in laboratory equipment inventory, lots of forms and books were used to list out inventory and the data are written manually[5]. The data can suddenly misplace or even lost. For future use, this conventional system should be replaced with a user friendly and more systematically system.Itmeans that a computer software or application is important in managing the chemical and equipment in chemistry laboratory[6].

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One of the subject matter of analytical chemistry department in vocational school is laboratory management. The basic competence of this subject matter is students able to manage the chemical and laboratory equipment in the chemistry laboratory. One of the learning sources of this subject matter is aChemistryLaboratory Equipment Inventory media. This media is a computer-based software application used in the laboratory to manage chemistry laboratory equipment. This application designed to manage the laboratory equipment, include the location, the specification, the instruction to keep and to use, etc. The design of this application is simple and easy to use. This application can be use in managing the laboratory equipment and also as a learning source for student in learning of laboratory management.

2. Methods

This study is a part of the research in developing a MySQL-Android based Chemical Inventory Management Systems (CIMS). In this study,the media, namely Chemistry Laboratory Equipment Inventory Media, isfocussing on how to manage the chemistry laboratory equipment.

Figure 1. The icon of Chemistry Laboratory Equipment Inventory Media

The media consists of 2 software applications, which are the database and the reader. The database is installed on personal computer or laptop and the reader is installed on Android smartphone. The database includes of several things about the equipment, which are the name, the barcode, the specification, the amount, the location, etc.

No	Barcode	Nama	Ukuran	Jenis Bahan	Jumlah	Kondisi	Sumber	Spesifikasi	Tahun Pembelian	Lokasi ...	Cara Penyimpanan	Cara Penggunaan	Foto
1	2.6.1.1	Alu dan Mortar	-	Porelin	20	Baik	FMIPA	Pyrex	2000	LA B 1	Cara penyimpanan.docx	cara pengunaan.docx	alu dan mortar.jpg
2	1.1.2.1	Beker Glas	50 ml	kaca	20	baik	FMIPA	Pyrex	2001	LA A1	Cara penyimpanan.docx	Cara pengunaan.do...	beker glass 50 ml.jpg
3	1.1.2.3	Beker Glas	250 ml	kaca	10	baik	FMIPA	Pyrex	2003	LA A1	Cara penyimpanan.docx	Cara pengunaan.do...	beker glass 250 ml.j...
4	1.1.2.2	Beker Glas	100 ml	Kaca	20	Baik	FMIPA	Pyrex	2011	LA A1	Cara penyimpanan.docx	Cara pengunaan.do...	beker glas 100 ml.j...
5	2.1.2.1	Botol Reagen Bening	50 ml	kaca	30	baik	FMIPA	Iwaki	2000	LA D2	Cara pengunaan.docx	Cara penyimpanan....	botol bening.jpg
6	2.1.2.2	Botol Reagen Gelap	50 ml	kaca	30	baik	FMIPA	Iwaki	2005	LA D2	Cara penyimpanan.docx	Cara pengunaan.do...	botol gelap.jpg
7	2.5.1.1	Botol Semprot	-	Plastik	15	Baik	FMIPA	Asistant cap	2016	LA A2	Cara penyimpanan.docx	Cara pengunaan.do...	botol fix.jpg
8	2.1.13.1	Bunsen	-	Kaca	20	baik	FMIPA	bahan gela...	2008	Rak A3	Cara penyimpanan.docx	Cara pengunaan.do...	bunsen.jpg
9	2.1.3.1	Corong	25 mm	kaca	4	baik	FMIPA	Herma	2009	LA B1	Cara penyimpanan.docx	Cara penggunaaan....	corong diamater ke...
10	2.1.4.1	Corong Pisah	500 ml	Kaca	8	Baik	FMIPA	Pyrex	2009	LA B2	Cara penyimpanan.docx	Cara pengunaan.do...	corong pisah.jpg
11	1.1.6.1	Erlemeyer	100 ml	Kaca	20	Baik	FMIPA	Pyrex	2009	LA A1	Cara penyimpanan.docx	Cara pengunaan.do...	erlenmeyer 100 ml.j...

Figure 2. The database of Chemistry Laboratory Equipment Inventory Media

The reader is a kind of application which installed on Android smartphone. Using camera on the smartphone, the application will scan the QR code of the equipment. Smartphone must be connected with the server, personal computer or laptop where the database was installed, through wifi. Another word, the server can be connected with 2 or more Android smartphone.

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The subject of this study is students of analytical chemistry department who learn laboratory management. The students fill out questionnaires about the learning process using this media. This questionnaire consists of three aspects, which are the depth of the laboratory equipment management contents, the performance of the program, and the display at screen of Android smartphone. For each aspect, there are consists of 5 – 6 statements. Students also fill out the open question, "Did you interested using this media in learning of laboratory management? Explain your answer!".

3. Results and Discussion

The Chemistry Laboratory Equipment Inventory has been validated by reviewers before it used as a learning source in laboratory management subject matter. The student activities using this media were:

a. Fill in the database

The students fill the Chemistry Laboratory Equipment Inventorydatabase by clicking menu "Add Inventory".

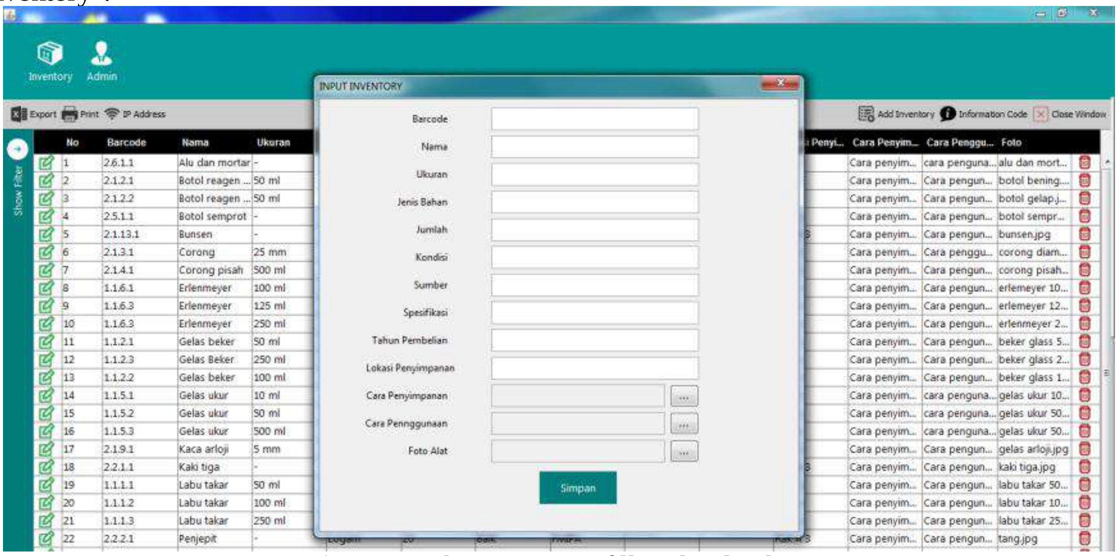

Figure 3. The process to fill in the database

b. Printing the QR code

The next process is printing the QR code of equipment. The QR code include of specific information of equipment.

Figure 4. Printing the QR code

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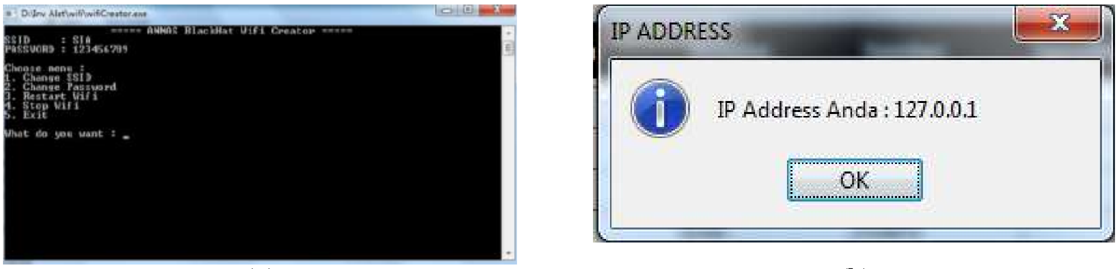
c. Synchronizing Android smartphone and the database
Synchronizing means make connection between smartphone and laptop (the database server) using wifi.



(a) (b)

Figure 5. Synchronizing the smartphone and server,
(a) activating wifi creator, (b) IP address of the database

d. Scanning the QR code by Android smartphone
The camera of Android smartphone is used to scan the QR code at the equipment. The result will appear at the screen of the smartphone after a few second.

(a) (b)

Figure 6. Scanning of QR code of the equipment
(a) The QR code, (b) the display at smartphone

The Chemistry Laboratory Equipment Inventoryisnot only focuses on the technical side but also refers to the way of managing laboratory equipment. Using this media, student slowly began to switch from conventional (conventional)method of managing laboratory equipment to digital method.The Chemistry Laboratory Equipment Inventoryis easy application and practical to use because of the light program performance. Laptop used as database processing the data of equipment with wifi applications so that data transfer can cover a large area and faster.

The data analysis through student perception after using The Chemistry Laboratory Equipment Inventorymediaas learning source is viewed from 3 aspects, which are the depth of concept, program performance, and the display at screen of Android smartphone, shown at Figure 7 below.

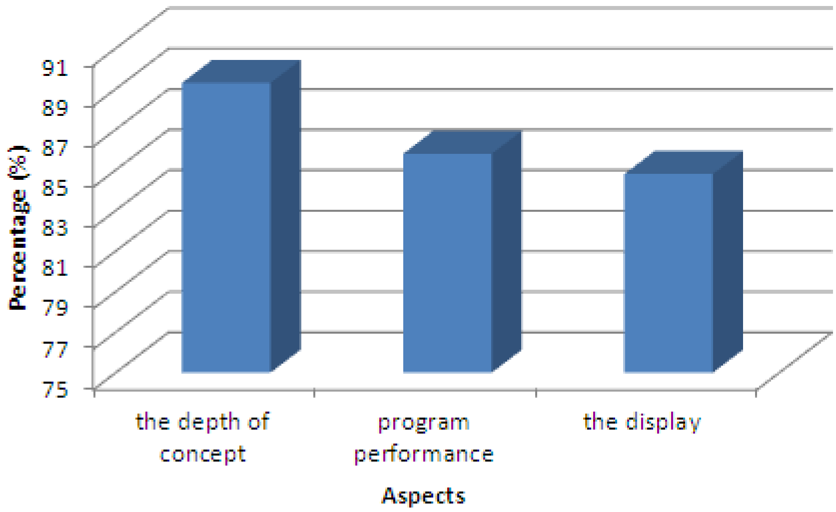


Figure 7. Student perception after using The Chemistry Laboratory Equipment Inventorymediaas learning source

The display aspect on the Android smartphone screen gets a value that tends to be lower than the other aspects. This is possible because the media display depends on the quality and resolution of each smartphone screen. In addition, the perception of each student on the display of computer based media is very subjective[7].

All students agree that Chemistry Laboratory Equipment Inventory media is very interesting and help them to learn the laboratory management. They say that this media is interesting because:

a. Achieving deeper learning outcomes
b. Improving the experience
c. Applying technology in managing laboratory equipment.
d. Easy to use
e. Have a large capacity of database
f. Updating the data is easy
g. Using Android smartphone to read the QR code is fun.

4. Conclusion

Overall, the students respond positively to the implementation of Chemistry Laboratory Equipment Inventory as a media in learning of laboratory management. A more fine grained analysis shows they feel the media have encouraged them to achieve deeper learning outcomes, and have improved the overall educational experience.

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Campus Yard Management and Utilization as a Learning Facility and Source in Universitas Kristen Indonesia

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Abstract. This study aims to determine the management and utilization of UKI yard conducted in July to August 2017. The methods in this research used survey, semi-structured as well as in-depth interview. The survey was conducted by observing the entire yard of UKI. The interview sessions involved the users and the managers of UKI yard concerning the management, funding, and the utilization. All the data obtained were analyzed by using descriptive statistics. UKI yard has an area of belonging to UKI foundation. The UKI yard is comprehensively managed by UKI Foundation, Rectorate, Faculties, and Study Programs and used as parking lot, sport area, discussion zone, practicum, plantation field, such as ornamental plants/fruit/shady trees, and also as biodiversity conservation. To optimize the utilization of UKI yard it is managed in accordance with the duties and functions of the parts contained in the UKI foundation. For example, the parking area is managed by the UKI Foundation; the supply and the maintenance for supporting facilities and for learning resources are managed by the Vice Rector on Finance, Human Resources and Public Administration Affairs; Practicum area is managed by the Study Program Board; and the sport area is managed by Vice Rector on Student Affairs. Sports facilities are utilized as the students' nonacademic, talent, and softskillbuilding.*Pulai (alstoniasholaris), melinjo (gnetumgnemon), beringin (ficusbenjamina), ketapang (terminaliacatappa)* and *cashew* (*anacardiaocidentale*) are native Indonesian plants found in UKI yard. For the purpose of practicum part of the yard, Biological Garden is made on which various types of plants for conservation, practicum materials and learning resources are employed. Finally, the yard management and utilization were comprehensively conducted an attempt to realize UKI as green campus.
Keywords: Campus Yard, Learning Facilities and Resources, Management

1. Introduction

The quality development of higher education recquires, two of them, the entire understanding how the students learn as well as how the teaching material is recieved. A message perception during the teaching and learning process functions as a primary determinant to the learners' information storage quality. Innovative instruction atmosphere and teaching process appropriateness tend to produce creative gradutes and innovative individuals whose unique potentials are needed to develop.

Teaching source is any types of teaching facility and media, a functionally important teaching component. It is reasonably acceptable to say a lecturer in higher education is recquired to utilize teaching source and media as they hold effective contributions on the teaching context by which participatory learning and concrete learning activities are thoroughly experienced by entire students; consequently the horizon enlargement attempting to achieve instructin objectives are effiently and effectively met.

A university is a formal institution in which education development and leaners' knowledege are substantially enlarged. A campus phisically consists of classsroom, laboratory, lecturer room, library, sport facilities, and yard. The campus yard is area used for various purposes including to plant various types of plants, learning facilities, etc. (Silalahi et al, 2016a). The plants growing in the yard holds the roles as *ex-situ* conservation (Toni 2010), bioindicator (Putri 2015) and noise density and pollution reducer. Silalahi (2015, 2016b) reported that they are usually ornamental plants, fruit-producing plants, and shade plants.

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Conservating the plants growing in the yard is understood as an *ex-situ* conservation act. Toni (2010) reported that the city forest developed within Unversitas Kristen Indonesia (*henceforth* UKI) is aimed at learning and conservating. To introduce the plants diversity, UKI's city forest is divided into three zones according to the Indonesian plant phyto-graphography: (1) zone for plants originating from western Indonesia like *meranti (shorea sp.)*, (2) zone for plants originating from central Indonesia such as ebony, and (3) zone for those from eastern Indonesia such as *matoa*.

Conservating the plants growing in the yard realizes the possibility of students' positive attitude toward plant and environment. Observing native plants of Indonesia, like *pulai (Alstoniascholaris), melinjo (Gnetumgnemon), banyan (Ficusbenjamina), ketapang (Terminaliacatappa)* and cashew (*Anacardium occidentale*) with stem diameter > 50 cm suggested that the selection of plants in UKI yard was initially preassumed to preserve a variety of native plants (Silalahi, 2015). Additionally, the four plants have relatively large number of flowers and frequency; consequently feeding various insects, birds and small mammals are brought into a possible action.

Empirically it is seen in recent times, without considering the conservation value and spirit, there is a tendency to replace the plants in UKI yard with other plants, such as *trembesi (Albiniziasaman), acacia (Acaciamacrophylla),* guava *(Psidiumguajava),* starfruit *(Averhoa carambola*. The loss of native Indonesian plants in the campus yard implies the loss of learning facilities of Indonesian plants and the miselection of plants growing possibly has implications for the existence and sustainability of plant diversity. Furthermore, the aesthetic value and frequency of flowering and fruiting of conservated plants have to be taken into account.

Until recently the function of the campus yard as a media and learning resource is not utilized as it is assumed that the modern facilities and learning resources are better than the natural facilities available in the campus environment. As a result the plants growing in the campus yard have scientifically and traditionally unidentified. It is thought that indentifying the plants scientific terminology is unimportant, meaningless, and unpplicable to support the teaching process. Ideally, the indetification of plants in the campus yard is positively effective to increase the students' awareness and knowledge toward the living plant species.

Jakarta, the capital city of Indonesia, has the largest number of population and campus compared to other Indonesian cities. The campuses established before PermenristekdiktiNomor 44 Tahun 2015 (Ministerial Decree of Ministry of Research, Technology and Higher Education) about National Standard issued have a limited campus yard area which means that a few plants and limited sports activities realized. Urban society including students does not know the various plant species though they consume some fruit everyday. For example many students recognize soursop (*Annonamuricata*), pineapple (*Ananas camosus*), longan (*Nepheliumlonganum*), avocado (*Preseaamericana*), durian (*Duriozibethinus*), but they do not understand the spesific characteristics of the plants. This is to infer their perception and learning awareness toward Indonesian native plants are totally camptured and possibly decreases.

Manajement is activity that set organization or institution that is man and non man, so the purpose of organization or institution can be achieved effectively and efficienly (Sulistyorini, 2009). It means management is the process of organizing human and non-human in order to effectively and efficiently achieve the institution obejectives. Management is also defined as a process of organizing various resources by cooperating with others through a certain process to achieve organizational goals effectively and efficiently. Fattah as cited in Barnawi and Arifin (2012) said management is often defined as science, tips and professions. Management is meant as the process of planning, organizing, leading and controlling the whole efforts of a certain institution to effectively and efficiently achieve its goal (Suharno, 2008). Thus, campus yard management is obviously inferred to acooperative process in effectively and efficiently utilizing the entire educational facilities and infrastructure in the campus yard.

The teaching paradigm movement from teacher-centered to student-centered believed positions the leaners involvement -an act to acquire the cognitive, affective and psychomotoric aspects- in positively active manner. The students, through the application of student-centered approach, are

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directed to have equal reinforcement and facility attempting to independtly construct his or her own deep undertanding.

Environment according to student-centered learning plays a functional role as a learning media and source. Biodiversity dealing with the plant classification and taxonomy is one of the topics learned in Biology and the use of instructional media in teaching it avoids its difficult concept and structure to the learners since the real experience is defnitely constructed.

The sixth standard form of Accreditation of Higher Education Institution (*Akreditasi Institusi Perguruan Tinggi*) suggests the quality is determined by facilities and infrastructures and strengthens some indicators, namely (a) management system, (b) ownership and use of campus area, (c) adequacy and quality, (d) facilities development plan, (e) the provision of centralized learning source and its accessibility to enormously support academic interaction among students, lecturers, experts, and other practitioners.

Obviously there are many simply used and easily practical designed media accessable to the teachers, but creativity, innovation and initiative have to be brought into a reality. In Biology learning, environment is contextually utilized in teaching a range number of materials, for example the types of plants growing in the school yard are alternatively used to the biodiversity teaching. Hence, the account for media exisiting in the school yard positates in a primary influential consideration promoting its well-organized use in learning.

UKI located in Jakarta has a range number of plants growing in the campus yard phisically different (trees, shrubs, and herbs) and functionally altered (shelter, ornamental plants, fruit producers, guardrail). To date the studies on the management and utilization campus yard are far betwen. Such account leads to the scientific study objectives of the management and utilization of campus yard as learning facility and source in UKI.

2. Methods

2.1. Data Collection

The study was conducted at UKI campus, located at JalanDiponegoro No 80 (Campus 2) and JalanMayjendSutoyoNomor 2 (Campus 1) in East Jakarta, started in April 2015 to July 2015 and June 2017 to August 2017. Instruments were developed to determine the management and utilization of campus yard. Digital camera, recording the types of plants and intesive interview, understanding the utilization of campus yard are two instruments of data collection. The purpose sampling method to select the respondents, namely Vice Rector for Academic Affairs, Vice Rector for Student Affairs, the head of Biology Education Study Program and some lecturersutilazing campus yard as learning source was conducted. The management of campus facilities was taken from Accreditation of Higher Education Institution 2016 document of UKI. Thoroughly observing the Campus 1 yard was employed to inventory the plants growing in UKI yard, to identify its local terminology (Indonesian language), and to classify its quantity. Finally, the head of Biology Education Study Program interview gave deeply understanding on the arrangement system of campus yard and its division.

2.2. Data Analysis

Data was analyzed quantitavely and qualitatively. The analysis of utilization management of campus yard as learning facility and source was analyzed with descriptive statistics.

3. Results

3.1. The Description of UKI Yard

Universitas Kristen Indonesia (UKI) is one of the private universities located in Jakarta. UKI has two campuses, namely (1) at Jalan Diponegoro No 80, Central Jakarta, hereinafter called Campus 1 and (2) on Jalan Mayjen Sutoyo, East Jakarta here in after called Campus 2. The Campus 1 yard is 82m^2 and the Campus 2 yard is 134,000m^2. The office buildings, lectures and laboratories area is 1,397,959m^2; sports area (soccer, futsal, basketball and volley) is 10,331.8m^2; parking area is 20,870.8m^2; gazebo is 115m^2; lecturer housing 471m^2; student dormitory 662.3m^2 ; Biology garden 42m^2; canteen 214m^2; minimarket is 255m^2 and the rest is campus park.

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3.2. Campus Yard Management as Learning Facility and Source in UKI

UKI yard was utilized as learning facility and source to assiss the teaching process; subsequently to achieve the UKI vision and mission. The campus yard management functioned as a media to reach the optimal result of intelligent and softskill graduates production, a response to the stakeholders' demand on officers' cognitive, affective, and psychomotor competence.

The good UKI yard management, in accordance with the Regulation of the Minister of Research, Technology and Higher Education number 44 of 2015 on National Standards of Higher Education, particularly the Learning Facilities and Infrastructure Standard, has brought utilization balance on the use of its yard as sport area, plant conservation, classroom, teaching facility, parking area, garden, and green house (picture 1 and 2).

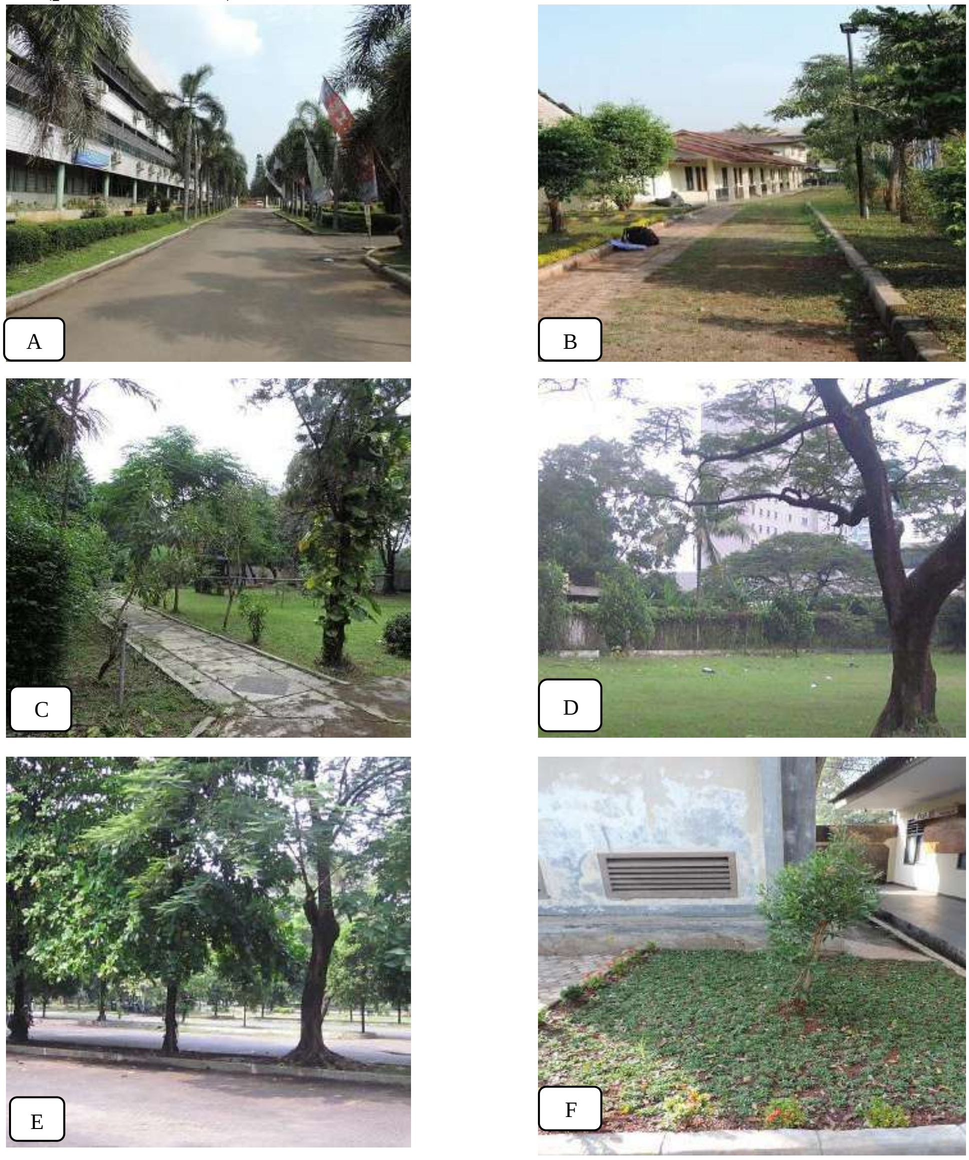

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Figure 1. Pattern of UKI yard: a. Yard/ UKI main street; b. backyard (fronyard of students dormitory); c. guest-house and green-house park; d. futsal outdoor area; e. parking area, f. student dormitory yard; G and H. Building A.

3.3. Plants in the UKI Yard

Campus yard plants have been documented by Silalahi (2015; 2016), particularly thoses were as crops, ornamental and shady plants, but their use as learning facility has never been studied. By species the ornamental plants indentified were fourty-five, shade were twenty-four, food producers were sixteen, and other functions were fourteen (Silalahi 2015).

Those plants are only utilized by Biology Education Study Program, Faculty of Teacher Training and Education, UKI as a teaching aid, particularly as sample speciemens and materials for herberia collection in teaching High Taxonomy Plant Course, Low Plant Taxonomy, Plant Morphology, Plant Physiology, and Plant Ecology. The role of each yard plants varies according to the courses, however.

Contextually various characters of leaves, stems, roots, flowers and fruit, the core subject of Plant Morphology, were studied through the yard utilization of UKI. Several species of plant leaf diversity identified, for example plants that have and compound of rambutan (*Nepheliumlappaceum*), kembangmerak (*Caesalpiniapulccherrima*), mahogany (*Swieteniamacrophylla*), tabebuya (*Tabebuya* sp.), angsana (*Pterocarpusindicus*), and trembesi (*Albiniziasaman*). The widely-used plants to study the morphology of single leaves were *Hiibiscusrosa-sinensis* leaves, *Hibiscus tiliaceus* leaves, and *Soncusarvensis* leaves, *Colocasiaesculenta* leaves.. Furthermore, the direct observation of leaf structure has made simplicity to the students' learning.

Additionally various garden plants utilization in teaching morphonological structure of stem revealed high frequency. Plants have a various trunk structure, namely wood (trees and shrubs) and herbs. For the stem structure various plants in UKI yard have rectangular, such as *Physalisungulata* stems, stems of *Orthosiphonstamineus*, *Justiciagendarussa* stems; while triangular found in UKI such as *Cyperusrotundus* and other types of Cyperaceae.

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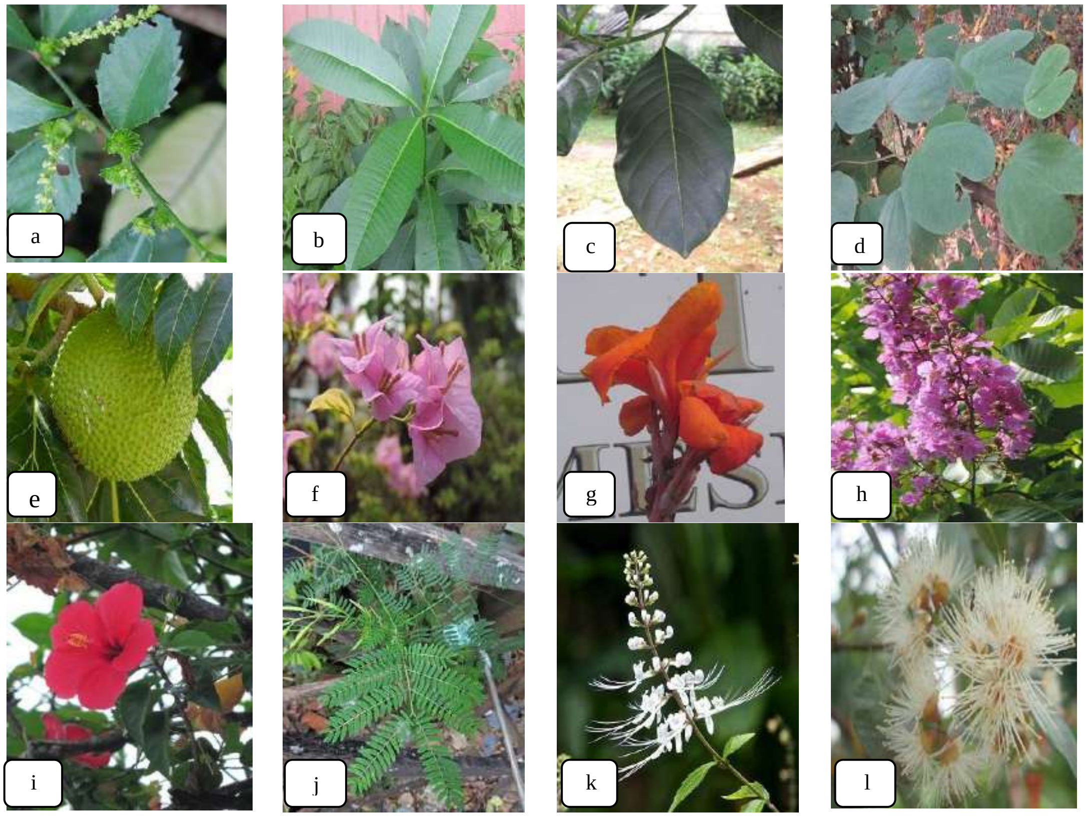

Figure 2. Some plants indintified in UKI used as teaching aid. a. *acalyphasiamensis*; b. *alstoniascholaris*; c. *artocarpusheterophyllus*; d. *bauhinia purpurea*; e. *artocarpuscamansi*; f. *bougenvilleaspectabilis;* g. *canna hybrid*: h. *lagerstroemia speciosa*; i. *hibiscus rosa-sinensis*; j. *leucaenaleucocephala*; k. *orthosiphon aristatus*; l. *syzygiumoleana*.

Plants found were utilized in teaching High Taxonomy Plant course, like the identification of habitus (tree, shrub, and herb), leaf (shape, color, leaf shape, leaf basal, leaf tip, and bone structure leaves), stems (color, shape), flowers (flower structure).

To facilitate the collection and maintenance of plants needed by Biology Education Study Program green house and Biology garden were made. Plants found in green house sambiroto (*Andrographispaniculata*), aglaonema (*Aglaonema* sp.), lidahmertua (*Sansiviera sp.*), cassava (*Manihotuttilisisma*), and taro (*Colocasiaesculenta*). On the contrary, plants found in biology garden were rambutan (*Nepheliumlappaceum*), starfruit (*Averrhoa carambola*), coconut (*Cocos nucifera*), mango (*Mangiferaindica*), and sawo (*Manilkarazapotta*).

In terms of management the green house seemed more optimally organized than biology garden as green house was relatively narrower and more commonly used than biological gardens. Some student's activities were conducted in green house, such as student' research data collection and place to increase interest and talent, which is generally organized by Students Association.

3. Discussion

The campus yard is a landscape in which rich biodiversity is found. This implies the importance of its comprehensive management as it defnitely contains added-values in learning including as biodiversity conservation and teaching facility and source. This study revealed that UKI yard functioned as learning resources, sports area, biodiversity conservation, and shelter.

Placement and management of plants in the UKI yard are done by considering the function of each area. Area used for parking, for instace, lot leafy canopy, such as *ketapang* (*Termilia catappa*) and *globokantiang* (*Polyalthia longifolia*) was planted. On the other hand, the plants with lush and densed

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structures, such as *bintaro (Carberra mangas)* and *tanjung (Mimusposelengi*) were planted to visually decorate the parking spaces.

All sides of pitch, area for football, and volleyball court, the UKI yard utilized as sport area, were planted with pulai (*Alstoniasholaris*) since it plays a role as shade, contains straight trunk and thin coverage consequently offers grass growing possibility around. The educational function of campus yard influences the studies in King Saud University, Riyath (El-Juhany and Al-Harby, 2013), Buca Faculty of education Campus (Ugulu*et al*., 2012) and Universitas Bengkulu (Wyriono and Nurliana, 2011). The researches, however, focused on useful medicinal plants (Patel, 2012; Witantri*et al*., 2015), vascular plants (Ugulu*et al*., 2012), ornamental plants (Juhanydan Al-Harby, 2013), students' understanding on campus yard plants (WyrionodanNurliana, 2011; Silalahi, 2016), and its distribution (Silalahi 2016b).

Silalahi (2016b) suggested several alternatives developed to determine the types of plants in the campus yard, namely (1) balancing the number and types of food procuder plants for fauna; (2) planning the zonation system that is one zone developed to keep the fertility and another one for fauna food producer. Another alternative that can be developed in the selection of plants on campus is the division of zones to restore soil fertility (Silalahi 2016).

The management of the yard includes (1) standard setting, (2) implementation of procurement standard, (3) evaluation of standard implementation, (4) control of standard evaluation results and (5) standard improvement (UKI Internal Quality Assurance System, 2015). The UKI Internal Quality Assurance System on infrastructure standards consisits of land, buildings, classrooms, student activity units, faculty rooms, leadership rooms, administrative rooms, laboratories, library rooms, sports facilities, public facilities and maintenance, safety and security facilities. The observation result showed the facility availabiltyand large parking lot independetly used by local residents.

The sufficient sports field is unoptimally utilized and irregularly scheduled.It is independently used by students, lecturers, administrative officers, and local residents, and its facility and infrastructure goes to the General Administration Bureau's responsibility under the Vice Rectors of Finance, Human Resources, and General Administration. However, the work program of Vice Rector for Student Affairs, Law and Cooperation in 2017 emphasized the renovation of some sports field intoones for which student's talent training and development turn to a reality. Currently UKI provides scholarships for athletes so that the UKI sports standards are adjusted to national sports standards.

The gazebo facilities equipped with wifi were used for students' discussion, work, relaxing and waiting. Its unoptimized utilization revealed as the electricity unavailability appeared and openned access system, accessable for local residents, practiced.

4. Conclusion

1. The synergestic and multi-layered responsibility ranging from UKI Foundation, Rectorate, Faculty, and Study Program are practiced to manage the campus yard.
2. UKI yard is utilized as sport area, students' gathering and discussion, practicum, ornamental and fruit plant sources, and conservation.
3. As a conservation spot various types according to plants structure, like trees, shrubs and herbs were found.

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Developing Student's Global Awareness Through Chemical Literacy: Problems and Possibilities

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Abstract. This paper was focused on the problem of raising global awareness in the context of chemical literacy. It is the purpose of this paper not only to discuss the difficulties but also the possibilities that exist within chemistry education for the development of global awareness. By focusing, as it does, on the relationship between the self and the natural environment.This paper discusses the difficulties that exist, such as the students' involvement with the natural world, as their object of study, and the modeling of the natural world, and the purpose of learning chemistry, as well as the possibilities for promoting the development of such relationship by keeping the natural world, as an object of study, in the foreground of the teaching-learning process. Other possibilities refer to the awareness of the personal and wider significance of chemistry ideas and issues, the wonder evoked by chemistry ideas and by natural forms and phenomena, the aesthetic appreciation of the natural world, and the 'story of the universe', as a story that addresses the interconnection of chemistry and human life. A discussion, however, of the importance of raising awareness, especially in the context of education, is imperative. Therefore, this study has recommended integrating environmental concepts into the chemical curriculum for all students irrespective of their academic in order to increase the global awareness.

Keywords: Global Awareness, Chemical Literacy.

1. Introduction

In this 21st century, we must be ready to face the era of globalization because inevitably we must be involved in it. We as the nation of Indonesia must prepare to participate in the arena of globalization. This is our obligation not only as an Indonesian citizen but as a citizen of the world. A good citizen of the world needs to have knowledge, attitudes, and values and social activities worldwide so as to follow the rapidly changing world. The theme of global awareness speaks to the need for students to be able to learn from and work collaboratively with individuals from diverse cultures, religions, ideologies, and lifestyles in an environment of openness and mutual respect. This theme also gives references such as the ways in which students utilize 21st-century skills to understand and engage with global issues and diverse learning communities [1]. Global awareness can involve recognition and appreciation through the size, complexity, and diversity embodied as a single entity on earth.

There are different interpretations of global awareness and in order to establish an efficient global education curriculum, a clear and precise definition must be constituted. There are several important variables of Global Awareness education. Proponents of a global education curriculum contend the variables are, "growing economy, ecological, technological, political, and cultural interdependence in the today's world"[2].The main focus of this global awareness curriculum was to improve students' grades. When a teacher makes the content relevant to their students, the learning experience is also enhanced. Traditional teaching styles have left students with the limited knowledge and lack of problem-solving and performance skills to understand the international communities.

Kirkwood [3] describes persons possessing global awareness as "those who possess high-tech skills, broad interdisciplinary knowledge about the contemporary world, and adaptability, flexibility, and world-mindedness to participate effectively in the globalized world.Global Awareness is an appreciation of interconnected worldwide environmental, political, economic, and social relations and their consequences. This appreciation includes recognition of a responsibility to participate in actively shaping those relations and consequences. This responsibility is demonstrated through active and constructive involvement with global issues individually, through our communities, and in concert

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with people around the world. The idea, global awareness in the context of science education has been central to the process of cognitive conflict since the aim of the instructional process is to challenge existing misconceptions. This awareness, in the context of teaching and learning, is about noticing things, about being fully conscious of what is being taught. Chemistry is one of the most important branches of science; it enables learners to understand what happened around them. In general, the topic of chemistry is related or based on the structure of a material, and also chemistry is a subject or subject that is difficult for many students. Chemical curriculum generally incorporates many abstract concepts and such concepts make it difficult for students, but what is important to learn in the field of chemistry and science is the science in everyday life[4].Awareness about the occurrence of globalization is the attitude or accept a fact that the planet where we live increasingly felt narrow with the breakthrough in the field of science and technology. Globalization is a continuous process if we are slow when we are out of date, but it will be fatal if we wrongly treat it. Chemistry is also very influential and has an important role in the development of other sciences, almost all industrial production for the purposes of the daily life of mankind using chemicals in the production process. Almost no daily necessities are consumed without the role of chemicals in the processing. Therefore we need to teach global awareness in chemistry learning in the classroom.Global awareness and chemistry learning results in more rounded individuals, encouraging our pupils to see things from different perspectives and helping them to make informed decisions, acquiring transferable skills that will be useful to them and will remain with them for life.

2. Discussion

2.1 Difficulties and Problems in Raising Global Awareness

Increasing global awareness will be easier if a learning object has direct and explicit relationships with global circumstances, such as natural phenomena (water cycle, photosynthesis, Aurora), environmental issues (water pollution, global warming, acid rain) and socio-science issues (transport, overpopulation), But difficulties exists when an object is not directly related and explicit with real global circumstances, such as current electricity. and there are other problems when the learning object is just a background in the learning process, not a foreground. Global awareness will be difficult to improve if the learning objects are just as background [5].

Freije[6] explains that so far there has been no study related to student awareness on global issues (especially global warming), so that classroom learning does not seek to raise students' awareness of global issues. Based on this, it is suggested to integrate global issues into the education curriculum.So at this moment, the whole country has a very important problem, which is to make a new educational methodology by changing the hierarchy level: from local to global, from a person to the planet as a whole [7]. Given the integration of global issues into the curriculum it will be able to help or remind teachers to present the global issues in the learning process so that students' awareness of global issues will increase. Students become accustomed to thinking about current issues and can relate them to the knowledge they have gained from classroom learning. In addition, students can also be more critical thinking about the truth of information that they have obtained.

Another issue is expressed by Guo [8], although teachers know that global awareness is important for students and teachers to have an interest in practicing in learning, teachers lack confidence because teachers who start careers with insightful knowledge have not strong skills to provide learning for students with diverse characters. So that teachers are difficult to connect learning materials to the global circumstances that exist around the student environment, the issues being discussed, or the natural phenomenon that is happening.It was also stated by Clarke &Drudy[9], who stated that teachers have a high level of enthusiasm to teach about global issues, yet they want to know more and have no confidence in their ability to teach what they consider to be a controversial issue or difficult.Crawford & Kirby [10], explains that the initiative to improve global awareness already exists, but there are still many obstacles faced by teachers. The obstacles are the difficulty of controlling the learning strategy, whether by instruction content, difficulty in balancing curriculum development, selection of source materials, time and budget constraints. The increase of global

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awareness for students for teachers, not a burden, but instead, teachers should develop professionalism in innovating for effective learning in increasing students' global awareness.

2.2 Existing Possibilities

Scientific knowledge. Students have opportunity to familiarize themselves with the content of basic scientific facts, concepts such as (item, substance, reaction, cell, organism, energy, etc) that are specified by the study of individual representatives of chemical, biological objects, physical, and chemical about the construction of building particles of inanimate and animate nature and scientific laws that aims the understanding of nature.

Scientific processes is a learning that includes observation, asking, experiment, then process data or information, presenting data or information, followed by analyzing, reasoning, conclude, and create. For certain subjects, materials, or situations, it is most likely that this scientific approach is not always aptly applied procedurally. In real life where students are required to follow the progress and issues around. The application of scientific issues related to students such as, the effect of the ion on the ozone layer, the influence of pollution on human health and the environment, as well as various contexts that circulate widely in society and surrounding environment that affect the scientific process. In this respect could be desired much more involvement of educational content.

According to DeBoer [11], scientific literacy allows the student to live effectively in a very rapidly changing natural world. On a par with DeBoer [11], Hazen and Trefil[12] similarly defined that scientific literacy as a knowledge that the student needs to understand the scientific content of existing issues. According to Hazen and Trefil, if someone treats news about the ozone layer, genetic engineering, or chemical waste in the same way as news about sports, business, or government, it can be inferred that this person can be categorized as scientifically literate.

Teaching chemistry contributes to chemistry literacy in particular, and to scientific literacy in general [13]. Understanding chemistry is very critical because our physical environment is mostly affected by chemistry and filled with chemical products [14]. Understanding chemical explanations are also very important for everyone because such an explanations have practical applications in daily life. Understanding chemistry helps a student to take part in public debates and to make sense of their everyday lives and environment. Understanding chemistry and the ability to apply that understanding to daily life is what is referred to as chemical literacy [15].

21st-century skills disclose about the global awareness, for instance

- Using 21st-century skills to understand and address global issues
- Learning is not only from one individual but dare to join to seek information from all circles regardless of culture, religion, degree, social status with ethics of mutual respect and appreciate
- Appreciating and understanding other’s cultures and nations, without having to always use the native language (non-English languages)

According to the 21st-century skills disclose about the global awareness, consequently, there are two focuses on the global awareness, the following are aware of the significance of scientific ideas and awareness of the significance of socio-scientific issues and problems.

The encouraging finding for those who teach international studies is that the entering students who pursue this major desire to enhance their global perspective. Our findings affirm the point that the potential for fulfilling the crucial goal of promoting global awareness is great [16].

Consequently, there is a relation about the chemical literacy and global awareness. Sine qua non, developing the global awareness can be done through chemical literacy. Students should be helped to develop an awareness of being part of an issue/problem, and thus develop a sense of relationship with the natural world concept as known as chemical literacy. Given that local issues and problems can have some personal significance, starting from students’ locality and helping them become aware that they are themselves part of certain issues and problems. It can be a good strategy to promote global awareness to students. This study stressed the developing global awareness to the students by giving them a learning process through chemical literacy for instance, by using a problem-based learning model or involving the chemical literacy on the pencil-paper test.

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2.2.1 Awareness Of The Significance Of Science Ideas

The environmental issues, such as ozone depletion, greenhouse effect, and acid rain, become more popular not only in chemistry. The environmental issues existing in the world mostly involve the chemistry as the reason why it happens. These environmental issues also involve many concepts of chemistry and other science concepts. Developing the awareness of the significance of science ideas like environmental issues to the student can be done by giving the student environmental issues existing in the daily life and lets the students speak their argument and solutions up.

We think that in training in natural sciences still dominate “receiving of knowledge,” which proved ineffective approach in the teaching process. Use of interactive teaching methods and modern information technology is limited. Our observations in the practice of teaching natural science, discussions with teachers and students show that most teachers do not understand the meaning of the term “scientific literacy.” Many of them connect it with scientific awareness and competence. This explains insufficient awareness of teacher for science literacy, which is a target to be formed.

We suggest the following example for a task which requires analysis of information and interpretation of evidence from the world around us for a formation of scientific findings.

Acid rains

The presence of chemical, dangerous to human health and the environment, in the atmosphere, in large quantities and for a long period, is causing pollution. For industrialized countries, this is due to carbon dioxide, sulfur oxides and nitrogen oxides emissions resulting from human activities (transport, industry, power generation, etc.). Released oxides can stay in the atmosphere for day and be carried over a long distance. As fresh air circulates above ground, it sweeps dust and pollutants. Sulfur oxides and nitrogen oxides mix with these pollutants and interact with their components (oxygen, nitrogen, water vapor) or with one another. Thus, new pollutants are obtained, acids, that fall on the ground in the form of acid rain. When they fall on the ground, they alter the chemical composition of soil and water.

In a nutshell, education for ‘chemical literacy’ concerning ‘the public of all ages’ is now widely seen as a general goal for chemical education, regardless of their way of learning. Show-yu[17] stated If we transform the ideas of Bybee [18] on scientific literacy to chemical literacy, and then the chemical literacy from the lowest to the highest levels are ‘nominal chemical literacy,' ‘functional literacy,' ‘conceptual and procedural chemical literacy’ and ‘multidimensional chemical literacy.' The student’s understanding of environmental issues needs to be enhanced more to reach the level of conceptual and procedure chemical literacy.

2.2.2 Awareness of The Significance of Socio-Scientific Issues and Problems

Socio-scientific issues, not only help contextualize science and provide opportunities for students to become aware of the interdependence and relatedness of such an issues and human life, but also help to promote an argumentation and socio-moral discourse [19,20,21]. By giving the environmental awareness is directly linked to a change in perception, which is a prerequisite for changes in behavior and action, moral/ethical considerations, in the context of socio-scientific issues-based activities, are crucial.

3. Conclusion

Global awareness is something important that we have to face in this era. Nowadays Indonesia, this aspect is still less noticed by society especially in the educational world. Whereas to face the 21st century, people must have important roles in the development of science.The problems such as pollution, global warming, and acid rain are the impact of less global awareness. Educational world has the important role to change those problems because the educational world has many agents of change. Starting with this point, the issues and the problems of global can be solved by applying

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literacy-based learning in school. According to this paper literacy-based learning not only can increase the global awareness but also can be the meaningful lesson.

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Synthesis Of Methyl Ester From *Pome* Assisted By Ultrasonic Irradiation And Cracking Using Zeolite Catalyst

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Abstract. The purpose of this research is to convert the Palm Oil Mill Effluent (POME) into biofuel to find alternative energy as a substitute for petroleum-based energy supply. This study began with the synthesis of methyl esters, the synthesis of methyl ester was carried out in two stages of reaction: esterification with the aid of ultrasonic irradiation using acid catalyst and trans-esterification reaction with base catalyst. The result of the synthesis then cracked by heating at a temperature of 380 °C for 2 hours using natural zeolite catalysts that have impregnated by active metals, i.e. Cr/HZa and Ni/HZa catalysts. The Ni/HZa catalyst produced 2.4% hydrocarbons, equivalent oil gas, 14.1% short-chain methyl ester and 83.2% long-chain methyl ester. The Cr/HZa catalyst was able to crack methyl esters to produce hydrocarbons of 5.4%, equivalent oil gas, 15.19% short-chain methyl ester and long-chain methyl ester of 79.4%. Characteristics of biofuel that was resulted from catalytic cracking of methyl ester using Ni/HZa catalyst: density 0,799 g /mL, kinematic viscosity 1,391 cSt, fog point 1,67 °C, pour point 0°C, acid number 1,86 mg KOH/g oil and water content 0,932 %. Characteristics of biofuel resulted from catalytic cracking of methyl ester using Cr/HZa catalyst: density 0,795 g / mL, kinematic viscosity 1,322 cSt, fog point 1°C, pour point 0°C, acid number 1,68 mg KOH/g oil and water content 2,102%.
Keywords: ultrasonic irradiation, biofuel, methyl ester, zeolite-based catalyst, Palm Oil Mill Effluent

1. Introduction

In the period of petroleum thinning, a lot of research is done to get fuel from non-petroleum materials. Utilization of vegetable oil as a fuel is hampered because vegetable oil has an average viscosity of 10 up to 20 times higher than diesel oil. This problem can be solved by transesterification of triglycerides present in vegetable oils [1]. Transesterification is the reaction between oil and alcohol to produce a methyl ester [2]. Methyl esters are considered safe to use as biodiesel, because they are not toxic, lower in sulfur and more environmentally friendly [3]. The use of CPO as a fuel is still a problem, that is, the viscosity is too high when compared to diesel petroleum [4]. To overcome it, the CPO is converted to methyl esters [5],[6].

Catalytic cracking is the process of breaking long-chain hydrocarbon compounds into hydrocarbons with shorter chains assisted by a catalyst. The MgO catalyst in the cracking reaction of palm oil produces a hydrocarbon mixture of olefin and paraffin [7]. The Cu metal catalyst impregnated in ZSM-5 was able to convert 34.96 wt% of oil palm to gasoline [8], while the Al_2O_3 impregnated Co catalyst tranformed 100% palm oil to paraffin in the diesel component range [9].

Palm oil has high exposure in the community which,if the palm oil is used as biogasoline, there is a subtantial chance that it will disturb the current condition. The methyl ester of Palm Oil Mill Effluent (POME) has been done by esterification followed by transesterification[10], [11]. The methyl ester is then developed into liquid hydrocarbons through catalytic cracking [12], [13], [14]. The quality test results of catalytic cracking,that the viscosity is still greater than the gasoline's. The major difficulty encountered in converting methyl esters from POME a caused by Free Fatty Acid is very high (reaching ≥ 40%), and it takes a long time to converting (ie, 4 hours at the esterification stage and 2 hours at the transesterification stage). CPO was succeeded converting to methyl ester, by

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reacting methanol and CPO (6.44: 1) using ultrasonic irradiation aid at a frequency of 40 KHz, 400W, at 38.44 ° C and 25.29 minutes yield 97.85% [15].

In this study, POME was converted to methyl ester by ultrasonic irradiation method to shorten esterification reaction time just 20 minutes only and also transesterification reaction. The resulting methyl ester is further reacted to the catalytic cracking reaction to produce biogasoline (biokerosene or biosolar) fuel with a Ni / HZa and Cr / HZa catalyst, which is a zeolite catalyst impregnated with Ni, and Cr.

2. Material and Method

2.1. Preparationof POME

A total of 350 g of POME is inserted into a beaker, heated over a hot plate, then the mixture is filtered, the filter oil is heated at 105 ° C, and degumming the oil, from phosphatides, proteins, residues, water, and resins, with added H3PO4 % of 1-3% of the amount of POME. After degumming, the POME is poured into Erlenmeyer and then added 10% active zeolite from POME weight, and then stirred while heated to 110 - 120 °C for 1 hour to bleaching of the POME, and then FFA of the POME was determined. If FFA ≤ 2% can be esterified with an alkali catalyst, and if FFA ≥ 2% is necessary first esterification stage using acid catalyst (H_2SO_4)

2.2. Preparation Catalyst

2.2.1. Preparation of HZa catalyst. Natural zeolites were washed with distilled water. Zeolites were dried in an oven at 110°C, and It was sieved with a 125μm mesh, the natural zeolite (Za) obtained was fed into the beaker and then added HCl 2 M solution (1: 2), stirred with a magnetic stirrer for 4 hours without heating. It was then filtered and washed with distilled water, zeolite is dried in an oven at 110 °C (HZa)

2.2.2. Preparation of Ni / HZa and Cr / Hz catalyst. The Ni impregnation on HZa was done by mixing the HZa powder into a 0.1 M NiCl2.9H2O solution (1: 5 b / v), then refluxing at 85 ° C. for 3 hours, then filtered and heated to 120 ° C for 12 hours, obtained Ni / HZa bifunctional catalyst. Activation of Ni / HZa catalyst was performed by calcination in the muffle furnace at 500°C for 4 hours. The same step was performed to obtain a Cr / HZa bifunctional catalyst by replacing 0.1 M NiCl2.9H2O with 0.1 M Cr (NO3) 2 .6H2O.

2.3. Synthesis of Methyl Ester with Ultrasonic Irradiation

Esterification is operated by reacting methanol and POME (6: 1) in a round bottom flask with concentrated H_2SO_4 as a catalyst (1% by weight of POME). This mixture is in ultrasonic irradiation for 30 minutes at 45 kHz and 60 ° C, the result of the process is inserted in separating funnel and left overnight. After the results were separated, then determined FFA. If FFA ≥ 2% it is necessary to re-esterification. The final result of the esterification process was added methoxy (0.4 g NaOH: 40 ml methanol), then is an ultrasonic irradiation for 25 min at 60°C. The mixture was inserted in a separating funnel and held for one night. Methyl ester is washed with warm water.

2.4. Catalytic Cracking Methyl Ester with Ni/HZa and Cr/HZa Catalysts

The catalytic cracking reaction of the methyl ester is carried out using a set of reflux devices. The methyl ester was introduced into a three-neck flask, and a Ni / HZa catalyst (5%) was added, then heated to a temperature of 380°C for 2 hours, after refluxed and then was distilled to separate the biofuel product. The biofuels were analyzed by using GC-MS, and were characterized by density test, viscosity test, fogging test and the acid number test. The same was done for catalytic cracking reactions using Cr / HZa catalysts.

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3. Results and Discussion

The catalytic activity of natural zeolite can be increased by activation and impregnation of the active metal on the surface of natural zeolite, as it will form two active sites, namely acid sites and catalytically active metal sites. This catalyst is called a bi-functional catalyst, which have two types of active sites, i.e. acid sites that serve for cracking and metal sites that act for dehydrogenation. In this study the active metals that are impregnated in zeolites were Ni and Cr. The presence of Cr and Ni metals introduced into the zeolite will increase the acidity of the catalyst or Lewis acid site. In addition, active metal exposure may also increase the Si / Al ratio and the specific surface area (SSA) of the catalyst [16]. The impregnation of the active metal on the zeolite surface can increase the SSA [17].

The trans-esterification stage begins by giving treatment to POME including filtering, heating, degumming, and bleaching. Free fatty acids (FFA) of POME 43,76%, to avoid soap formation, conversion of POME to methyl ester is done two stages, esterification and trans-esterification Esterification is intended to convert FFA to methyl ester with a strong acid catalyst (H_2SO_4). The esterification of this study was performed by ultrasonic irradiation method for 20 minutes. The use of ultrasonic irradiation at this stage can increase the formation, growth and rupture of cavitation, the phenomenon of bubbles forming from the liquid stream, in areas where the liquid pressure falls below the vapor pressure. As a result of the phenomenon is the reaction goes faster [18]. Esterification was done three times. FFA oil decreased to 1.3%. Furthermore, trans-esterification was carried out by reacting the esterification process with a NaOH acting as an alkoxide which is a strong nucleophile and methanol. The ratio of the mole ratio of methanol and oil used in the study was 6: 1, whereas the catalyst used was 1% of the weight of the oil, needed excessive methanol, intended so that the soap does not form solids, but soluble in methanol. In this study the trans-esterification reaction was performed with the aid of ulatrasonic irradiation for 20 minutes.

The trans-esterification reaction begins with the formation of soap as a result of a triglyceride reaction with a NaOH, with ultrasonic irradiation, the formation of soap can take place more quickly because of the formation of small droplets of the NaOH catalyst (dissolved in methanol) undergoing cavitation such as methanol. The droplet may expand the surface area for the occurrence of saponification reactions between triglycerides and NaOH catalysts. This formed soap acts as a transfer phase and increases the mixing of oil with methanol, so that the reaction of methyl ester formation can take place more quickly. The yield of methyl ester from POME conversion result was 71,6%.

The components of methyl ester as a result of POME conversion based on GC-MS analysis are presented in **Table 1**.

Table 1. Components of Methyl Ester as a Conversion Result of POME

No	Components	Molecular formula	Molecular weight(g/mol)	(%)
1	Myristic acid methyl ester	$C_{15}H_{30}O_2$	242	1,1
2	Palmitate acid methyl ester	$C_{17}H_{34}O_2$	270	52,4
3	Oleate acid methyl ester	$C_{19}H_{36}O_2$	296	41,1
4	Stearic acid methyl ester	$C_{19}H_{38}O_2$	298	5,4

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Characterization of methyl ester of POME conversion results is presented in Table 2.

Table2. Methyl Ester Characteristics of POME Conversion Results

Parameter	Unit	Methyl Ester	SNI Methyl Ester
The acid number	mg KOH/g oil	1.12	Maks 0,8
Water content	%weight	0.74	Maks 0,05
Density	g/cm^3	0.85	0,85-0,89
Kinematic viscosity 40^0C	cSt	1.69	2,3 - 6,0
Pour point	^0C	8.50	Maks 18^oC
Clouding Point	^0C	8.84	Maks 18^oC

According to Table 2., the methyl ester parameters have met the SNI, only the acid number and water content are still high enough. The high number of acids can lead to corrosive properties and high water levels allow for hydrolysis reactions that can cause elevated FFA levels [19].

Catalytic cracking is a method of breaking of compounds with long carbon chains into compounds with simpler carbon-chains through the aid of catalysts which can improve the quality and quantity of products, and take place at low temperature and pressure [20]. The reaction step of catalytic cracking of methyl esters is estimated through 3 step of initiation step which is reaction between alcohol with catalyst to form carbonium ion and stabilized radical. Step propagation is the reaction between carbonium ions and stabilized radicals with methyl esters, while the termination step is the re-forming of the catalyst.

The process of catalytic cracking of methyl ester in this study was carried out by heating for 3 hours at 380°C, methyl ester with 5% catalyst (Ni / HZa and Cr / HZa). Results of catalytic cracking of methyl esters were analyzed using GCMS. The component is presented in **Table 3 and 4.**.

Table 3. Biofuel component as a result of catalytic cracking Methyl Ester with Ni / HZa catalyst

Component	Number of Carbon Chains	%
Gasoline	C5 - C10	-
Kerosene	C11 - C12	-
Gas oil	C13 - C17	2.44
Heavy gas oil	C18 - C25	-
Short chain methyl esters	$C_{11-15}H_yO_z$	14.41
Long chain methyl esters	$C_{16-19}H_yO_z$	83.15

Table 4. Biofuel component as a result of catalytic cracking methyl ester with Cr / HZa catalyst

Component	Number of Carbon Chains	%
Gasoline	C5 - C10	-
Kerosene	C11 - C12	-
Gas oil	C13 - C17	5.44
Heavy gas oil	C18 - C25	-
Short-chain methyl esters	$C_{11-15}H_yO_z$	15.19
Long-chain methyl esters	$C_{16-19}H_yO_z$	79.37

Analysis with GCMS showed that hydrocarbon compounds were produced in the catalytic cracking reaction of methyl ester with Ni / HZa catalyst, and Cr / HZa, able to produce equivalent hydrocarbon gas oil respectively by 2, 44%, and 5.44%. The Ni / HZa, and Cr / HZa catalysts were able to convert long-chain methyl esters to methyl esters with shorter-chain respectively by 14.41%, and 15.19%. Cr / HZa catalysts have a better ability to produce hydrocarbon fractions and produce methyl esters with shorter carbon chains

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The physical characteristics of biofuel from catalytic cracking methyl ester reaction using Ni / HZa catalyst, and Cr / HZa are presented in **Table 5**

Table 5. Biofuel Characteristics of Catalytic Cracking Methyl Ester Reaction Results

Parameter	Unit	Sample				
		Methyl Ester	Biofuel from catalytic cracking results with catalyst		Gasoline	Kerosene
			Ni/HZa	*Cr/HZa*		
Kinematic viscosity 40^{0}C	cSt	1,683	1,391	1,322	0,456	1,058
Density	g/cm^3	0,849	0,799	0,795	0,772	0,795
Pour point	^{0}C	5,67	0	0	0	0
Clouding Point	^{0}C	1,67	1,67	1	1	1
Water content	% weight	0,739	0,932	2,102	0,26	0,46
The acid number	mg KOH/g oil	1,122	1,86	1,68	0,748	0,935

Based on Table 5., it is known that biofuel density is 0.799 g / mL (with Ni / HZa catalyst) and 0.795 g / mL (with Cr / HZa catalyst) has approached kerosene density (0.792 g / mL), and the viscosity of biofuel resulted is 1,392 cSt (using Ni / HZa catalyst) and 1,322 cSt (using Cr-HZa)that is smaller than methyl ester viscosity (1,683 cSt), but the viscosity of both biofuels has not equal to kerosene viscosity (1,045 cSt) and gasoline (0.449 cSt), so it can not be used as fuel equivalent kerosene or gasoline with 100% biofuel composition. The decrease in the viscosity of both biofuels can be done by blending biofuel with kerosene or gasoline. On the Table 5. the fog and pour points of both biofuel catalytic cracking of methyl ester using Ni / HZa and Cr / HZa catalysts are similar and almost to the point of fog and pour point of gasoline and kerosene, so that the biofuel can be used in areas with cold climates. The decrease in the viscosity of both biofuels can be done by blending biofuel with kerosene or gasoline. Biofuel acid levels are still high, even higher when compared with methyl esters. This may be possible because the catalyst used is a homogeneous catalyst of sulfuric acid which is difficult to separate apart during the separation process.

The water content of biofuel is still quite high, but the moisture content of methyl ester and biofuel resulted from cracking catalytic methyl ester with Ni / HZ catalyst is near kerosene water content

4. Conclusion

Methyl esters of POME can be synthesized with the help of ultrasonic irradiation, with a yield of 71.6%. The use of Ni / HZa and Cr / HZa catalysts in catalytic cracking methyl ester reaction resulted in 68,191% and 63,867% respectively of biofuels. The use of Ni / HZa catalyst capable of cracking methyl ester into gas oil is 2,44%, and short-chain methyl ester is 14,41%. The use of Cr / HZa catalyst capable of cracking methyl esters into gas oil of 5.44%, and short-chain methyl ester of 15.19%. Characteristics of biofuel result using Ni / HZa catalyst is density 0,799 g / mL; kinematic viscosity 1,391 cSt; fog point 1.67°C; pour point 0°C; acid number 1.86 mg KOH / g of oil; water content 0.932%, and using Cr / HZa catalyst is density 0,795 g / mL; kinematic viscosity 1,322 cSt; fog point 1°C; pour point 0°C; acid number 1.68 mg KOH / g of oil; water content of 2.102%

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Student Perception of Analytical Thinking Skills on Electrochemistry

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Abstract. This research aims to describe students perception about analytical thinking skills of high school students of class XII in Electrochemistry subject. This is a quantitative descriptive research which population of this study is all high school students in Kulon Progo Regency which can be generalized by high school category that has the same level of equality. The total of samples in this study are 100 students who are taken from two schools, including SMAN 1 Sentolo and SMAN 2 Wates. The technique of collecting data in this research is by interview and questionnaire. Based on the results, it can be seen that the percentage of analytical thinking skills of high school students on Electrochemistry is 68.75%. So from this result can be concluded that the analytical thinking ability of high school students in Electrochemistry material is relatively moderate.
Keywords*:* analytical thinking skills, electrochemistry, student perception.

1. Introduction

Based on the statistical data report utilization of national examination result of 2015/2016 academic year through application of PAMER 2016 [1] which informs that chemistry subject is in category D with average score 54,59. This score is lower when compared with the subject sains such as biology and physics which are in category C. These results indicate that chemistry is still considered difficult by some students in Indonesia.

Various efforts have been made and developed by previous studies on how to overcome the problem of chemical learning difficulties. Sstudents still difficult understand the chemistry caused by several factors, including students are less able to analyze the chemical problems.

The purpose of the curriculum includes four competencies namely the competence of spiritual attitudes, social attitudes, knowledge, and skills [2]. In the dimensions of knowledge, students are expected to understand, apply, and analyze factual, conceptual, procedural, and metacognitive knowledge. In line with the cognitive level classified by Bloom where one aspect of cognitive is the fourth aspect of analysis (C4). Analyst thinking ability is a basic skill that must be possessed by students, and the analyst's thinking ability can not be achieved by students if the student has not mastered the cognitive aspects (C4) before.

Analytical thinking skills can not separate from mathematical skills. Mathematical thinking tools are analytical habits of mind. They include problem-solving skills, representation skills, and reasoning skills [3]. Analytical thinking skills categorized into seven major areas, which are modeling, reasoning, symbolization, representation, proving, abstraction, and mathematization. However, these major cognitive activities are hard to be categorized due to their similarity and interrelation [3].

The principal theoretical implication of this study is that analytical thinking is something we really cannot teach as such, but we can exercise the existing potential to student directly along chemical analytical lines [4]. The goal of teaching for analytical skills is to encourage the students to formulate and ask questions, not just to answer them. Thus, teachers should encourage students to pose what they see as fundamental questions about whatever topic they are studying and help the students decide what resources to use or to how much time to take. [5]

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[6] Analytical thinking skills has indicators that can be seen in the table below.

Table 1. Analytical Thinking Skills' Indicators

Cognitive Process	Definition
Analyse: Splitting the material into parts, and determine how the parts are related to each other and the overall structure.	
Distinguishing	Distinguishing relevant or important sections with irrelevant or unimportant sections.
Organizing	Determining how an element fits its structure.
Relating	Determining the existence of an element that based on point of view, value or purpose.

Overall, this study strengthens the idea that the ability of analytical thinking can be defined as one of the high-level thinking skills that students must have to solve problems by differentiating and organizing a problem and can determine the relationship of these aspects based on the reasons, principles, and certain functions that the student has so that the problem can be solved. Aspects of analytical thinking in this research include organizing, linking and differentiating.

2. Research Methods

2.1 Types of Research

This research is descriptive research with quantitative approach. The descriptive research aims to describe the population characteristics based on data collected from the sample [7]. This study describes the students' analytical chemistry skills. The data analysis is quantitative, which is illustrated by mean statistic of research result.

2.2 Subjects of Research

The research subject is a source of data on a study that can be obtained information [8]. The subject of quantitative research should be representative. Cresswell [9] describes the representatives as the individual selection of population samples in such a way that the selected individual represents the population as a whole. The population is a group of individuals that have the same characteristics. The samples in this reseach are 100 students of senior high school students. This research was conducted in May-June 2017.

2.3 Data Collecting Techniques and Instruments

Data collection techniques in this research are interviews and questionnaires. Interviews are used as data collection techniques to find the problems to be researched, and it used to the researcher wants to know the things of the respondents in more depth [10]. Interviews were done on 3 chemistry teachers related to the analytical thinking skills of the students. The questionnaire is a statement used to obtain information from the studentsof a report about the person or things he/she knows [11]. The questionnaire was distributed to 100 students who had received electrochemistry subject.

The instruments used are interview guides and questionnaires. The interview guide contains questions asked to chemistry subject teachers related to the analytical thinking skills, while the questionnaire for the students contains how the students understand about analytical thinking skills.

The questionnaire that used measures three aspects of the analytical thinking skills: distinguishing, organizing/classifying, and relating. Each aspect is spelled out into 5 statements so the total questionnaire contains 15 statements to be answered by the students.The scale of the questionnaire used is Likert scale with four alternative answers. This scale is arranged in a form of statement and

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followed by a response option that indicates the level. Response options are SS (strongly agree), S (agree), TS (disagree), and STS (strongly disagree). Likert-size option scoring depends on the nature of the statement. For a positive statement the answer score is SS = 4; S = 3; TS = 2; STS = 1. For negative statements is the opposite, ie SS = 1; S = 2; TS = 3; STS = 4.

2.4 Data analysis technique

Data analysis techniques used to determine the analytical thinking skills of the students based on the results of the questionnaire and supported by the results of interviews with the teachers. Stages of data analysis conducted in this study are:

a. Calculating the score obtained from the questionnaire calculation.
b. Determining the average literacy score of learners.
c. Determine the percentage of analytical thinking skills, with the following categories.

Table 2. categories level of analytical thinking skills

Value	Categories
76 – 100	High
56 – 75	Medium
< 56	Low

d. Analyzing the results of the interviews obtained.

3. Results and Discussion

3.1 Results

The results of data were obtained from this research is about students' analytical thinking skills based on each aspect and indicators. The following research data were presented below.

Table 3. percentage of analytical thinking skills

No.	Aspects	Percentage
1	Distinguishing	69.30%
2	Organizing	67.85%
3	Relating	69.10%
	Averages	68.75%

According to the data on that table, the average result of analytical thinking skills as a whole has a percentage of 68.75%. This result shows that students' analytical thinking skills are still in the medium category.

3.2 Discussion

Data score on table 3 is analyzed by descriptive statistical analysis using percentage and average calculation which is purposing to describes aspects of analytical thinking skills that is:

3.2.1 Distinguishing

The first consists of 5 grains of statements.All of the expression on the first aspect are: 1) Distinguish between voltaic cells and electrolysis cells, 2) Distinguish between oxidizing and reducing agents in voltaic cells and electrolysis cells, 3) Distinguish observation results before and after laboratory work, 4) Distinguish electrode on voltaic cell and electrolysis cell, and 5) Distinguish the charge on the electrode contained in the voltaic cell. The results of the research on each item statement based on the indicator are show in figure 1.

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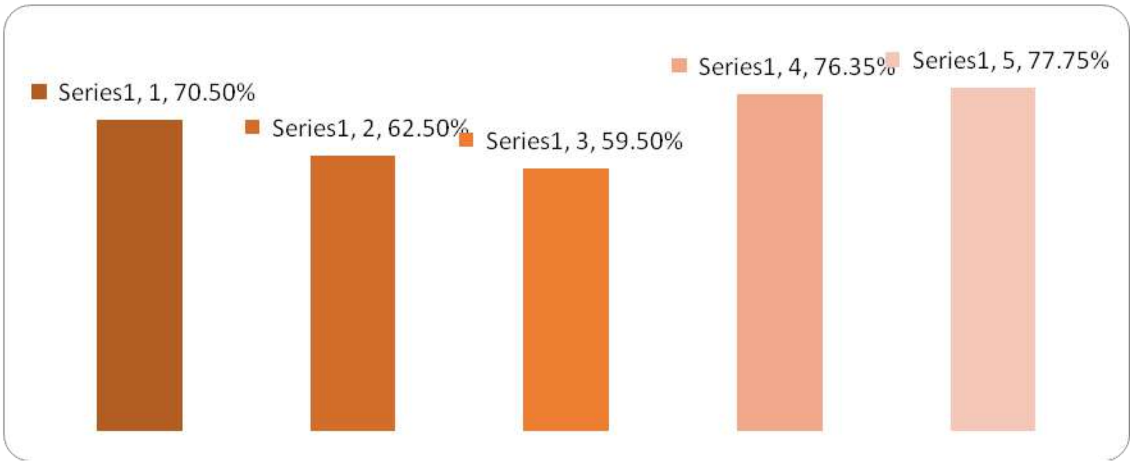

Figure 1. Analytical thinking skills of each statement by distinguishing aspect.

The results of the analysis in the first showed that as many as 77.75% of the investigators could differentiate the charge on the electrodes contained in the voltaic cell, while 59.5% of the participants could be informing of the observations before and after the lab work. This result indicates that students can better distinguish the charge on electrodes contained in the voltaic cell.

3.2.2 Organizing

This second consists of 5 grains of statements. All of the expression on the second aspect are: 1) I can write a voltaic cell reaction, 2) I can write and understand cell notation of voltaic cell, 3) I can draw diagram of cell in voltaic cell and electrolysis cell, 4) I can count cell potential (E^ocell) of voltaic cell, 5) I can define negative electrode and positive electrode in voltaic cell or in electrolysis cell. The results of the research on each item statement based on the indicator are show in figure 2.

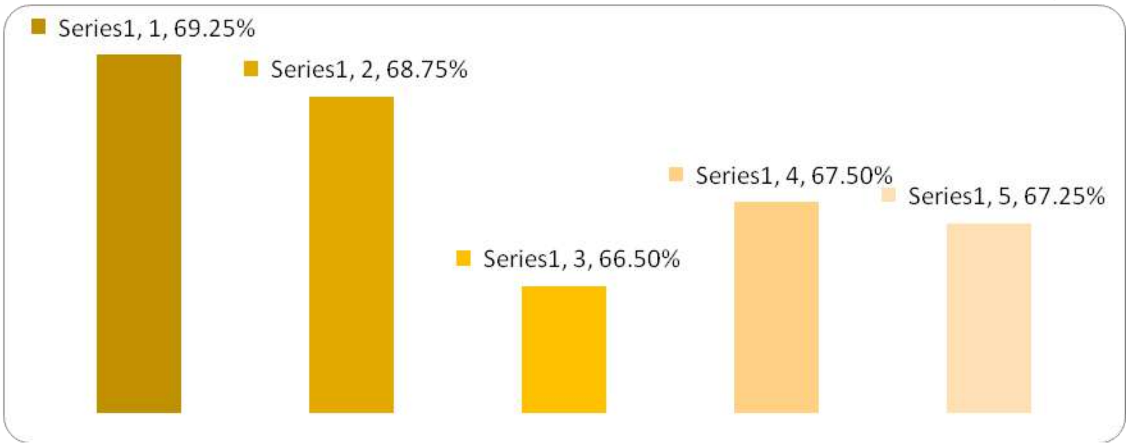

Figure 2. Analytical thinking skills of each statement by organizing aspect

The results of the analysis in the second show that in depicting cell diagrams in both voltaic and electrolyzed cells, the participants arepoor, the learners still can't distinguish diagrams for voltaic cells and electrolysis cells designated by 66.5% percentage.

3.2.3 Relating

This third aspect consists of 5 grains of statements. All of the expression on the third aspect are: 1) I know the realation between voltaic cell component and electrochemistry principle, 2) I can describe the relation between redox (reduction and oxidation) reaction and electrochemistry

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pinciple, 3) I know the relation between redox reaction and voltaic cell principle work, 4) I know the relation between voltaic cell and spontaneous reaction in volatic cell, and 5) I can describe the relation between electrochemistry principle with its application on daily live. The results of the research on each item statement based on the indicator are show in figure 3.

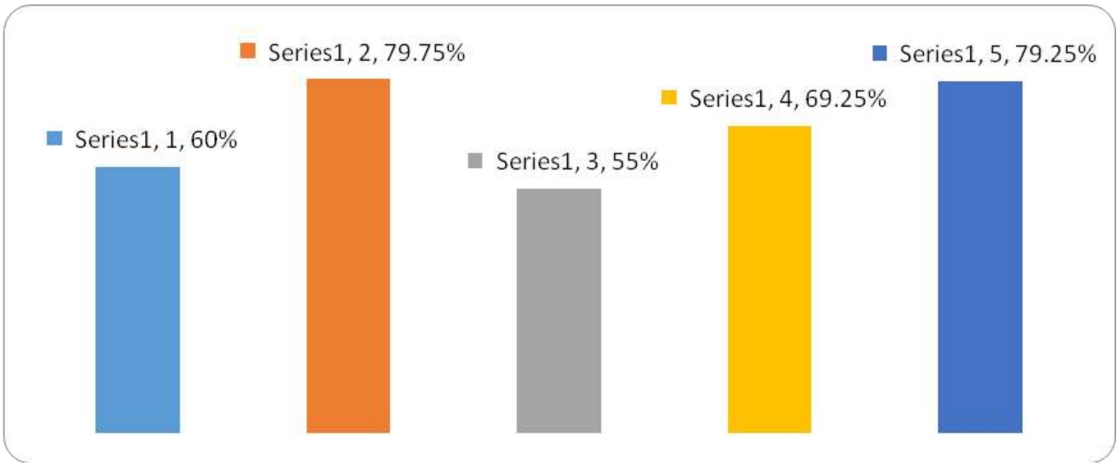

Figure 3. Analytical thinking skills of each statement by relating aspect

The result of the analysis in this thirdexpression shows that in knowing the correlation of redox reaction with the voltaic cell working principle, the learners are still lacking in understanding the two relations, as indicated by the percentage of 55%. Whereas students have been able to explain the relationship between redox reaction with electrochemistry as shown by 79.75%.

If reviewed as a whole, the percentage of analytical thinking skill in the field of electrochemistry is 68.75%. The results shown that the analytical thinking ability of learners in the middle category. It meansthat the participants are not sufficiently biased with learning activities that use analytical thinking steps, and have not been ableto understand the chemistry. Itmeans that student learning activities still require to dominate the chemistry studied, without knowing the concepts that must be mastered by students. If we viewed from the results of interviews with teachers, the lowability to think analytical learners are supported by several factors, that is the activity evaluation at the end of the material be studied, the teacher tends to be more interested in making a simple description. Problems that have been making do not contain aspects of analytical thinking because making a problem that contains aspects of analytical thinking is considered still difficult. That is, only a few learning topics are develope into questions that are considered capable of being used to measure analytical thinking skills.

Therefore, to carry out the achievement of analytical thinking ability of learners, it is necessary evaluation activities that can measure aspects of students' analytical thinking skills, such as repetition questions made with a model description where the student answers later required to answer with steps or processes ranging from understanding contents of the problem until the process of solving the problem. That way the teacher can assess how students' analytical thinking ability in solving the repetition problem.

In electrochemical materials, many topics can be developed to measure the analytical thinking ability of learners. Problem models developed may vary, for example by giving a little story about the use of batteries on motor vehicles. This topic can be making into a story that describes the availability of electricity in a vehicle's electrical source due to a chemical reaction between positive plate,

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electrolyte and negative plate generating electricity by a charge-discharge system, then from the reaction equation given to the story, learners are asked to determine the cathode and anode. Also, teacher can also be asked to calculate the potential of cells in the reaction.

4. Conclusion

Based on the results, it can be concluded that the analytic thinking skills of students in SMAN 2 Wates are moderate. This research is pra-research (survey) and limited so that the authors expect other researchers to continue this research until the final stage using a broader subject of research.

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A Comparative Study of Learning Outcomes in Redox Reaction material by Cooperative Learning Model on NHT and TPS types in SMAN 6 Jambi

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Abstract. The Background of this research focuseson learning system which hasn't the teacher made the student role-playing in the learning process. Thus, the lack of the activity of students in the class and it also have an impact on student learning outcomes. The use of cooperative learning model with TPS and NHTtypes is one of the alternativemethods to increase the activity of the students in the classroom.This study aims to determine whether the results of redox study reactions of students taught using cooperative learning modelof NHT are better than those taught using SMT type in class X SMAN 6 in JambiRegency.This research used the *Quasi-Experimental Design* with the study of*Randomized Post Test-Only Comparison Group*Design.The population in this study were students of class X of SMAN 6 Jambi, regularly enrolled in the academic year 2013/2014, who are taught by the same teacher. Samples were selected by the random technique, with X.2 as a class for the first treatment with cooperative learning model TPS and X.4 as a class for the secondtreatment,with cooperative learning model NHT. The results obtained by the average value of students taught using cooperative learning model NHT is 75.4. While the students taught by cooperative learning model TPS had an average value of 70.1 and based on the statistical test using t-test right parties obtained $t_{count} > t_{table}$ (3.56> 2.00) at level $\alpha = 0{,}05$, so that H_0 isrejected and H_1accepted, in other words, $\mu_1 > \mu_2$.Based on the observation of the activity of class students are taught using cooperative learning model NHT has better activity with a percentage of 75.52% compared with the value of a class that taught using learning model TPS type with a percentage value of 70.8%. Judging from the results of thequestionnaire, responses of students to the learning for bothmodel have good criteria with the percentage of student responses of 74.72%for NHT and 79.725% for TPS.It can be concluded that the learning outcomes of redox reactions on cooperative learning modelwith NHT are better than those taught using TPS type in Class X SMAN 6 Jambi with the level of $\alpha = 0.05$.

Keywords: NHT, TPS, Learning Outcomes

1. Introduction

Learning is a process of interaction between educators and learners with a wide range of activities to achieve the goals set. In chemistry, learning means that learning in the field of chemistry studies. Learning in chemistry requires more creativity students both psychologically and physically because chemistry is the science that is acquired and developed based on experiments seeking an answer to the question of what, why and how the phenomena of nature, especially with regard to the composition, structure, transformation, dynamics and energetics substance (Depdiknas, 2003). Chemistry learning aims to gain experience about the various facts and the ability to identify and solve problems related to chemical, skilled in the laboratory, and have chemical properties that are applied in everyday life (Sastrawijaya, 1998: 113). Some techniques that can be applied in the study of chemistry tailored to the distinctive properties of chemistry (Sastrawijaya, 1998: 174), namely: 1) to study chemistry with an understanding of the concept, 2) of a material that is easy to difficult, 3) using a variety of techniques to memorize, solving, mastery of concepts, master the rules of chemistry, troubleshooting in the lab, and 4) associated with everyday life.

For example, the discussion redox reaction is one subject matter that is used to achieve the standard of competence in chemistry lessons in class X as for the exact method used in the form of

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discussion is accompanied by example in real life can be in the form of audio-visual equipment that facilitates the intent of theories, concepts and as well as the laws in it. Thus, the role of chemistry teachers also be increasing because used to plan learning methods are interesting and appropriate so as to help students more easily understand the material being taught, the learning process, it will help students in improving attention and motivation so do not quickly feel bored in learning chemical and creates a fun learning environment.

With the enactment ofthecurriculum in 2013 at present, students must be involved in the learning process so they can optimize the capabilities and can find their concept of a lesson. One way to do that is by applying the learning activities of the group. However, in the process of group learning activities undertaken merely to complete the task of the students, while activities, cooperation, and responsibility of each of its members are not reached. Therefore, it takestheeffort to improve students' understanding of chemical concepts to increase the variety of fun learning model group, engagesstudents, enhances student activities, cooperation and student responsibility.

From the picture, a appropriate model learning in the learning process is a cooperative learning. In cooperative learning there are various types are applied, some of which are the *Number Heads Together* (NHT) and the type of *Think Pair Share* (TPS). Both types of learning are essentially the same, namely equally with the most suitable form of the group and used to teach the learning objectives formulated sharply in one correct answer, such as the calculation, facts and science concepts. Therefore, in the learning of chemistry at a redox reaction material by the characteristics of the material that isacalculation, facts and concepts can use cooperative learning model NHT and TPS.

The opportunity to discuss with the group that has been determined by the teacher were given by NHT, then the end of the discussion was conducted presentations. At the presentation, each member of the group is required to share the knowledge and understanding they acquire during the discussion but other members should not help members appointed. Meanwhile, the TPS type of cooperative learning students in advance given the opportunity to think individually, then the students discuss with their partner sharing knowledge and understanding that they get the time to think individually throughout the class. NHT emphasizes students to be more active and take full responbility for understanding the subject matter as a group or individully can be seen by differences of them. The purpose of this study was to determine whether the learning outcomes of redox reactions of students taught using cooperative learning model NHT better than those taught using SMT type in Class X SMAN 6 Jambi City.

2. Literature

2.1 Teaching and Learning

Learning is a process of change behavior as a result of interaction with the environment to meet their needs. Learning is an individual process attempts to obtain a change in behavior in a new way, a whole as a result of the individual's experience in interaction with the environment (Slameto, 2010). Skinner in the Syah (2013), defines learning as "a process of progressive behavior adaption". Furthermore, Morgan in SyaifulSagala (2012), said learning is "any change that is relatively settled in behavior that occurs as a result of practice or experience". It change in a person’s behavior that occurs as a results of training or experience in the form of skills, attitude, habits, knowledge, and skills that being concluded by learning.

The learning activity is important for students, as it provides an opportunity for students to come into contact with the object being studied as widely as possible because then the knowledge construction process that occurs will be better. Learning activities required activity because in principle the study is done to change behavior, so do the activities. There is no learning if there is no activity (Sardiman, 2011). Therefore, students are required to be more active in learning activities, and teachers as facilitators who direct and guide students in learning activities.According to Djamarah (2010), a process of learning about a teaching material is considered by successful if the specific instructional objectives (ICT) was achieved by students. The scoring function is of feedback to teachers to improve the learning process and implement remedial programs for students who have not

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been successful. Similarly, in the learning of chemistry, feedback is needed for the learning process to succeed, this is can be done by using cooperative learning model.

2.2 Cooperative Learning Model

A cooperative learning model is a form which has been based on understanding constructivist. The model is a model of learning that prioritizes the existence of groups. Each student in the group has different levels of ability (high, medium and low) and if possible group members come from different races, cultures, tribes and gender equality. Cooperative learning model prioritizes cooperation in solving problems to apply knowledge and skills to achieve learning objectives. Accordingly, Isjoni (2007) revealed that the objective of the application of this model is that the students can study in groups with their friends in a way respectful of opinions and give the opportunity to others to put forward ideas to express in groups. This is related with the results of research by Johnson and Johnson (1991) in Ajaja and Eravwoke (2010: 3) state that on learning together and alone showedthat cooperative learning enhanced more positive attitude towards subject members andthe teacher.

Cooperative learning Numbered Head Together (NHT) is one type of cooperative learning that emphasizes in special structures designed to affect the pattern of interaction of students and has a goal to increase academic mastery. This technique was developed by Kagan in Lie (2008), It is provides an opportunity for students to share ideas and consider the most appropriate response. Also , this technique also encourages students to enhance their spirit of cooperation. Cooperative learning model Think Pair Share (TPS)was first developed by Frank Lyman at the University of Maryland quoted Arends (1997) in Trianto (2007), is a kind of learning that is designed to influence the students' interaction patterns. TPS is an effective way to create an atmosphere variation pattern class discussion. Assuming that all discussions need settings for controlling the overall class and the procedures used in the TPS can give students more time to think remedy to respond and help each other.

2.3 Material Redox Reactions

On oxidation-reduction reaction concept is based on the incorporation and release of oxygen defined: Oxidation is the incorporation of oxygen with an element or compound. The reduction is the release of oxygen from the compounds.

Examples Oxidation: Rusty metals, such as iron.

$$4Fe_{(s)} + 3O_{2\,(g)} \rightarrow 2Fe_2O_{3\,(s)}$$

Source of oxygen in the oxidation reaction is called oxidizing

Examples Reduction:Reduction of iron ore (Fe_2O_3,hematite) by carbon monoxide (CO)

$$Fe_2O_{3\,(s)} + 3CO_{(g)} \rightarrow 2Fe_{(s)} + 3CO_{2\,(g)}$$

Substances that attract the oxygen reduction reaction called a reducing agent.

On the concept of oxidation-reduction reaction by incorporation and release of electrons defined: Oxidation is the release of electrons Reduction is the electron acceptance.Example: The reaction between Na and Cl form NaCl.

Oxidation is a number that indicates the charge contributed by the atoms of the molecules or ions. Equations are compounds according to IUPAC nomenclature based on the oxidation number is as follows:

1. The metal has only one oxidation*number*. For example, alkali metals, alkaline earth, and aluminum. Naming compounds are metal in front of the name, and the name of nonmetal followed ida. Example: NaCl: Sodium chloride.
2. The metal having multiple oxidation numbers. For example, the transition metal compounds are by writing naming oxidation numbers with cordinal numbers after the name of the metal. Example: CuO: Copper (II) oxide.
3. A non-metal atom that can form two or more compounds. The process of giving name begins with positively charged non-metallic atom followed oxidation number (in Roman numerals), while negatively charged nonmetal atom was placed in the back by ending ida. Example: NO: nitrogen (II) oxide.

The progress of the textile industry, pulp, paper, chemicals, pharmaceuticals and food industries in addition to a positive impact also have a negative impact. Occurrences in everyday life that involve

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redox reactions rust including iron, washing clothes stain using bleaching agents, shocks accumulators, as well as the application of the concept of redox dirty or wastewater treatment with themethod of activated sludge.

2.4 Hypothesis

The hypothesis formulated in this study is "learning outcomes redox reaction using cooperative learning model NHT better than the TPS type in Class X SMAN 6 Jambi".

3. Methods

The research is a study. *Quasi-Experiment* This research method is comparative studies with two different treatment in the two groups: the experimental group and two experimental groups. The sample group consisted of the number of students who are one class. Students experiment the untreated learning using cooperative learning model TPS*(ThinkPair Share)* and the experimental class learning two were treated using NHT*(NumberHeads Together)*.

The research design used by the author is *Randomized Post Test-Only Comparison Group*Design,which can be described by:

Table 1. Study Design

Class	Treatment	test post
Treatment I (TPS)	X	T
Treatment II (NHT)	Y	T

The population in this study were students regular X class SMAN 6 Jambi enrolled in the academic year 2013/2014, which is taught by the same teacher. So that the total population of 175 students and is divided into 4 classes. Samples used there are two classes of treatment classes I taught using cooperative learning model TPS*(ThinkPair Share)* and class II treatment are taught using cooperative learning model NHT *(Number HeadsTogether*).So in this study sampling was done by using a random, after the draw is done then obtained X.2 class and as a treatment class I and class II X.4 as treatment classes.

The instrument used in this study is the evaluation test results ofthestudy, observation sheets, and questionnaires. The tests used in this study is a matter of objective multiple-choice (post-test). The test instrument evaluation of learning outcomes of students tested must qualify validity, level of difficulty, different power, and reliability. Observation sheet for this study was made to observe a study to see if the management of learning is effective for learning students. The focus observation Learning management in this observation sheet is activity in the learning process. Questionnaire in this study is used to view the students' response to cooperative learning model TPS and NHT used in redox reactions material. The type of questionnaire used was a questionnaire enclosed.

The analyzed data is data test student learning outcomes (post-test) in the experimental class I and class II experimental data and non-test with sheets enclosed observation and questionnaires. In the analysis of data, to calculate the number of scores obtained student is:

$$Score = \frac{correct\ answer}{total\ number} x100$$

To test the hypothesis, researchers compared the average achievement of students'experimental group I and group II experiments. To examine the significance of these two classes to analyze the similarity of two average with *t-test* right party. A previous test of normality and homogeneity. Data assessment student activity with the observation sheet prepared by using the following formula (Safari, 2012):

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$$Value\ activity\ = \frac{scores\ obtained}{total\ maximum\ score} x100\%$$

To analyze the data regarding whether or not the response of the students through answers graders X SMAN 6 Jambi on chemical subjects using TPS and NHT learning models, in calculating the questionnaire used answer sheets percentage formula as

$$\%\ influence = \frac{total\ score\ answered\ students}{total\ maximum\ score} \text{x } 100\%$$

4. Results and discussion

4.1 Results

After treatment given the experimental class I and class II experimentdifferent, carried out data collection in the form of learning outcomes by providing a series of tests at the end of study*(post-test)* to get the results of student learning with the mean average as follows:

Table 2. Resultsof student learning

classes	Total student	Average earning outcomes
X.2 (type TPS)	40	70.1
X.4 (type NHT)	38	75.4

Based on the normality test using test results obtained Liliefors as in table 3 below:

Table 3. Normality test

Class	L_0	L_t	Description
Experiment I	0.1292	0.1400	normal
Experiment II	0.1125	0.1437	normal

Based on thehomogeneity test using the F test result as shown in table 4 below:

Table 4. Test homogeneity

Class	Variance (S2)	Homogeneity test	Specification
Experiment I (TPS)	76.27	$F_{arithmetic}<F_{table}$ (1.43 <1.72)	Homogeneous
Experiment II (NHT)	53.22		

In this study, the hypothesis was tested by using t-test with similarity average of one party, namely the right side. From the calculations, the price of$_t$ = 3.56, whereas from t distribution table obtained $_{table}$ = 2.00, thus $t<T_{1-\alpha}$ are not fulfilled for$_{t>table}$ (3.56> 2.00). Then H_0 $_{is}$ rejected and H_1accepted, in other words, $\mu_{1>}\mu_{2.}$Assessment of student activity by observation sheet are shown in Table 5. as follows:

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Table 5. The value of student activity with the observation

classes%	Average Rating	Criteria
Experiment I (TPS)	70.8%	Good
Experiment II (NHT)	74.95 %	good

Assessment results to the student questionnaire responses cooperative learning model TPS and NHT can be seen in table 4.5 as follows:

Table 6. The results of questionnaire

No		Class % student response	criteria
1	Experiment I (TPS)	79.725	good
2	experiment II (NHT)	74.72	good

4.2 Discussion

The study was conducted in a regular class X of SMAN 6 Jambi, using two classes, X_2 as an experimental class I and class X_4 as class II. Where the experimental class I use cooperative learning model TPS, whereas the experimental class II using NHT model. Learning that still use conventional methods and are still centered on the teacher, resulting in less active students in learning activities. This is due to several reasons such teachers are limited facilities and time are considered less to use the model to student-centered learning. Students often have difficulty understanding the chemistry lesson, the students are also hard to ask questions actively and give opinions, and have difficulty solving problems independently so wait for teachersto work together to solve problems/issues that are given, it makes students become passive.

Ibrahim Trianto (2007) states that the cooperative learning model was developed to achieve three important learning objectives that academic learning outcomes, the acceptance of diversity and the development of social skills. Cooperative learning model prioritizes cooperation in solving the problems to apply knowledge and skills to achieve the learning objectives. Cooperative learning model TPS and NHT has been used in a wide variety of subjects, and most suitable for teaching and learning goals formulated sharply with one correct answer, such as the calculation and application of mathematics in character, and the facts and science concepts.

Based on observations of students in classroom activities that use cooperative learning model TPS and NHT, from the data analysis of student activity values obtained experimental class II (NHT) is higher than the experimental class I (TPS). The average percentage of student activity values obtained experimental class I is 70.8% with good criteria, and the average percentage of the value of the experimental class II student activity is 74.95% with good criterion.

In the learning process, required student activity because students must construct their knowledge. While the teacher role is to create conditions conducive and supportive for the creation of new knowledge. According toSardiman(2011), No learning if there is no activity. Piaget in Dimyati and Mudjiono (2013) argues that the knowledge created by individuals because individuals perform continuous interaction with the environment. According to Abraham and Nana Syaodih (2003) instructional core of interaction between teachers and students. In this interaction, the teacher doing teaching and student learning.

Based on the average value of students 'post-test, the experimental class I is 70.1 while the value of students' post-test experimental class II is 75.4. From the results ofthetest for normality using Liliefors test of the experimental group I obtained the result $L_0 < L_{table}$ (0.292 <0.140), this indicates

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that the experimental class I normal distribution. Likewise with the results obtained experimental class II $L_0 < L_{chart}$(0.1125 <0.1437), which showed that the experimental group II normal distribution. The test results obtained with homogeneity test results $F_{arithmetic} < F_{table}$ (1.43 <1.72), suggesting that both the experimental class inanormal distribution. The results of the calculation of the similarity test two averages of the value of the second post-test experimental class t-test one party that left the result$_{t>table}$ (3.56> 2.00). Thus the testing criteria are rejected H_0 and accept H_1,this indicates that the learning outcomes of students who use the redox reaction of cooperative learning model of NHT better than with who use cooperative learning model TPS. Djamarah (2010) states that each of the learning processes always results in learning outcomes. From the difference in learning outcomes of both classes of experiments, it appears that cooperative learning model NHT give better results than the type of TPS.

There are several obstacles that held on the learning process in the classroom using learning model NHT compared with a class that uses a learning model TPS namely:

1. In the process of learning in the classroom using learning model NHT, more visible activity of the discussion as to the number of groups that a little further enable teachers to monitor each activity group. While in the class using the invisibility of SMT type activity of students in a discussion as to the number of groups a lot, so the teacher is hard to monitor the group one by one.
2. In a class that uses a learning model NHT with the number of members more (5) allows the level of thinking over the different group members (heterogeneous). While in class using TPS type with a small number of members (2) is likely to have the same level of thinking, so that if one partner who has a low thinking makes no discussion groups.

Judging from the results of learning, student activities and student questionnaire responses class against TPS and NHT learning models, the cooperative learning model NHT better than TPS. That is could occur because the NHT cooperative learning model is an approach to learning that allows students to be more active and take full responsibility for understanding the subject matter in groups and individually. According toTrianto (2007), NHT serves to encourage the success of the group as it involves a lot of students in studying the material covered in the lesson and check their understanding of the lesson content.

The second model of cooperative learning can stimulate students are actively involved together, discuss and mutual help among group members. It can be seen by the results of the student questionnaire responses cooperative learning model TPS and NHT is good, with a percentage of 79.725% for a model TPS and 74.72% for the NHT. In both of models, students typically learn individually, without competition and awards tested is conditioned by the existence of competition and the award is a motivation for their learning, and the learning environment can make students more active and can affect the results of student learning,

5. Conclusion

Based on the results of research and discussion can be concluded that the learning outcomes of students who use the redox reaction of cooperative learning model of NHT better than compared with the use of SMT type X class SMAN 6 in the city of Jambi.

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Chemistry Learning: Perception and Interest of Vocational High School Student of Automotive Engineering Program

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Abstract. This study explored the implementation of chemistry learning in vocational high school regarding of interest and perception of students of Automotive Engineering Program. Descriptive studies have been conducted. There are 112 students of automotive engineering as research samples from one public vocational high school in Yogyakarta. Samples were determined by cluster sampling technique. Two instruments were used to collect the data, namely closed questionnaire for perception and open questionnaire for interest. Perception questionnaire has 20 items statement, while the interest questionnaire has 6 open ended questions. The data of perception were analyzed descriptively quantitatively with the ideal rating category. Interest data was analyzed qualitatively by analyzing the answers of the research subjects, coding the answers and grouping them into the specific theme. The results showed that most vocational high school students of automotive engineering are not interested in chemistry. The biggest cause of disinterest because the student just want to focus on vocational materials, chemistry unrelated to the automotive field, learning is not interesting, and chemistry is difficult to understand. In general, the perception of vocational high school students in learning chemistry is sufficient. In particular, student perceptions are good for teacher role indicator and sufficient category for indicators of student engagement and meaningfulness of learning. The important implications for the development of chemistry learning in the context of vocational are discussed.
Keywords : chemistry learning, interest, student perception, vocational high school

1. Introduction

The lowering of high school students' interest in chemistry is becoming a growing issue today. This condition also happens to vocational school students. Some of the engineering students lack motivation in chemistry learning [1]. This situation is certainly less profitable given the essence of chemistry lesson in engineering vocational schools. Chemistry is a basic subject given at vocational school of an automotive engineering program. Chemistry is aim at not only understanding and mastering "what" and "how" a job is done, but also understanding about "why" it should bedone. Mastery of chemistry influences the development of vocational competencies of the student in the future.

Low motivation also shows that students' interest in chemistry learning is low. Interest is keyto the success of chemistry. Interest is a unique psychological state that occurs during interaction between persons and their object of interest [2]. In the context of chemistry lesson, objects can be learning situations, content and resources, teachers, and personal interaction. The dimension interest that gives more influence to student's interest in learning is personal aspect. Personal interest was relatively stable interest associated with tend to enjoy or engagement with specific topics, subject areas, or activities [3, 4].

Students interested in chemistry learning may be affected by different factors. Someof studies have pointed various factors responsible for declining students' interest. These factors include pedagogical aspects [5], content that taught [6],the role of teacher, personal traits and choices [7] and prior learning experience [8]. Personal interest development is related to student's constraints individually. The psychological dimension that affects individual nature is perception.

Perception refers to attaching meaning to environmental inputs received through the senses [9].This meaning is related to the ability of the student to give response either positive or negative to something received, viewed or felt.Previous studies have shown that students have a perception that

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chemistry is irrelevant to the vocational field [1,10]. This wrong perception is likely to be the cause of the low interest of vocational high school students toward chemistry learning.Whereas a lot of chemistry content that is relevant to the field of vocational. For example in the automotive engineering program, chemistry is applied in studying fuel, batteries, chemical materials, metals, electroplating and environmental pollution. Some factors can affectof students' perception are something is being perceived, the context of the situation and personal experience [11], gender, ethnic background, experience, cognitive ability and grade level [12]. Thus it is necessary to explore furtherer the perception of automotive engineering students on learning chemistry regarding of theories of learning perspective. Theoretical perspective on chemistry teaching includes content, learning activities and interpersonal perspective [13].

Student perceptions of the chemistry learning are important. Student perception can be reporting the quality of interactions and processes of chemistry learning. Measurement of student perception is an important strategy forevaluating and developing of chemistry lesson. Beyond providing firsthand impressionsof the quality of student-teacher interactions and classroom processes, result of student observation possess naturally acquired expertise through their lived, everyday experiences in classrooms.Exploration of perception followed by an analysis of interests and supporting factors inhibitors perceived by students. Thus will get the whole describe about what, how and implication of result of perception analysis of student of the vocational high school of the automotive engineering program to chemistry learning.

2. Research Method

Descriptive studies have been conducted in this research. There are 112 students of automotive engineering in 11th grade of academic year 2015/2016 and 2016/2017 as research samples. The samples were taken fromone of the public vocational high school in Yogyakarta.It was the one of school laboratory ofUniversitasNegeri Yogyakarta. In Yogyakarta were only two public vocational high schools with automotive engineering study program. Samples were determined by cluster sampling technique.

Research data was taken from two instruments. The closed questionnaire that had four alternative options were used to obtain students' perception data on chemistry learning. Measured aspects were elaborated from the theoretical perspective in teaching [13], and dimension of tripod survey [14] According to [14] developed the Tripod student perceptions surveyto measure teaching quality. The “tripod" describes the component of learning effectiveness i.e. (a) content knowledge, (b) pedagogic knowledge and skills, and (c) the ability to connect with students on a personal level. In another hand, [13] stated that quality of teaching couldbe measured based on content, learning activities and interpersonal perspective. Based on the two theories, aspects of perception questionnaire were developed. There was three aspects i.e.students engagement (with six indicators), meaningfulness of learning (nine indicators) and role of teacher (five indicators). The questionnaire had 20 itemsof statements. The second instrument was open questionnaire with six questions. The questions were developed emphasizedin personal interest as the one of the dimension of student’s interest in learning[3, 4] and the factor that affected students interest in chemistry learning [15]. The instruments were judgement to chemistry learning experts to ensure the accuracy of them.

Analysis of quantitatively descriptive was used to determine the category of students’ perception. The steps of data analysis were calculated the mean score both in total or each aspect of students’ perception, and then categorize the measurement result based on ideal scoring criteria. The criteria were very good, good, in sufficient, less good and very bad. Interest data was analyzed qualitatively by analyzing the answers of the research subjects, coding the answers and grouping them into specific theme and also displayed in percentage.

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3. Result and Discussion

3.1 Perception of Vocational High School Students to Chemistry Learning

Vocational high school students' responses to the 20 items of perception questionnaire have a mean score of 52, 84; meanwhile, the ideal score is 80. This value is categorized in sufficient. The percentage of student perception category is displayed in Figure 1. Most of students in automotive study program have a perception in sufficient category to chemistry learning. Among 23.21% students have a good perception and only 4, 46% students in very good perception about chemistry learning in vocational school. In the other hand, there are about 13.39% students not as good perception to chemistry learning.

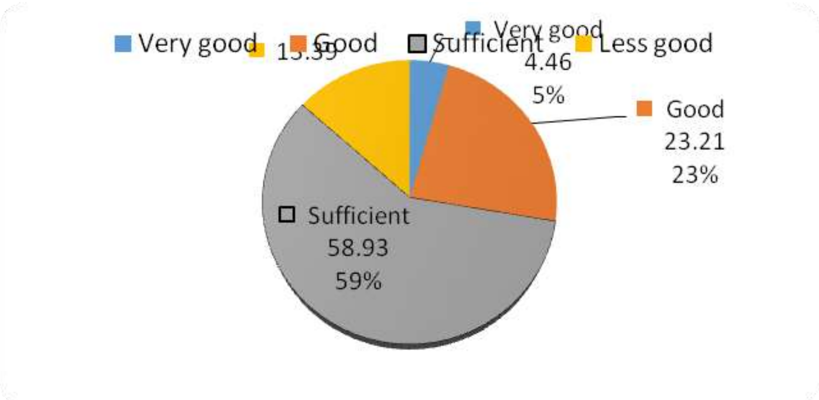

Figure 1. The Distribution of Percentage of students in the categories of perception

Perception of vocational high school students was explored to know the extent of successful implementation of chemistry learning according to student opinions. The results showed that there are still vocational high school students of automotive program students who have a poor perception to chemistry learning. It indicates that there are still deficiencies in the implementation of chemistry learning in vocational high school. Students' perception is related to the process of attaining awareness or understanding of sensory information in their learning. But the ability of each student to respond to the stimulus is not the same. There are students who are very easy to accept something new and there is a relatively long time. Ease is not independent of the readiness of students in following the learning. Students with conditions that are not ready both physically and psychically tend to not enjoy the situation. It is given the impact to students' perception of the learning situation. The perception of students is also influenced by the condition of the stimulus. It is in the form of components of chemistry learning. The classroom atmosphere, the character of the subject matter and the classroom interactions clearly affect how students view the whole the chemistry learning. Not good interaction of students and teachers tends to cause negative perceptions for students'. This tendency will be more visible if the content is delivered in the learning does not match the needs of vocational students, Vocational School students tend to appreciate more positively on vocational subjects. According to [16] if students do not form a positive connection with their teacher, it is within their control to minimally learn core content or refuse to learn anything at all. Positive relationships that are not formed in learning chemistry will affect the willingness of vocational high school students to learn chemistry better. It becomes the task of the chemistry teacher to establish a positive interaction in chemistry learning. Thus the perception of students of vocational high students becomes better. This is very important considering that student perceptions of the learning environment are likely indicative of the motivational aspects of classrooms [17].

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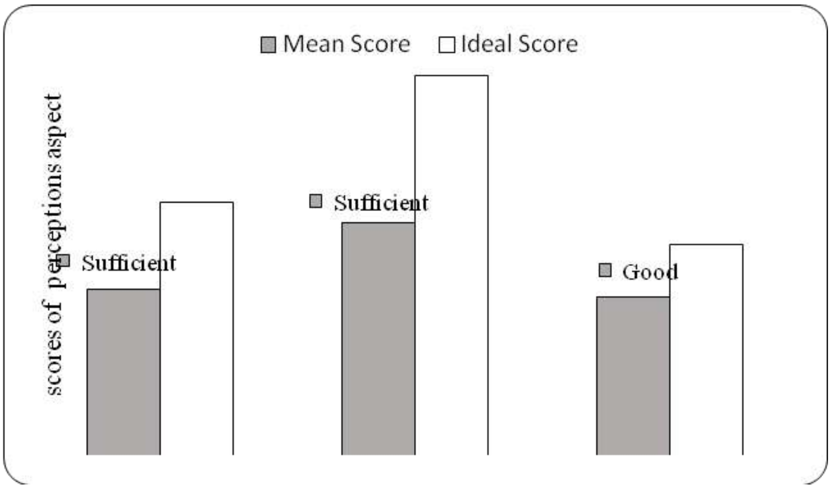

Figure 2.Categories of students' perception in each aspect

The study of vocational high school students' perceptions of chemistry learning is sharpened by analyzing each aspect in perception. It can be known in more detail things that are perceived well or enough. Figure 2 presents the categories of students' perceptions for each aspect. Aspects of students' engagement and meaningfulness of learning were perceived sufficient by students. As for the aspect of role teacher, the students have a good perception. Good students' perceptions of the role of teachers indicate that chemistry teachers in vocational high schools have successfully established positive relationships with students. Students feel comfortable because they be noticed, and their teachers give scaffolding when they need it. This is supported by previous research which states that student' perceptions of teachers effect on learning motivation [18]. This factor becomes the main basic to realize the expected quality of chemistry learning. In regulating student learning, teachers are considered to be the crucial part of the reform process [19]. Teachers must continue to develop themselves to play a better role as part of the process of improving the quality of chemistry education.

The other aspect isperceived poorly by the students. Student engagement is relatively better perceived by students of a vocational high school. This aspect describes that in the chemistry learning the teacher emphasizes student activity. Teachers engage students in identifying essential concepts, discussions, frequently asked questions and self-assignments. This learning is more opened to the students' minds to engage in constructing knowledge. Active learning such as problem-based learning provides students with opportunities to reflect and engage in feedback processes, so that students feel comfortable learning by experience. According to [20] stated that active learning increases the self-efficacy and understanding concept of vocational high school students.

The lowest category of student perception is in the meaningfulness learning aspect that emphasizes in the meaningful of chemistry content. This can't be underestimated because the content becomes the main object that students will learn. If the students' appreciation of the content taught is not good then it is feared will have an impact on chemistry learning process and result. A previous study has shown that low chemistry achievers became less optimistic about the relevance of chemistry to nursing as the course proceeded [10].

3.2 Decription of Vocational High School Students' interest in chemistry learning

The interest of vocational high school of automotive students to chemistry learning is analyzed based on students' answers to open questions. The six questions related to interest and whether, difficulties, frequency of learning, beliefs of usefulness, and expectations related content and learning strategies. The analysis results are discussed for each question

.

3.2.1. Question 1:"Are you interested in studying chemistry more?"

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The results show that most of the vocational high school students of automotive engineering are not interested in chemistry subject. As many as 84.38% of vocational students of automotive engineering program are not interested in studying chemistry (Figure 3). Various reasons put forward by students as the cause of such disinterest.

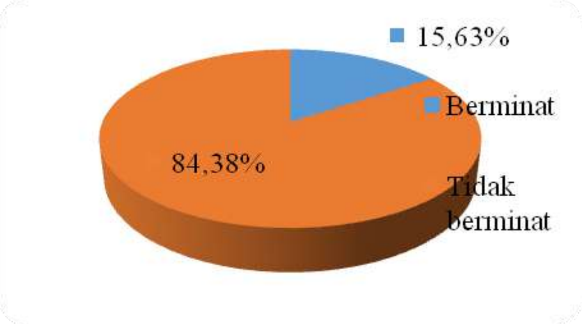

Figure 3. Percentage of students interest

The biggest cause of disinterest because the student just want to focus on vocational materials, chemistry unrelated to the automotive field, learning is not interesting, and chemistry is difficult to understand. Learning content factor becomes the main problem to explore student interest in vocational high school. The selection of inappropriate chemistry content causes the students not to be interested in learning. Chemistry is only considered a compulsory subject that is not relevant to the field of student's vocational. These results have implications for the need for chemistry teachers in vocational high school to map out relevant chemistry learning content to the automotive field. For example the problem of gasoline and diesel fuel in the discussion of petroleum. Likewise, learning about the fraction of petroleum in the form of lubricants. Recent studies have shown that the transfer of chemistry to the engineering education context and its material should be presented in a familiar and related context [21].The context in learning in vocational schools is of course associated with student vocational competence. The context-based learning in vocational schools improves the positive attitude, interest and meaningfulness of learning for students [1, 22, 23]. Interest is a specific quality that is individual. Previous research states that vocational field of learning is one important dimensions for developing students' interest in science [6, 24]. The results indicate that teachers are more emphasis on basic chemistry theories and do not provide applicative subject matter which is directly related to the students' vocational competencies.

The next cause is related to chemistry learning that students find unattractive. According to [5] states that pedagogical issues are the main factors affecting students' interest in learning a particular subject. Teachers must be able to choose the right learning strategy in accordance with the character of the subject matter and the student.Characteristics of vocational education are the emphasis on practical work. Vocational high school students will tend to get bored if the teacher just lectures and gives practice questions. Vocational students need to be invited to explore to construct their knowledge. This is in line with the results of [7] research which states that although teachers were not a major cause for declining students 'interest in chemistry, students' interest could be enhanced by appropriate approaches of pedagogical techniques.

In another hand, the small part of vocational school students expressed interest in chemistry subjects. The reasoning of it are; (1) chemistry is important to learn. (2) Want to understand chemistry applications; (3) chemistry is interesting (4) chemistry support areas of expertise. This factor should be developed so that it will affect all students of vocational high school. How teachers package the content and how to deliver subject matter in learning to foster students' awareness of the importance of chemistry in support of vocational competencies.

3.2.2. Question 2:"Is chemistry a difficult lesson?"

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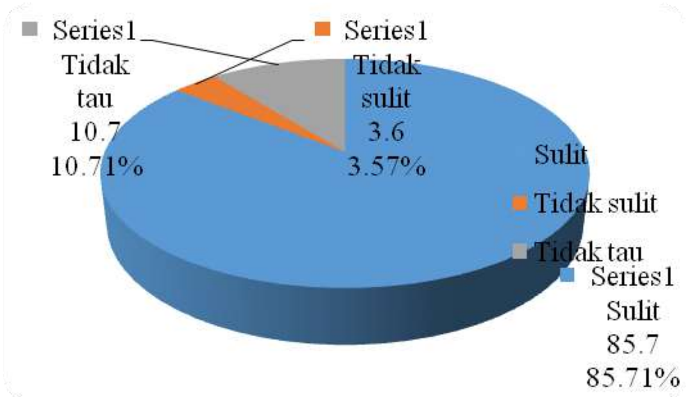

Figure 4. Students' opinions about the difficulty of chemistry

The next question is about whether chemistry is difficult or not. The results of the analysis in Figure 4 show that most of automotive engineering vocational students state that chemistry is difficult. According to student answers, the source of difficulty lies in the number of formulas and terms that must be memorized. Based on the content characteristic, chemistry involves different terminologies, structures, and calculations. The learning of these elements may cause difficulties for the students. The teacher's job is to convey the subject matter as clearly as possible with the appropriate assistance for the individual. The process is expected to overcome the learning difficulties experienced by students.

3.2.3. Question 3:"When do you study chemistry? Is it every day?"

The low data of student interest in learning chemistry is supported by the frequency data of learning. The results of the analysis show that 84% of students stated that they only study chemistry if they face repetition and if there is a task. As many as 15% of students study chemistry once a week, the night before a chemistry lesson and 1% of students say they never study chemistry at home, just remember what the teacher in class. This condition indicates that students have not looked at chemistry lessons as things to be mastered. The effort given by the students has not been maximized, just getting the value without perceiving the benefits. In addition to the results of less good learning, this situation also affects the not applied chemistry in solving automotive problems by students later in the world of work.

3.2.4. Question 4:"Are you sure that chemistry learning is useful for supporting your vocational competencies?"

The next question in the questionnaire is related to vocational high school students' belief in the benefits of chemistry learning. This benefit is attributed to its support for achieving students' vocational competencies. As many as 87.5% of students stated sure the chemical would be beneficial. Other students as many as 10.7% said they were not sure and the rest did not answer. These results provide a good basic for developing quality chemistry learning. Students who are convinced of the benefits of learning something will do their best to achieve success.

3.2.5. Question 5:"What content do you need to give in chemistry learning?"

Based on the results of the analysis of the fifth question, can be known what material is expected or suggested by students of vocational high school to be studied in chemistry learning. Most of students expect the material taught in chemistry learning is applicative and related to their skills. Nevertheless, the questionnaire data also shows that there are 18 students who do not give an opinion, just state just follow what subject matter will be given according to the applicable curriculum. The most answers to the chemistry subject matter that students will learn in a row are fuel chemistry, lubricating oils, batteries, reactions to the battery, electrolyte solutions, elements and compounds,

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metals and their properties, chemical reactions and dangers, constituents of tires and accessories of vehicles and chemicals in the industry. Nevertheless, there is an interesting note from the student's answer, which is four students of vocational high students stated that no important chemistry content is learned for vocational students of automotive engineering. The answer is very unintelligible because in vocational subjects students of vocational automotive engineering also got material about battery construction.

3.2.6. Question 6:"What do you suggest for more interesting chemistry learning?"

About the learning atmosphere, in open questions, to make learning chemistry interesting and fun they provide some suggestion. The answer of the vocational student to the last question about the expected learning strategy is quite varied. The answer with the most percentage is learning is balanced with the practice of laboratory, the content is reduced and directly applied in the automotive field. The next great answer is that not to give countless and theoretical homework assignments. The third percentage is the answer to the need for special textbooks, not just a few copies. The next answer is learning made fun, group learning as well as a friendly and communicative teacher in learning.

4. Conclusion

Exploration results show that not all vocational high school students have a good perception of chemistry learning. Low perceptions can be attributed to the analysis of students' interest in chemistry studies that are still low. The cause of the low perceptions of students stems from the meaningfulness of the subject matter that has not been felt. This implies the need for the development of context-based chemistry learning. The context in question is the content of vocational subjects closely related to student competence. The selection of appropriate content in context-based learning is expected to have a positive impact on improving students' chemistry learning interest. Students with high interest tend to have a good perception that will ultimately improve the quality of chemistry learning in vocational high school

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Mathematics Value and Its Position in Other Subjects: 9 High Schools in Yogyakarta Province

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Abstract. This study was conducted with the aim of positioning mathematics among other subjects and proving whether there is a positively strong correlation between mathematics and other subjects alternatively taught during the teaching-learning session. The approach utilized in the scope of the study is quantitative with survey method. The research was conducted during two months. The data were collected using academic documents from nine high schools including three junior, two vocational, and four senior high schools settled in Yogyakarta province. The information was needed merely concerned with scholastic records for 2014/2015 and 2015/2016. Five subjects, Mathematics, Indonesian, English, Religion, and Civics, were entangled. Data for all 6909 students were used because the study adopted total population sampling. The data were analyzed using multiple correlations and descriptive statistics with SPSS 24. The results showed that there is positive correlation between mathematics and the other subjects even though that correlation is still not strong and the means of mathematics among other subjects for all the high schools is not ranked the first. It would be concluded that mathematics is still basic towards other subjects; the yearly average score of mathematics is relatively good. Students should be motivated on applying mathematics in their daily life.

Keywords: Correlation, Cross-sectional Survey, Position, Total Population Sampling

1. Introduction

Mathematics has been proving itself a basic subject. Although it is necessary and important that a particular time should be set aside for every school day for the study of mathematics, it is recommended to guard against creating the impression that mathematics is disconnected from the rest of what is studied in schools. It is worthy to understand that mathematics can be meaningfully discussed in science, social studies, literature and reading, music and art classes, and virtually each curriculum domain. Mathematics has already proven itself very important in all these domains found in the curriculum. It is recommended to connect mathematics to the areas it is easily to belong. Teachers should be cautious when connecting mathematics to other areas because the process needs visible and explicit ways. This means that when subjects are taught other than Math, there is need to locate and mention the mathematical implications of what is being taught, even if the concentrations of Mathematics do not match with what is designed in the curriculum; it is still needed to connect Mathematics to those concentrations. It also means that when math is being taught and it can be found or thought of ways the math content could be applied to science or social studies or something else, that connection is needed to be developed by teachers. The appropriate context problems are needed to be constricted (word problems) that relate to topics taught in science and social studies, for example[6].

The very tough mindset of some students who often stand on the idea that Mathematics will never serve them at all, is still prevailing; teachers along with parents should find appropriate method to explain the ways math functions in everyday life. But math is also relevant and contributing to a wide variety of academic subjects [11].

Science

Science and math are intimately related, especially in fields such as chemistry, astronomy, and physics. Students who can't master basic arithmetic skills will struggle to read scientific charts and graphs. More complex math, such as geometry, algebra and calculus, can help students solve chemistry problems, understand the movements of the planets and analyze scientific studies. Math is

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also important in practical sciences, such as engineering and computer science. Students may have to solve equations when writing programs.

Literature and Writing

Both literature and writing literature might deemfar from Math, but for students to master fundamental arithmetic skills, they will have chance to outstandingly understand poems.The poetry counter (meter) is used with the purpose of being aware of number of words to be inserted in a line and the impact of some rhythms on the readers' understanding as results of mathematics calculations. At any level, Mathematics can be helpful for students when reading literature assignments in order to discern or set the time for reading and period needed to finish their work. Mathematics always needs logical and linear of thinking which help students to solve mathematical problems in logical and clear ways.

Social Studies

Social studies classes, like history, frequently ask students to revise graphs and charts in order to get information and historical data on ethnicity. In geography classes, students might need to understand how the altitude of an area affects its population or chart the extent to which different populations have different average life style. Knowledge of basic mathematical terms and formulas makes statistical information accessible.

The arts

The students from arts need basic mathematical skills in order to follow their careers in music, dance, theater or arts. Mathematics contributes a lot in musical rhythms of dances because many dancing groups or theater performances always apply mathematical skills. Art prospers on geometry, and students who understand basic geometry formulas can craft impressive art pieces [11].

This study focused on the position of mathematics comparing to others subjects. Mathematics results for two years were correlated to the results of the other subjects. It will be tested whether the theories stated above fit the results from the nine high schools in Yogyakarta Regency.

2. Literature Review

There are so many previous authors interested in the central role of mathematics upon other domains and its influence on them. Some of them are discussed here below:

It is generally agreed that 'mathematics is a critical skill for all, including to those who have not achieved a Grade C at GCSE by age 16 [4]. Further, an argument is put forward that in today's world of 'rapid change'[5], especially in terms of technological advance, there is a high demand of mathematical skills[8]; [12]. Hence, the more the world develops, the more mathematics skill is needed.

It deems to be generally accepted that in order for adults to function (reasonably well) in an increasingly complex world, they require a basic level of numeracy [5]. Numeracy, or mathematical skill, is considered crucial which is highly needed in terms of life skills, such as individual financing, (e.g. loan mortgage choice, setting budget, making contracts) and data management[12]. Thus, numeracy is a basic step for aged people to work properly in this changing world.

Universal numerical skills are valued in some sectors, but in many, they are seen as essential.In some tasks, such as costing, assessing risk, and controlling quality and solving problems, statistic and probability should be effectively integrated [5];[4]; [12].Most importantly, it is advised to all workplace members to improve their mathematics in order to avoid mistakes and errors in their working places [4]. Overall, mathematics skills are very helpful to solve daily problem.

It is generally agreed that mathematics skills are needed for reaching innovation in business and industrial activities. The point is that in order to compete at international level in economic sector the qualified young people involved in mathematics and educational science are very needed [5]. All in all, mathematics contributes to innovative business.

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Domains such as Technology, Engineering, Science and Industrial Mathematics (STEM) are absolutely central for globally economic growth competitiveness because they provide many of the jobs of tomorrow for young people [5].The impact of educational Mathematics on economy can be well seen in many countries with significant growth of industrialization (Pacific RIM)because students in those nations are particularly well based on international comparisons [12]. Therefore, industrial advance depends on mathematics skills.

Research Purpose

The main focus of the study, as the previous sections clearly witness or prove, was to correlate mathematics with other subjects based on the students' scores on their tests or academic or scholastic exams because the theories from reviewed literaturesattest that whatever domain in the world has the basis or root on mathematics. This means that every subject can be correlated with mathematics either highly or lowly. Moreover, the study equally rushed to determining the position (rank)of mathematics, as subject,among other subjects taught such as English, Indonesian language, Civics, Religion, and so forth. Here it was not ignored that the level of correlation for all subjects to mathematics varies from subject to subject, it can be strong, slightly strong, and possibly null. On the other hand,it can be positive or negative.

Hypothesis

Having leaned against the theories of the study, it was hypothesized that:

1. Mathematics is positively correlate to other subjects for the majority of the schools included in the study;
2. The correlation of mathematics to other subjects is still not positively strong for all subjects based on the students' results for the two scholastic years (nine schools);
3. The students' resultsindicator (mean) from the nine high schools, for the scholastic years 2014/2015 and 2015/2016do not permit mathematics take the first rank on the list of other subjects.

3. Methodology

This study is bent to quantitative approach with survey-based method.The type of survey adopted in the study is cross-sectional; it was only conducted within 2 months.

Population and Sample

The determination of the participants was worked through across all schools involved in the study, SMP Muhammadiyah 1 Wonosari, SMP N 12 Yogyakarta, SMP Muhammadiyah 3 Depok, SMA N 1 Godean, SMA N 1 Wates, SMA Muhammadiyah 3 Yogyakarta, SMA Muhammadiyah 4 Yogyakarta, SMK Muhammadiyah Imogiri, and SMK Muhammadiyah 1 Temon, all the schools are based in Yogyakarta.The determination of students, whose scores were used in this study, was done using purposive sampling method with different techniques within[2]. For ordinary level (O'level/ SMP), the number was determinedwith total population sampling technique (2628 students), and then purposive sampling technique for advanced level (A'level/ SMA and SMK, 2018 and 2173 students respectively).Hence, the total number of 6909 participants was involved in this study. The schools at which this survey was conducted cannot represent other schools in the province because the number is too small. Therefore, internal generalization was preferred.

The information about schools, their locations, and number of students involved in the study, are displayed in the table below:

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Table 1. Distribution of Participants By Schools and Scholastic Year

No.	School Name	Location	N of students for scholastic year 2014/2015	N of students for scholastic year 2015/2016	Total
1.	SMP Negeri 12 Yogyakarta	Yogyakarta City	509	508	1017
2.	SMP Muhammadiyah 3 Depok	Sleman District	379	403	782
3.	SMP Muhammadiyah 1 Wonosari	Gunung Kidul District	437	392	829
4.	SMA Negeri 1 Wates	Kulon Progo District	164	167	331
5.	SMA Negeri 1 Godean	Sleman District	169	179	348
6.	SMA Muhammadiyah 3 Yogyakarta	Yogyakarta City	392	397	789
7.	SMA Muhammadiyah 4 Yogyakarta	Yogyakarta City	280	360	640
8.	SMK Muhammadiyah Imogiri	Bantul District	712	854	1566
9.	SMK Muhammadiyah 1 Temon	Kulon Progo District	283	324	607
Total			3325	3584	6909

Data Collection

The process of collecting data involved the use of documentation as the main instrument. The researchers made tours to all the nine schools to meet each subject's teacher, then the staff and even the students for the verification of the data. The data were collected officially under the permission of the local government or central managerial offices for private high schools. The format of the instrument used to collect the data can be found on the attachment of the paper.

4. Data Analysis and Discussion

In this section, the focus was put on the correlation and descriptive analysis. *Correlation*is a statistical method that can be used to examine any possible linear association that can happen between twocontinuous variables. For descriptive analysis, it was simply proceeded the comparison of means for all subjects by school for mathematical positioning purpose; determine the position of mathematics among other subjects. There must be two kinds of information, one for the correlation another for the position of mathematics. Concerning the first purpose, there are two outputs; scholastic years 2014/2015 and 2015/2016.

According to [1] in his book entitled "*Introduction to Research in Education"*, the coefficients of correlation are classified into three big parts: positive correlation, negative correlation, and null correlation (zero correlation). Within the first two parts, we can have perfect, high, moderate, and low correlation. Concerning with the coefficients, +1 stands for perfect positive correlation, whereas -1 stands for perfect negative correlation. +0.93 stands for any correlation that is highly positive, whereas -0.76 is for any highly negative correlation. +0.30 gives the idea about medium or moderate positive correlation;however, zero represents a null correlation.

According to the rule of thumbfor interpreting the size of correlation coefficient, the value and its interpretation were synthesized in the table below [3]:

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Table 1. Rule of thumb for Interpreting the Size a Correlation Coefficient

Size of Correlation	Interpretation
0.90 to 1.00 (-0.90 to -1.00)	Very high positive (negative) correlation
0.70 to 0.90 (-0.70 to -0.90)	High positive (negative) correlation
0.50 to 0.70 (-0.50 to -0.70)	Moderate positive (negative) correlation
0.30 to 0.50 (-0.30 to -0.50)	Low positive (negative) correlation
0.00 to 0.30 (0.00 to -0.30)	Little if any correlation

Based on the table 1, the statistical hypothesis for determining the correlation of mathematics to other subjects was set out as follow:

1. $H0_1$: $-1.00 < r < 0.00$ $\quad$ Ha_1 : $0.00 < r < 1.00$
2. $H0_2$: r-all > 0.70 $\quad$ Ha_2 : $0.00 < r < 0.70$
3. a. $H0_3$: $\mu_{math1} = 1^{st}$ rank $\quad$ Ha_3 : $\mu_{math1} \neq 1^{st}$ rank
   b. $H0_3$: $\mu_{math2} = 1^{st}$ rank $\quad$ Ha_3 : $\mu_{math2} \neq 1^{st}$ rank

The first null hypothesis must be rejected if the correlation coefficient varies from 0.00 to 1.00; positive correlation. The second null hypothesis must be rejected if the correlation coefficients for all subjectsvaries from 0.00 to 0.70; not a positively strong correlation.The third null hypothesis ($H0_3$: a and b) must be rejected if the mean of mathematics subject for both year and all schools is not ranked the first.

Table 2. Cumulative Correlation Matrix for All Subjects / Scholastic Year 2014/2015

Control Variables			MATH1	INDON1	ENGL1	RELIGION 1	CIVICS1
MATH2 & INDON2 & ENGL2 & RELIGION2 & CIVICS2	MATH1	Correlation	1.000	.267	.779	.430	.385
		Significance (1-tailed)	.	.115	.000	.023	.038
		df	0	20	20	20	20
	INDON1	Correlation	.267	1.000	.080	.622	-.059
		Significance (1-tailed)	.115	.	.361	.001	.397
		df	20	0	20	20	20
	ENGL1	Correlation	.779	.080	1.000	.262	.398
		Significance (1-tailed)	.000	.361	.	.119	.033
		df	20	20	0	20	20
	RELIGION1	Correlation	.430	.622	.262	1.000	.091
		Significance (1-tailed)	.023	.001	.119	.	.344
		df	20	20	20	0	20
	CIVICS1	Correlation	.385	-.059	.398	.091	1.000
		Significance (1-tailed)	.038	.397	.033	.344	.
		df	20	20	20	20	0

Information:
Number 1 found behind the name of every subject stands for academic year 2014/2015, example: math1 means mathematics for the first scholastic year (2014/2015).

For this academic year 2014/2015, it can be seen from the table that the correlation between mathematics and the other subjects is different from subject to subject.It is clearly displayed in the table that the coefficient of correlation between Math1 and Indon1 is 0.267, Math1 to Engl1, 0.779, Math1 to Religion1 0.430, Math1 to Civics1 0.385. All these coefficients are positive. There is a high positive correlation between Math1 and Engl1 (0.779), a low positive correlation of 0.430 between

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Math1 and Religion1, 0.385 between Math1 and Civics1, and0.267 between Math1 and Indon1.For this case, the first null hypothesis must be rejected because all coefficients of correlation are between 0.00 < r < 1.00. For the second null hypothesis, because the correlation coefficients for all subjects (r – all) are not located above 0.7(r-all > 0.70); for Math1and Indon1 0.267, Math1 and Religion1 0.430, Math1 and Civics1 0.385.

The analysis output for the second academic year can be seen Table 3.

Table 3. Cumulative Correlations Matrix for All Subjects/ Scholastic Year 2015/2016

Control Variables			MATH2	INDON 2	ENGL2	RELIGION2	CIVICS2
MATH1 & INDON1 & ENGL1 & RELIGION 1 & CIVICS1	MATH2	Correlation	1.000	.783	.812	.714	.433
		Significance (1-tailed)	.	.000	.000	.000	.022
		df	0	20	20	20	20
	INDON 2	Correlation	.783	1.000	.725	.693	.301
		Significance (1-tailed)	.000	.	.000	.000	.087
		df	20	0	20	20	20
	ENGL2	Correlation	.812	.725	1.000	.589	.406
		Significance (1-tailed)	.000	.000	.	.002	.030
		df	20	20	0	20	20
	RELIGION2	Correlation	.714	.693	.589	1.000	.388
		Significance (1-tailed)	.000	.000	.002	.	.037
		df	20	20	20	0	20
	CIVICS 2	Correlation	.433	.301	.406	.388	1.000
		Significance (1-tailed)	.022	.087	.030	.037	.
		df	20	20	20	20	0

Information:
Number 2 found behind the name of every subject stands for academic year 2015/2016, example: math2 means mathematics for the second academic year (2015/2016).

The correlation between Math2 and Indon2 is 0.783, Math2 and Engl2 0.812, Math2 and Religion2 0.714, Math2 and Civics2 0.433. All the correlation coefficients between Mathematics and other subjects are positive. The first null hypothesis must be rejected because all the coefficients are between 0.00< r < 1.00. The second hypothesis must be rejected because the coefficients of correlation between Mathematics and all other subjects are not above 0.7 (r-all> 0.70); for Math2 and Civics2, the coefficient correlation is 0.433.

Concerning positioning mathematics, its score mean, within other subjects', all the ranks are inserted in Table 4. In the same table, there are four variables from which variable of *mean* was chosen.

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Table 4. Descriptive Report on the Position and Value of Mathematics Among Other Subjects for 2014/2015 and 2015/2016

SCHOOL		MATH1	INDON 1	ENGL1	RELIGION1	CIVICS 1	MATH2	INDON 2	ENGL2	RELIGION2	CIVICS 2
SMP N 12 Yogyakarta	Mean	80.3502	79.9360	79.9788	87.7117	81.7859	79.0102	78.3331	81.5259	82.5666	81.4605
	Variance	6.772	8.381	8.924	4.507	9.027	6.141	3.056	3.922	7.154	4.959
	Maximum	82.79	82.63	83.30	89.76	85.21	81.20	79.72	83.19	84.25	83.83
	Minimum	77.61	76.88	77.52	85.52	79.58	76.32	76.37	79.34	79.48	79.42
SMP Muh. Wonosari	Mean	77.1513	79.6608	77.4529	81.0772	78.6147	76.7402	75.2969	77.6584	78.4388	75.4970
	Variance	3.872	4.062	.564	8.005	1.399	.049	.000	1.916	1.449	3.471
	Maximum	78.78	81.99	78.17	84.32	79.94	76.99	75.31	79.26	79.83	77.65
	Minimum	74.96	78.42	76.67	79.12	77.66	76.56	75.27	76.80	77.70	74.42
SMP Muh. 3 Depok	Mean	78.2068	79.9188	79.8010	79.5200	88.0874	78.3488	79.8078	80.4189	80.0444	86.8857
	Variance	13.645	19.956	10.000	.340	1.143	11.798	12.289	6.152	.015	5.391
	Maximum	82.01	85.06	81.81	80.19	89.30	81.97	83.86	82.23	80.18	88.99
	Minimum	74.64	76.96	76.16	79.10	87.30	75.14	77.73	77.59	79.94	84.39
SMA N. 1 Wates	Mean	81.8433	85.9942	81.8649	92.3597	86.5427	82.3636	84.5101	82.3411	88.3785	85.1502
	Variance	5.814	8.780	.576	3.802	.280	6.037	3.462	1.751	.432	.583
	Maximum	83.70	89.32	82.55	94.60	87.06	85.20	85.67	83.58	89.00	85.98
	Minimum	79.12	83.63	81.05	91.08	86.00	80.89	82.36	80.95	87.69	84.47
SMA N. 1 Godean	Mean	70.3848	71.4790	77.2520	78.8807	88.3135	66.7082	69.9491	71.6633	81.4483	77.9438
	Variance	217.229	70.933	41.924	54.558	14.617	76.981	103.221	27.540	26.169	4.702
	Maximum	82.99	79.84	82.25	83.84	92.38	75.45	81.56	77.72	84.75	79.57
	Minimum	54.18	63.00	69.94	70.39	84.78	57.91	62.67	68.55	75.56	75.48
SMK Muh. 1 Temon	Mean	78.0277	76.0449	76.6689	76.2166	76.3501	74.4149	76.2151	76.9285	73.0615	66.6232
	Variance	12.091	19.085	13.700	15.100	22.952	39.029	20.907	17.672	24.636	48.023
	Maximum	81.78	80.02	80.33	79.71	80.18	80.90	80.99	81.68	78.34	73.07
	Minimum	74.91	71.37	72.93	72.03	70.98	68.44	71.88	73.70	68.49	59.30
SMK Muh. Imogiri	Mean	77.0322	78.6892	77.2535	80.3378	78.9944	77.1306	78.6520	77.1622	80.2917	79.1262
	Variance	.049	.059	.027	.003	.012	.053	.001	.009	.008	.062
	Maximum	77.27	78.95	77.44	80.40	79.08	77.39	78.69	77.26	80.39	79.28
	Minimum	76.84	78.47	77.13	80.28	78.87	76.94	78.63	77.07	80.22	78.84
SMA Muh. 3 Yogyakarta	Mean	79.5341	78.5348	80.6131	84.7967	78.9099	80.7127	78.4335	80.2597	83.9778	79.4541
	Variance	13.954	2.717	7.594	8.542	11.788	16.950	1.152	12.579	10.360	1.657
	Maximum	83.10	79.97	82.69	87.61	81.72	85.12	79.46	83.26	85.86	80.89
	Minimum	75.65	76.74	77.49	81.78	75.08	76.96	77.32	76.35	80.26	78.40
SMA Muh. 4 Yogyakarta	Mean	78.9901	81.1366	81.1373	80.6014	78.8912	81.7745	82.2317	81.7457	81.8546	79.3054
	Variance	6.464	1.943	10.411	2.829	1.205	19.466	8.651	9.910	6.007	.484
	Maximum	81.16	82.61	84.25	82.46	80.12	86.47	85.38	84.89	84.45	80.04
	Minimum	76.19	79.84	77.80	79.18	78.02	77.71	79.56	78.60	79.57	78.66
Total	Mean	77.9467	79.0438	79.1136	82.3891	81.8322	77.4671	78.1588	78.8560	81.1180	79.0496
	Variance	31.141	24.444	10.763	30.742	24.299	34.570	27.830	16.857	21.737	36.825
	Maximum	83.70	89.32	84.25	94.60	92.38	86.47	85.67	84.89	89.00	88.99
	Minimum	54.18	63.00	69.94	70.39	70.98	57.91	62.67	68.55	68.49	59.30

Recalling that math1, indon1, engl1, religion1, and civics1 are for academic year 2014/2015 but math2, indon2, engl2, religion2, and civics2 are for academic year 2015/2016.

Having looked through the results displayed in the table 4, the third null hypothesis must be rejected because the rankor position of mathematics for both academic years and across all schools is not the first. Even though the mean of mathematics for scholastic year 2014/2015 at SMK Muhammadiyah 1 Temon is the highest (ranked the first) with 81.78, it cannot justify the acceptance of null hypothesis; the first school through the last one on the list within the table contain or yield the mean-values that do not permit mathematics be positioned as the first. Therefore, from nine high schools, there is only one school, 11.11%, (its first academic year) where it can be found mathematics is ranked the first.

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5. Conclusion

Any correlation can be considered positive when there are two variables which increase or decrease together. For example, a positive correlation might exist between age and reading skills for deaf children, meaning that older children tend to exhibit higher reading skills. A negative correlation means that the two variables differ inversely; that is, as one goes up, the other goes down [7]. Therefore, Mathematics is still central as the results interpretation proves it within the next paragraph.

Relying on the results of this study (analysis), it is absolute to formulate three conclusion statements. First of all, there is positive correlation between mathematics and other subjects. This can be justified by the correlation coefficients displayed in the tables above (table 2 and 3). When there is positive correlation between mathematics and other subjects, then there must be effect of mathematics upon those subjects. Secondly, except for some particular cases at some schools, the correlation coefficients between mathematics and other subjects across both academic year (2014/2015 and 2015/2016) is still slightly positively strong. This can be justified by the correlation coefficients found in both table 2 and 3. Thirdly, throughout the whole schools, it can be confirmed that mathematics is not the most understandable and dominating subject comparing to other subjects taught in the high schools nevertheless there might be one case at one high school (SMK Muhammadiyah 1 Temon academic year 2014/2015). Generally, mathematics mean for both scholastic years across the nine high schools does not permit mathematics asa subject to be ranked the first.

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Analysis School of the Future: Transitioning Traditional Classroom to Digital

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Abstract. The phenomenon of globalization that requires the presence of the public as an open-plan living space and time has become a necessity. Life of a global society increasingly dependent on technology, should have to respond quickly to the school in order not to lose his role in preparing the learners to contribute to a digital society. The concept of schooling in the future will certainly be different. There are at least four things that need to be observed the school respond to a shift away from traditional classrooms to digital, are; (1) the ability to adapt to technological progress as a support for learning; (2) the availability of facilities to enhance innovation internet-based learning; (3) accessibility of global classroom easily and quickly; and (4) the existence of educators easily adapt to changes in technology. These have been important in ensuring learners to learn according to the development and advancement of technology.
Keywords: School of the Future, Traditional Classroom,Digital Age

1. Introduction

School in the future will be different. The role of teachers and the use of technology/media must change if the school wants to prepare students who can contribute to the global society is increasingly dependent on technology. Adaptability of teachers and the existence of supporting infrastructure is needed to make the transition from traditional learning methods and devices to digital approaches to be optimized to meet the needs of students. Traditional classroom transition to digital greatly varies from teacher to teacher and school to school. This variation in the four stages of adoption and adaptation of technology; (1) conducted by trial and error; (2) do old things in the old ways; (3) do old things in new ways; (4) doing things in a new way [1].

The process begins by trying the technology randomly added technology devices to multiple classrooms or libraries. Then the technology used to do old things in the old ways, such as displaying the teacher lecture notes in power point instead of using the OHP transparencies. The next stage that looks promising is doing old things in new ways, such as teachers who use the 3D model to show the structure of a compound than described on the board; or a student who uses a word processor and clip art instead of handmade images to make a short story. The last phase of doing new things in new ways, fully use the power of technology, regarding providing content oriented to the future to develop students' skills. At this time many learning practices that have reached the fourth stage by adopting and adapting the environment of students with technology to support and enhance the ability of teachers and students.

Utilization of technology can expand and improve the ability of teachers to fulfill some roles and responsibilities related to the duties and functions. Availability of technology allows teachers to plan and provide interactive learning and participating in the global community of practice with fellow educators with a better way. This becomes important as an effort to give students knowledge and experience to optimally match the needs and technological developments.

2. Technology and Learning

Students today are the first generation that grew up in the digital world. Mobile phones, portable DVD players, computer games, instant messaging, and the iPod is the device everyday. Students of this kind are known as a "digital native" [2]. The challenge for schools in the future is to create an educational environment that goes beyond and improve the ability of "digital native" and reinforcing these students with the knowledge and skills necessary for success in a global society. The result looks as the technology becomes more useful, more ubiquitous, more "smart," and more powerful. At the same time become less intimidating, less was seen, less demanding, and cheap. These advances allow

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the school make the transition from traditional the digital environment. These changes will have an impact on future technologies used by teachers, students, the structure of the classroom, and the teacher's role.

Advances in technology for schools in the future, the latest technology is video conferencing which brings experts into the classroom. In the future, such interactions will be enhanced through 3D collaboration tools such as those developed by Teleportec(www.teleportec.com).These tools allow existing guest speaker distant places to be shown in the form of life-size, three-dimensional shape and can interact with the contact "eye to eye" with the students who participated in the video conference. Guest speakers can be "virtually" seated at a table that is aligned with the students or stand in front of the class. The virtual environment allows the speaker to "see" who ask questions and view student when answering. The system is capable of displaying the body language and facial expressions impressive authenticity and enriching learning experience [3].

Progress can also be seen in sophistication and use of pedagogical agents, individuals, used computers to help and be a mentor for the learners. One example of a simple pedagogical agent is an assistant "clipped" in Microsoft Office that monitors user actions and give advice. Pedagogical agents more sophisticated embedded in a computer-based learning environment to help learners to achieve the desired results. The agent seems to have the animated character traits that carry out four major tasks; expert knowledge, supporting motivator, mentor, or someone who is knowledgeable [4]. The examples in the classroom regarding pedagogical agents include the following; (a) assistant information to help students manage information; (b) tutor to facilitate learning; (c) a mentor to support, guide, and expand students' thinking; and (d) a device for making personal pedagogical agent students.

3. Global Classrooms

Almost everyone already has a mobile computing device. At least in the form of smartphones, which has computing capability such as messaging, listening to music, watch videos, store documents, presents a list, and can connect to the internet. The existence of this technology can deliver information quickly and can connect people around the world as an open-plan space and time.

Through the use of complex satellite systems, the world is connected by a digital network that really makes the classroom when it becomes global. Now students learn from such a variety of resources ranging from printed books to the live video conferences with people who are geographically separated thousands of miles. The teachers also have access to use resources such as ePals Global Network(www.epals.com/community)which has more than 118,000 class of about 200 countries that participate in cross-cultural learning. Teachers can plan subjects through cooperation with other teachers or engage students in a learning interactive research studies involving children around the world.

The world is also open to students in the website via live streaming video that can be played before the file is completely downloaded from the web. Students can view snapshots directly from the North Pole, a New York City Center, Eiffel Tower, Mount Fuji, the Municipal Market Hong Kong and Indonesian Art.

Visiting different countries via video to enhance students' understanding of the differences regarding time. For example, the video may display the sunrise, when the time was the evening in a classroom of students. Viewing the world "when the" open students' eyes to the differences and similarities that exist in the culture of the world when the students see what people wear, drive, eat, and do.

4. Structure Classroom Future

When thinking about the school in the future, it is easy to imagine the high-tech environment paperless, wireless, and has a global connection. But, as seen in the current technological developments, shows that the future classrooms require more than just putting a computer in the classroom. But in the future have to apply appropriate technology, which complements the individual or group learning for students [5].

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School of thought are explained in the future, which opens access in Philadelphia in 2006(www.phila.k12.pa.us/offices/of/home/html).Structure of USD 63 million is the result of a joint venture between Microsoft Corporation in Philadelphia School District and reflects the vision of Bill Gates to prepare students in the 21st century. It starts with a new mindset that the students regarded as "learners" and teachers are "educators,"the environment, fully digital. The learners use smart cards for Presence, to access the lockers, and to track learning outcomes. The students no longer carry books in a backpack, since the e-book has replaced printed books. Teachers continue to connect with the students, because both are equipped with a laptop that is always linked to a wireless Internet network. Classrooms no longer have definite boundaries as an open-plan space and time, this is done to meet the diverse learning needs of students.

School of the future will likely lead to the online classroom. Ability advantage of technological developments and changes in learning models to support the optimization study, will obtain the advantages of a digital environment. Need to re-create the pedagogy by with developments in technology, one of them by proposing needed changes [6].

5. Learning Innovation

Learning in the digital era involves the use of technology-based learning and interactive multimedia. Teachers also need to participate in the internet-based community, which constitutes a group of educators from across the country and around the world who have the same goal to share ideas and resources. The internet-based interactions, providing opportunities for teachers to collaborate, exchange ideas and materials. These communities may include teachers who teach subject areas and grade levels the same or teachers with similar interests, such as the integration of technology, the management of the classroom, and collaborate with gifted students.

One Internet-based community that can be used one of them is Tapped In (tappedin.org), which provides the opportunity for teachers to collaborate with a global network of teachers. This collaboration may include planning and implementing learning projects involving students and teachers from different schools to work together to solve the problem of learning and educational issues. The teachers also had the opportunity to manage and attend classes on-line, became a mentor to other teachers, and piloting new ideas in an environment that is conducive and supportive.

Similarly, learning innovation experienced by the students, the traditional classroom students have never been connected to each other, in contrast to the current conditions in the wireless digital. In the digital era allows students to learn from a variety of sources and media. Learning community of students spread throughout the world by means of interactive communication web-based such as blogs (personal journals that can be accessed publicly), wikis (web information that can be edited by the user member) and podcasts (multimedia file distributed over the Internet that are formatted for downloading directly to mobile devices). This allows students to exchange ideas and experiences related to learning new knowledge is constantly growing.

Interactive digital devices continue to be popular, as seen in technorati.com which shows that in March 2007, there are 71.1 million blogs on the internet. Wikipedia was about as popular regarding more than one million entries are available in more than 200 languages in March 2006. Interestingly, there are only 120,000 entries in the Encyclopedia Britannica during the same period [7]. Thus, it allows students with mentoring teachers can use technology to explore, find out, and advance the quality of students' learning and contribute to the knowledge of others.

The availability of facilities such as internet-based learning resources, is believed to be able to provide an opportunity to enhance students information literacy, the ability to use a series of critical thinking and solve problems effectively. The students learn how to place, analyze, and evaluate information to determine the accuracy of, and draw conclusions. The ability to access and contribute to the material web-based information is a critical capability required by both the teachers and students to learn throughout life.

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6. Teacher's Role in the Future

Role of a teacher will always have a fundamental responsibility in the form of allowing students to learn. However, there has appeared a difference over time in how teachers achieve these goals. The role of a teacher in the future will still result in improved student learning, but teachers must have broader capabilities than just knowledge of content and pedagogy abilities. The teachers in the future must be competent in the field of technology and information literacy.

Most of the teachers today have basic computer literacy skills [8], but often lack the understanding to apply these skills effectively to integrate technology into their teaching. The teachers have to be computer literate to acquire technological competence. This means that teachers should know basic computer literacy, but more importantly, know how and when to use technology to enhance learning.

It is clear that the technology will be more and more in schools in the future. Therefore, the technological competence will be a critical requirement for teachers in the future. For example, teachers must be able to plan classroom activities that continually integrate interactive multimedia experiences that engage students in meaningful learning. Also, teachers in the future will be the users of the technology. Teachers will have the latest website to make students and parents stay informed about expectations and classroom activities. It is the practice of learning through participation in online learning.

The teachers in classrooms in the future must show a willingness to explore and discover new technological capabilities that enhance and extend the learning experience. Teachers should have the openness to learn from the students and ask students ideas regarding the application of innovative technology to discuss and resolve real-world problems, so it is excellent in preparing students to demonstrate the ability of students to careers in the future.

Based on the Association for Educational Communications and Technology (2004), affirmed the role and competence of teachers learning amid the digital era, namely; (a) accessing information efficiently and effectively; (b) evaluate information critically and competently; (c) using information accurately and creatively; (d) seek information in accordance with personal interests; (e) appreciates literature and other creative convey information; (f) strive to achieve excellence in information retrieval and formation of knowledge; (g) recognize the importance of information to a democratic society; (h) the practice of ethical behavior related to information and information technology; (i) to participate effectively in group profession to find and produce new knowledge.

As mentioned, the school of the future will rely on e-books and digital libraries. Therefore, future teachers must master the use of technology and information. To set up a class, the teacher should put material from various sources online and make sure the material is accurate, appropriate, easily accessible, and can be used by the guidelines of copyright. Also, teachers also need to align the online material to the material in e-books and resources available.

Once he was in the classroom, the teacher in the future should be pointed out and teach information literacy skills to students. Teachers will appreciate the students can access information freely, showing the importance of critically verify the data, acknowledge the source of information, and how to comply with copyright regulations. The students will learn the values of the formation of the new information through digital collaboration worldwide. This is a requirement on student mastery of critical thinking skills necessary to succeed in the 21st century.

7. Conclusion

The teachers, students, and the parties involved in education must prepare for the future use of technology and media education for learning. Technology and media have had a potentially significant impact on the school and provided a glimpse into the school in the future.

Technology and media education provides tools to engage students in active learning and interactive. As a teacher, should be able to choose the best tools for the students as a means to improve learning performance. Thus the learning objectives can be achieved optimally.

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Perception of Students to the Act Of Plagiarism in the Preparation Student Final Assignment

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Abstract. This research is based on the issue of plagiarism in the academic world especially in Higher Education. The main issues studied in this study are: "What is the perception of students to the act of Plagiarism in the preparation of Student Final Assignment?". This study was conducted with the aim to describe the act of plagiarism in preparing the final assignment of students. The method used in this research is a descriptive analytical method. Informant of this research is the student. The research doing on 2017 at odd semester. Through a descriptive analysis of prevention of plagiarism in the preparation of the final assignment students is turn can provide accurate information. The research results obtained is the lack of knowledge about the style of selingkung writing, limited time available in the preparation of the final task of students, the development of information technology that facilitate and open opportunities to cheat. Plagiarism action in university, especially in the Faculty of Education is precautionary in the presence of guidelines for the writing of scientific papers made in the University and socialized by lecturers, either on the course or on the lectures in the classroom. Lecturers have not protection on the issue of plagiarism, socialization on the issue of plagiarism that is still not sufficient for information needs to be known by students. Workshop or final job writing training either study program or faculty in the campus environment that has not been done as needed.
Keywords : Final Project, Plagiarism, Student.

1. Introduction

Universities as a institution engaged in education have a purpose that refers to tri dharma colleges that have been proclaimed by the government of education, research and community service. In the implementation of educational components, there are signs that regulate in the educational process, such as originality in scientific work either by lecturers or students. Related to the academic process conducted in universities, there are deviations in the implementation of one of them is the plagiarism done by the students in making the scientific work, especially on the final task that they must carry out as a student. The Government in 2010 through the Regulation of the Minister of Education of the Republic of Indonesia Number 17 provides the definition that "Plagiarism is a deliberate or intentional act of obtaining or attempting to obtain credit or value for a scientific work, by quoting part or all of the work and or other scientific work recognized as his scientific work, without declaring the source properly and adequately ".

There are some cases related to plagiarism (especially in the academic world). This is so distressing because institutions like colleges should be the front guard in dealing with plagiarism since the act of plagiarism contradicts the values of education. The act of plagiarism certainly does not just happen, the demand to produce a paper leads us to do everything we can to achieve that goal. There are several causes of plagiarism as suggested by Herqutanto (2010) there are two things in general that plagiarism is the reason, the first is the plagiarist does not know that the action is plagiarism. Another reason is to accidentally do plagiarism because it is influenced by what they read so unconsciously copy what it read. While Sinaga (2010) in his research concluded various factors that cause plagiarism of thesis happened among students of Department of Sociology FISIP USU among them is the lack of knowledge about the rules of writing scientific papers, low writing ability and less understanding of the material to be written in the thesis, by mistake or forgot enter the bibliography, just want a good value, want to finish quickly and find a shortcut, laziness in the students less communication with supervisors and lack of supervision from the institution of education.

There are various ways of preventing the practice of plagiarism, among them (a) fostering student integrity, so they are honest in doing scientific studies; (b) improving the function and the role of supervisor of the thesis / research because the student's research is also the betting of the career of the mentor; and (c) using plagiarism software (Wijaya, 2010).

In the world academic action plagiarism prone to occur, a student in his daily course will be preoccupied with tasks such as making papers or other scientific papers, has become a public secret in the digital era today the internet feels to be the right solution in the middle of piling up the tasks given, no doubt the activity of copy paste is considered to be the best method for solving a scientific paper especially among students. It is a very distressing thing if we take care deeper, instead of feeling very hard to finish the tasks when he has deceived others and himself. There are various ways of preventing the practice of plagiarism, among them (a) fostering student integrity, so they are honest in doing scientific studies; (b) improving the function and the role of supervisor of the thesis / research, because the student's research is also the betting of the career of the mentor; and (c) using plagiarism software (Wijaya, 2010). In the world academic action plagiarism prone to occur, a student in his daily course will be preoccupied with tasks such as making papers or other scientific papers, has become a public secret in the digital era today the internet feels to be the right solution in the middle of piling up the tasks given, no doubt the activity of copy paste is considered to be the best method for solving a scientific paper especially among students. It is a very distressing thing if we take care deeper, instead of feeling very hard to finish the tasks when he has deceived others and himself. Cheating others because of their actions harming others by stealing the work of others, deceiving themselves, by acting as if they were successful, searching and mastering what he wrote, and in the absence of it.

The concepts and ideas above are the cornerstones of developing this research. The prevention of plagiarism in the preparation of the final duty of the thesis is expected to be one of the effective ways to reduce or even eliminate the actions that lead to plagiarism, especially students at UPI. Analysis of problems in general is; "How the Faculty Students Perspectives plagiarism in students of the Faculty of Educational Sciences of Indonesia University of Education (UPI) in the preparation of the final assignment". Based on the formulation of the problem, the purpose of this study is to get an idea of the perception of UPI Faculty of Education sciences students about plagiarism in the final assignment. The research method is analytical descriptive. The research approach uses qualitative studies. This is done in the hope that it can be in accordance with the purpose of research that is to know Prevention of plagiarism in the preparation of final assignment of students in the Faculty of Educational Sciences. The focus of the research is further directed at the analysis of the prevention of plagiarism in the preparation of the final assignment of students. Subjects of this study are students. To obtain data and information from this research will develop tool /instrument of data collecting in the form of interview guide and observation guide. The preparation and development are done according to the schedule that has been determined on the next research schedule.

2. Result And Discussion

Government through Permendiknas Number. 17 of 2010 defines plagiarism as a deliberate or inadvertent act in obtaining or attempting to obtain credit or value for a scholarly work, by citing any or all of the work and/or other scholarly work of the recognized party as its scientific work, sufficient. At various colleges, plagiarism issues often receive special attention, preventive measures are always seeking to be free from plagiarism. Plagiarism is regarded as cheating academics with various associations of meaning such as forms of deception, forms of dishonesty, and forms of deceit (Sutherland-Smith, 2008). The issue of plagiarism often becomes isolated in the college environment, plagiarism is considered a shame that is difficult to forgive, college in addition to producing gray literature, of course, must ensure that the resulting works must be original and free plagiarism.

Based on the results of research that has been conducted through in-depth interviews with students at the Faculty of Education at Indonesia University of Education, there are generally three aspects related to student perceptions of the action of plagiarism in the preparation of the final task. According

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to the respondents plagiarism in the preparation of the final work done by the students is to do the quotation without listing the original source, the opinions of these respondents in tandem with the government's view of the action of plagiarism itself, the opinion of the respondents regarding plagiarism depicted from the excerpts of interviews conducted.

"Hmm the act of doing some sort of quotation or the transfer of other people's copyright without the knowledge and without good rules and which should"

"The plagiarism hmm quotes without listing the original source. Hmmm yes, the opinions of others who are not listed so. His opinion is the ideas of others or an expert who poured into a sentence, especially in the scientific works "

"Plagiarism means cheating the work of others by hmm not quoting the author's name". (HS)

The actions that fall into the category of plagiarism are quite diverse, according to Webe-wulff (2014) there are at least ten forms of plagiarism that often occur, the act of plagiarism includes; copy paste, translation, covert plagiarism, shake and paste and collections, clause quilts, structural plagiarism, pawn sacrifice, cut and slide, self-plagiarism, other dimensions. From the results of in-depth interviews conducted on Faculty of Education students, they stated that they had done the action of plagiarism during the preparation of the final task. As stated by the respondents are drawn from the excerpts of the interview conducted.

"Once I did copy-paste by section. That's usually me because injury time that the distance of the guidance is too close ...."
"... I often do plagiarism sometimes yaaaa sometimes the whole".
"Yes... I never do plagiarism ...."
"Yes... I never do plagiarism, but I am from my English journals translate first to continue the Indonesian language I copy-paste it first." (AH)

The form of plagiarism that is generally done by students of the Faculty of Education in the preparation of the final task, in general, include copy paste, shake and paste collection and translation. In relation to the perception of the students on the action of plagiarism in the preparation of the final task are the factors causing the action of plagiarism among students in preparing the final task, these factors include; 1) lack of knowledge about the style of selingkung writing 2) limited time availability 3) the development of information technology that facilitates and open opportunities to cheat 4) some lecturers have not protective on the issue of plagiarism 5) the use of plagiarism application is still minimal. 6) lack of socialization on the issue of plagiarism 7) lack of workshop or training of final assignment.

The policy of using guidebook of scientific writing as an effort to prevent plagiarism is effective to avoid plagiarism. The handbook of scientific papers effectively prevents plagiarism by having a special chapter on plagiarism and citation techniques.

"The guidance policy of this scientific paper needs to be submitted by every mentor, and it has effectively prevented me from being more careful and careful in writing. It's good, but it's rich still needs to be improved, it means the necessity must be given to the students, the plagiarism test should be done ". (M5)

As M4 expresses firmly with the special chapter on the action of plagiarism. The handbook is helpful in writing scientific papers.

"It has been helped in the writing of scientific papers because there is described there is a special chapter of the act of plagiarism. It is very precise, I suggest that students who again make up the final task always so must use the manual ". (M4)

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The policy of using scientific guidebook as an effort to prevent plagiarism of other people's writing. M3 expresses firmly that this handbook is helpful in avoiding the plagiarizing of other people's work.

"Yess I think it is very helpful to avoid a plagiarism work of others, precisely with this manual I am more comfortable. It is very appropriate hmmm because both policies are aimed so that we avoid the action of plagiarism ". (M3)

Similarly, the RP expressly affirms that the student will be spared from plagiarizing the work of others.

"The policy of using the guidebook is precisely so that students avoid copy-paste or plagiarize the work of others. Hmmm is right, the use of the book is explained about the quotation, I think it will avoid the action of plagiarism ". (M1)

As confirmed by CNS that this scientific paper manual can effectively prevent the plagiarism of others' work.

"I think the policy is effective well prevent in copying and pasting the work of others, of course with information about clear quotations so that students can understand it. Of the three policies that have been made by the Department is right yah I think in avoiding the plagiarism ". (M2)

"It has been helped in the writing of scientific papers because there is described there is a special chapter of the act of plagiarism. It is very precise, I suggest that students who again make up the final task always so must use the manual ". (M4)

With the guidelines in the preparation of scientific work, students are helped in avoiding the act of plagiarism either accidentally or intentionally. Preparation of scientific work guidelines made by the university is expected to be maintained and developed in accordance with the development of the times and the development of science so that the benefits can be felt by all components of the academic community within Indonesia University of Education.

3. Conclusion

Students' perceptions of plagiarism in the final task basically have an understanding of the action of plagiarism, only, in fact, they have a reason for doing such actions is the lack of knowledge about the style of the scattered writing so that the wrong way of quoting and not in accordance with applicable rules. Limited time availability in end-task or deadline suites with specific deadlines. In addition, the development of information technology (especially internet) that facilitate and open opportunities to cheat. Another thing that supports the occurrence of the action of plagiarism is that some lecturers have not been protective on the issue of plagiarism, but also the use of plagiarism application is still minimal. The lack of socialization on the issue of plagiarism in the campus environment is also the reason for the occurrence of plagiarism. Lack of workshop activities or training of final assignment done either program study or faculty in the campus environment. Plagiarism action in university, especially in the Faculty of Education is precautionary in the presence of guidelines for the writing of scientific papers made in the University and socialized by lecturers, either on the course or in the lectures in the classroom.

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