

Constructivist E-learning in Higher Education

Branko Bognar¹, Vesna Gajger², Vlatka Ivić³

^{1,2}*Department for Social Sciences, Faculty of Education, Josip Juraj Strossmayer University of Osijek*

³*Department of English Faculty of Humanities and Social Sciences, Josip Juraj Strossmayer University of Osijek*

Summary

The use of e-learning has been recommended at all levels of the educational system, thus in higher education as well, but it is very often reduced to downloading teaching materials from the teachers' websites. Students rarely participate in forums discussing some teaching topics, and they even less use the learning management system in their educational process (Dukić & Mađarić, 2012).

Among the learning management systems, the web application Moodle, which is based on the principles of constructivism and constructionism, is particularly popular. Constructivism assumes that learning is a social process where individuals learn through interacting with other people (Pritchard & Woollard, 2010), while constructionism additionally includes correlation of knowledge and social action (Burr, 2003).

To encourage students to learn through interaction, researchers conducted an action research with the attempt to explore the possibilities of initiating discussions on the network forum of the Moodle system. The research was organised within the Pedagogy course in the first year of the teacher studies during the two academic years. The most important advantages of this way of learning proved to be the freedom and flexibility of participation, the possibility of exchanging experiences and ideas, reflection and collaborative learning. Discussions on web forums have shown also certain deficiencies such as inadequate and unequal activity of all participants, the lack of connection to the discussions of other participants (monologue form of writing), the lack of criticism, too long texts, technical problems and the problem of availability of computers connected to the Internet. This research has shown that it is possible to organise a constructivist e-learning in higher education students enjoy participating in.

Key words: *action research; cooperative learning; learning management system; Moodle; web-based discussion forum*

Introduction

Since computers have become an integral part of modern life, e-learning has become one of the key topics in the pedagogical debates and research. Unfortunately, in practice it is often reduced to downloading teaching materials from the teacher's websites, though modern computers connected to the Internet with a variety of network applications, some completely free of charge, allow constructivist learning. Constructivist learning is founded on five basic principles:

Learning is a process of interaction between what we know and what we still need to learn. Piaget (2005) believes that this happens as a process of *assimilation* when the new knowledge is included in the existing mental structures or as a process of *accommodation* when the mental structures are altered in order to avoid a mismatch between the new information and the



existing structures. Both processes support establishing of balance between the existing and new knowledge that is organized in schemes. The scheme can be imagined as a network of meaningfully interconnected pieces of information related to some topics (Pritchard & Wollard, 2010). The schemes represent the growing mental structures specific for each individual. While organising the learning process it is important to take into account the previous knowledge of students, i.e., schemes that were previously created.

Learning is a social process. In traditional teaching, learning is considered an individual process in which students study the content presented in a variety of teaching resources, or listen to the lectures of their teachers. Contrary to this McDermott believes that:

...learning is not in heads, but in the relations between people. Learning is in the conditions that bring people together and organize a point of contact that allows for particular pieces of information to take on relevance; without the points of contact, without the system of relevancies, there is no learning, and there is little memory. Learning does not belong to individual persons, but to the various conversations of which they are a part. (McDermott, 1999, p. 16)

It is therefore important that teachers provide possibilities for cooperation and conversation about various educational topics for their students (Smith, 1999).

Learning is a situational process. Lave and Wenger (1991) believe that the situational learning is achieved through participation in certain social and cultural circumstances. Learning cannot be reduced to the process of acquiring knowledge, but it implies taking an active role in the permanent community of practice (Lave, 1991).

Learning is a metacognitive process. Schunk (2012) points out that metacognition includes the understanding of the skills and strategies that enable successful resolutions of the problems. On the other hand it is important to know how to use these skills and strategies in order to learn effectively.

Finally, learning is based on the students' activity and autonomy (Pritchard, 2009).

E-learning is based on the use of electronic devices in the learning process. In the past this meant the use of analogue devices, whereas today digital devices are mostly used, among which particularly important are computers and mobile devices connected to the Internet.

It should be noted that e-learning can be achieved through different theoretical approaches, including, among others, also constructivism. The modern systems for e-learning allow the achievement of all stated constructivist principles. Therefore, instead of focusing on creating, collecting, grouping and delivering information (Miller, 2000) which was a feature of Web 1.0 systems, Web 2.0 applications allow users to create content independently through mutual communication (Mason and Rennie, 2008). One of such systems is Moodle (Modular Object-Oriented Dynamic Learning Environment). Although this system can also be used for the delivery of educational content, it is designed primarily to facilitate learning based on constructivist and constructionist principles. Constructionist philosophy assumes that people learn best when they, through the interaction, create educational content for the others (Rice, 2011). For the realization of the interaction in the Moodle system it is possible to use a variety of activities such as forums, chats, dictionaries, Wiki and workshops.

For constructivist e-learning network forums that enable asynchronous communication on the topics of participants' common interest are particularly important. The forums in Moodle are mostly initiated by the teachers, and students can set a new topic of discussion or get involved in some already started by responding to some of the previously sent messages. Mason and Rennie (2008) point out that the benefits of the forums in e-learning are their flexibility and availability from anywhere and at any time, they support the participation of more introvert students, all remains recorded, asynchronous participation provides more time for reflecting on responses which also helps reflective students to participate, the teacher is more a moderator

than a lecturer, forums are easy to install and administer, and all that students write is permanently recorded, which makes the evaluation easier.

The forums are particularly suitable for the realization of discussion. Discussions in contrast to the usual conversations involve serious, thoughtful and focused communication. Brookfield and Preskill (1999) point out four objectives that can be achieved by participating in discussions:

...(1) to help participants reach a more critically informed understanding about the topic or topics under consideration, (2) to enhance participants' self-awareness and their capacity for self-critique, (3) to foster an appreciation among participants for the diversity of opinion that invariably emerges when viewpoints are exchanged openly and honestly, and (4) to act as a catalyst to helping people take informed action in the world (Brookfield & Preskill, 1999, p. 5).

Methodology

As our aim was to introduce changes into teaching practice, we chose the action research. The action research is not focused on "objective" diagnosis of the current situation (Kemmis, McTaggart, & Nixon, 2014), but it allows practitioners the self-reflexive examination of the professional conditions and professional activity with the purpose to achieve substantial changes.

The changes we have tried to achieve are based on the autonomously selected values of practitioners. In this study, our intention was to encourage *students' cooperation, activity and autonomy* in the realization of e-learning. Through conversation with the students, as well as through their responses in the questionnaire, we have noticed that none of the students had any previous experience in e-learning based on constructivism. That means that no one has taken part in discussions on the web forums as a part of the teaching process. This problem is confirmed by the results of the survey conducted by Dukić and Mađarić (2012) on the sample of 388 students of Josip Juraj Strossmayer University in Osijek, which showed that 93.6% of the students said that they used the Internet as an additional source for teaching content. On the other hand only 41% of the students participated in the forums dedicated to teaching issues. Therefore, we decided to explore the possibilities of achieving constructivist e-learning in higher education in pedagogy at the Faculty of Education.

Table 1.
Action research plan

| Objectives | Activities | Criteria |
|--|---|--|
| Realization of constructivist e-learning | Agreement on the choice of topics, ways to participate in the discussion and evaluation criteria Discussion on the network forum Implementation of the evaluation questionnaire in the Moodle | Discussion started from the prior knowledge and previous experience of students Learning is achieved through interaction within small teams Topics of discussions were connected with the socio-cultural context that is familiar and relevant to students in their professional learning Students develop an awareness of various metacognitive strategies, and took control over them during the learning process Students participated independently and actively in the discussion |
| Students' satisfaction with discussion | Implementation of the interviews with two groups of students | Students' expectations of discussion via network forums are mainly realized Students are satisfied with the possibility to participate in the discussion forum and with their activities |



In the process of change, we started from two research objectives: *the realization of e-learning in higher education based on the principles of constructivism and the students' satisfaction with their participation in discussion via the network forums* (Table 1). To achieve the set goals, we organized a discussion forum using the system for e-learning Moodle.

The discussion was attended by the students of the first year of the Pedagogy course at the Faculty of Education, Osijek, Branching study in Slavonski Brod during two academic years: 43 students in the academic year 2013/2014 and 31 student in the year 2014/2015, the course leader Branko Bognar and the assistant Vesna Gajger. As critical friends in the research, the students of the fifth year of the same study programme have been involved (the academic year 2014/2015), and Vlatka Ivić, senior language instructor from the Faculty of Humanities and Social Sciences in Osijek. It has been agreed with the students that the discussion lasts for three weeks in January.

For monitoring implementation of the process of change, we used a standardized open interview conducted with two groups of students who participated in the discussions. In the first group there were four students who participated in the interview in the academic year 2013/2014, and there were five students who participated in the interview in the following academic year. In addition, students were asked to do the evaluation questionnaire in Moodle. 66 students out of 74 (89.2%) who participated in the discussions did the questionnaire. The discussions recorded in Moodle represented an important source of data.

Results

Process of discussion

At the beginning of the course we introduced the possibility of participating in the discussions on the network forum to our students. Firstly, students were divided into teams of five to seven members. Team members chose their own team names at the beginning of classes (e.g. Cranberries, Sapphires, Good-hearted teachers, etc.). We envisaged that students participate in the discussion within their previously created teams.

About the ways of accomplishing discussion we agreed in details with the students in late December during the lessons. Each team could choose one of the following topics: e.g. discussion on films with educational issues, on books (Neill, 1999; Miller, 1995) and on general topics such as the implementation of health education or education for creativity). In addition, students could have offered their own topics that are related to the course curriculum. The teams generally chose to discuss the films (six teams, 50%), the book "The Drama of Being a Child" (4 teams, 33.33%) and one team selected health education and one education for creativity. Before starting the discussion there was a forum discussion opened for each team in Moodle. After opening the appropriate forum students could read the introductory message and download the attached documents (instructions for APA standards use, a list of suggested literature, criteria for assessment of the discussion, and instructions on the team roles) set by their professor. Critical friend stated that preparatory activities were successful:

Teachers have done a lot to prepare students for successful participation in the e-discussion in their course Pedagogy. In addition to the introductory meetings and agreement during the lessons, all the students were given very detailed instructions on what is expected of them and how the discussion in the forum should look. (Personal communication, February 2015).

The discussion was initiated by the teacher asking students to introduce themselves and state their impressions and experiences in relation to the film, book or introductory text. After the presentation and disclosure of their personal experiences which lasted a week, the teacher gave the accompanying task depending on the topic of their discussion. The teams discussing the films were given the task to express their opinion on the proposal of the Teachers'



association “Teachers organized” which advocates the introduction of suspensions for students. The students were asked to compare this initiative with the educational approach of Neill (1999) in his *School Summerhill*. Students were invited to propose some educational activities related to the problems they saw in the film. In shaping the ideas of the educational activities they should have used the suggested literature or other sources they could find themselves. In the next task they had to make a plan of action research with the aim of improving the educational activities in an elementary school.

After three to four weeks of participation in the discussion (in the first year the discussion lasted for three weeks, while in the second year due to students’ other liabilities discussion was extended for another week) students were asked to write a conclusion regarding the topic discussed, and the short review on the debate they participated in. In addition, they had to specify a list of cited literature. Finally we asked them to fill in an anonymous evaluation questionnaire that was available in Moodle.

Analysis of the achievement of set objectives

When analysing the data, we took care of the set objectives and the related criteria (Table 1).

In order to achieve the first objective – *achieving the constructivist e-learning* it is important to consider if the principles are fulfilled according to the statement that *learning is a process of interaction between what we know and what we still need to learn*. This is especially apparent during the first activity when students presented their impressions on a selected topic and connected them with their personal experience. Through the content analysis of their writings in the forum we have noticed that the students were familiar with the discussion topics, and they easily linked them with their personal experiences. We also observed that the topics encouraged them to question and critically analyse their experiences from childhood, family, school relations, education of their children, or living in a particular community. Thus, a student participating in the discussion on the book “*The Drama of Being a Child*” wrote:

I realized that I unconsciously “copy” educational patterns of my parents and project them to the education of my children ... I could not stop thinking about it [the book] and I began to realise that each action of mine is somehow mirroring of my childhood, all my understanding and thinking is a reflection of what happened to me in my childhood. (Student M.G., personal communication, January 9, 2015)

Although the activity of having the discussion on the Internet is primarily focused on the *process of learning through participants' interaction*, content analysis shows that the monologue approach is still prevalent in discussions. The communication with the other team members did occur as the students often stated: “I agree with my colleague when he/she writes ...” This problem is noticed by the fifth year students as well when we asked them to engage in critical analysis of the discussions, but observed also by some of the participants:

I expected more discussions in the real sense of the word. Our discussion was reduced to long monologues. But this is not the fault of our professors but us and our poor experience in this type of tasks. I believe that next time will do much better, because now we have more experience. (Student 44, personal communication, February 2, 2015)

Using one of the criteria for assessing the quality of the students' discussions related to the communication with all members of the team, we noticed that the students in the first year ($n=43$) communicated significantly longer with each other (76.74%) than the students in the next year ($n=31$, 51.61%). Despite the lack of real discussion, students were reading what the other members of their team had written which is obvious from the content of their discussions: “I was not exactly thrilled with the idea (discussing), but it turned out just the opposite. A lot of things I've learned by reading the reviews of other colleagues and it was an interesting and nice experience.” (Student 10, personal communication, January 31, 2014)



The third criterion, *the relation of the discussion topic with the socio-cultural context that is familiar and relevant to students for their professional learning*, especially came to practice during the participation in the second and third activity. The students had the task to comment on specific educational problems and current debates in the scientific community in search for their resolution. This is among other things related to the initiative of the Teachers' association "Teachers organized" which advocates the introduction of suspension for students. Some students initially accepted this initiative, however, nearly all eventually agreed that punishment, and thus, the introduction of the suspension is not the right educational solution. Instead they accepted Neill's educational approach in his school Summerhill:

I agree that the child should be given time to realize that they did something wrong, but I think that the punishment won't help much. We should show love to a child. And that his opinion is accepted. "Hate and punishment never cured anything, only love can cure" (Neill, 1999). (Student K.J., personal communication, January 17, 2015)

By reading suggested literature, discussing the current educational problems and trying to find solutions for them the students had the opportunity to *develop the awareness of the various metacognitive strategies, and they took control over them during the learning process*. This is particularly evident in the final review on the participation in the discussion where students wrote about what and how they learnt:

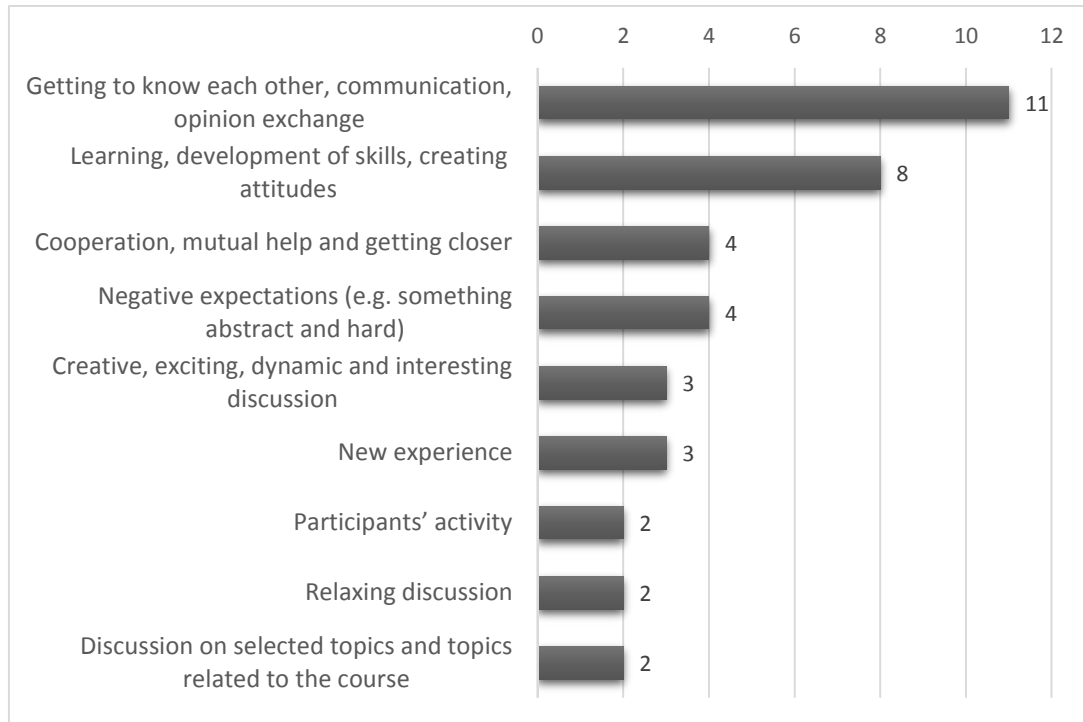
In the end I want to say that I have learnt a lot from this discussion. I adopted some new methods that I will, hopefully, apply in my future work. In addition, I had fun and laughed. In conclusion I can say that through this discussion I have realized that being a teacher is really one of the best professions in the world and that we just need to love it and live for it. We need to be teachers willing to compromise, creative, the one that is always there for the children. If we show love for the children, they will surely return it back to us with their joy and laughter, and there is no better and more beautiful gift than that. For sure. (Student V.M., personal communication, January 31, 2014)

In order to encourage the development and acquisition of various metacognitive learning strategies during the discussion in the academic year 2014/2015 we introduced the roles for the team members. *In fact, each member of the team had the opportunity to choose one of the following roles: leader, researcher, innovator, sunny person, critic, controller and entertainer* (<http://goo.gl/Z5VH9K>). After analysing the usage of roles during discussions we noticed that the roles didn't additionally burden the students. However, by assessing criteria for the evaluation of the quality of the discussion related to the use of the selected roles in the team, we found out that it is less than half of the participants (45%) who fulfilled it.

The achievement of the criterion for independent and active participation in the discussion was the least questionable because of the very structure of the activity. Thus, the design of the activity required the active participation of the students in all stages of the discussion as some students pointed out in their final comments:

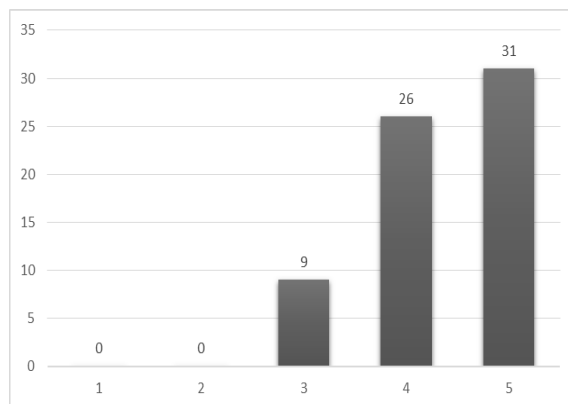
Professor, this is a different way of learning and I think that's great. In this way, we were given the freedom in the selection of literature and conducting this discussion and were allowed to decide personally what to read, and yet by giving us some guidance you taught us something new. (Student J.J., personal communications, January 31, 2014)

Student's activity is confirmed by the assessment of one of the criteria for the evaluation of the discussion related to their continuous activity. We estimated that 92.57% of the students fulfilled this criterion.

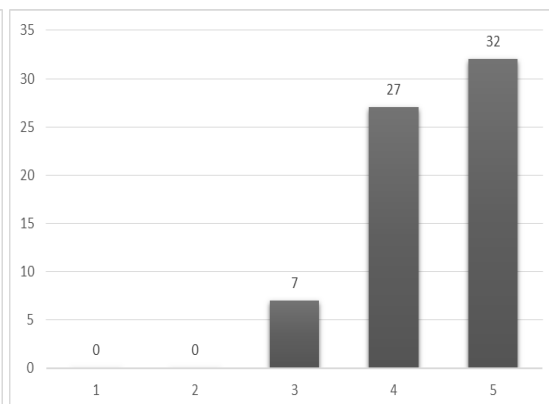


Graph 1. Students' expectations from the discussion.

Our objective was to achieve the *satisfaction of the students in participating in forum discussions*. When asked “What did you expect from the discussion via a network forum?” in the evaluation questionnaire 30 students answered. Some students indicated more than one expectation, so their total number is greater than the number of students who responded to this question. Graph 1 shows the most common expectations. It is possible to observe that students' expectations of discussion were mostly fulfilled. It is interesting to note that the students who participated in the discussion in the first year ($n=42$) were more satisfied with the fulfilment of their expectations ($M=4.43$), than students in the next year ($n=24$) whose average was 4.17. The answer to the question in the questionnaire “To what extent are you satisfied with your participation in the discussion via Internet?” confirms the above presented results (Graph 3). However, in this case the difference in average satisfaction with participation in discussion in the first year ($M_1=4.40$) and the next year ($M_2=4.33$) was lower.

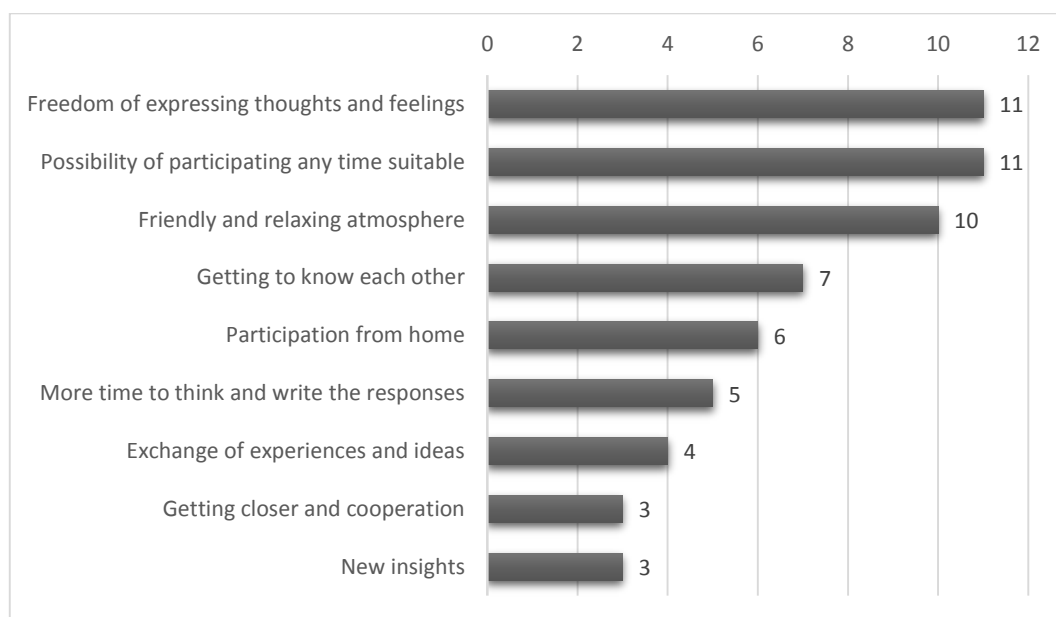


Graph 2. Fulfillment of students' expectations of participating in the discussion via Internet.



Graph 3. Students' satisfaction with participation in the discussion via Internet.

In the evaluation questionnaire students were asked to indicate the advantages and disadvantages they observed during the participation in the discussion via Internet. When asked about the advantages there were 38 respondents out of 66 (57.58%) students, when asked about the disadvantages there were 22 respondents (33.33%). In their responses students could indicate more than one perceived advantage and disadvantage. Among the advantages the special importance is given to the freedom of expression of thoughts and feelings, participation at any time, and friendly and relaxed atmosphere. Graph 4 shows only those advantages stated by three or more students.

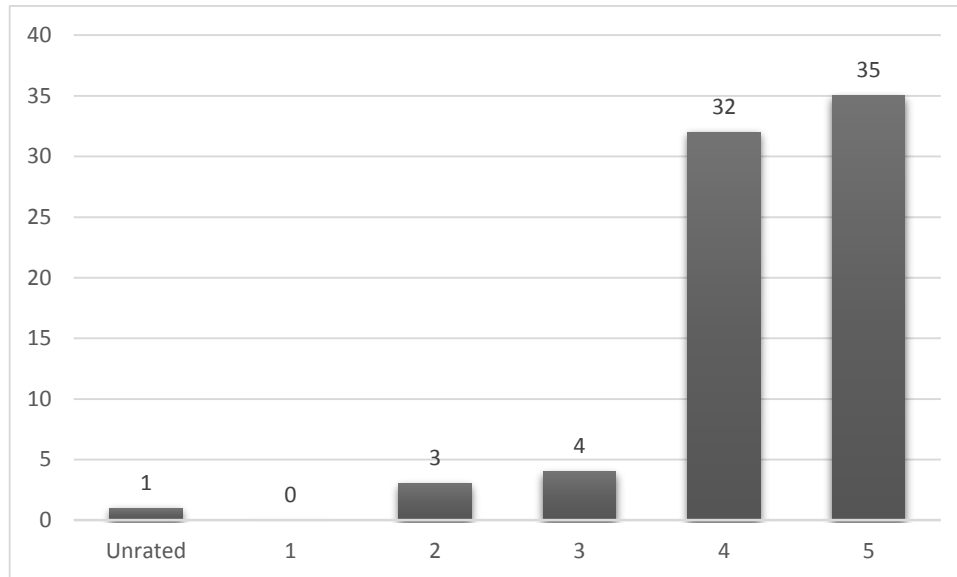


Graph 4. Advantages students noticed during participation in the discussion via Internet.

Regarding the disadvantages the most significant are late and unequal involvement of some students, insufficient communication and cooperation and technical problems (some students in rented departments mentioned the problem of using the Internet). For the same question asked in the interview, students also stated that they lacked a real discussion in terms of the confrontation of opinions and views.

In the questionnaire, we got the following suggestions for improving the discussion via Internet: change the time for this activity, reduce the number of words in discussions according to the criteria (boost shorter comments for the discussion to become more interesting and dynamic) and give more stimulating tasks that will induce confrontation of opinions. In addition, in the interview one student suggested that the professor takes part in the discussion more often to support the real discussion with his/her comments.

Based on the established criteria, students are assessed (Graph 5). The professor and his assistant participated in evaluation of the students. In the first year students achieved an average score of 4.40, whereas in the following year average score was slightly lower, at 4.23.



Graph 5. Results of evaluating discussions on the Internet.

Students who participated in the discussions in 2015 are asked in the questionnaire whether they think the discussion via Internet should be used in their higher education studies. Almost all (23 out of 24 students) agreed with this claim (16 in full and 7 partially) while only one student disagreed circling the number 2 on the scale of 1 to 5 (1- I fully disagree, 5 - I fully agree).

Discussion

In the discussions on the Moodle web forum the tasks initiated by the teacher played an important role. Herrington (2006) thinks that for the e-learning based on constructivism it is important to create authentic tasks. We believe that the real life examples presented through different media (books, films, videos, texts on the Internet) contributed to the authenticity of our tasks. These examples directed students to engage in relevant, but also in incompletely defined problems that they could independently define. The problems were complex enough so that they caught their attention for a longer time. The set tasks required the research of problems using different perspectives and sources, and offered students the opportunity for collaboration and critical thinking, and they also integrated different areas of expertise (e.g. pedagogy, psychology, sociology, philosophy, politics). The assignments enabled creating various solutions that were valuable for themselves.

Based on the data analysis it is possible to conclude that the discussions via Internet enabled constructivist e-learning. From the set criteria the only one slightly less satisfying was the requirement that learning is achieved through interaction within small teams. This problem was more obvious in the academic year 2014/2015. We can notice that the students in the first-year communicated more with each other (76.74%) than it was the case in the next year (51.61%). This probably reflects in their greater satisfaction with the fulfilment of their expectations as well as the satisfaction of participating in the discussion. As the discussions in both years were realized in a similar way, we think that the reason for this problem can be found in the group of enrolled students. In the constructivist learning the responsibility for their results should be taken by the students themselves since they, through interaction with other participants in the educational process, deepen the understanding of what they learn and come up together with the possible solutions to the identified or set problems.

The other reason might be the obligations with revision tests and preparations for the exams within other courses, which partially hampered the activity of students in discussions.

Therefore, next year we decided to organise the discussion earlier in the second semester, which was one of the participant's suggestions in the interviews.

Nevertheless, the problem of relatively superficial interpersonal communication still remains. We think that the ground for it lies in the experience that no one of the students had with this form of discussion. Although students - participants in the discussions belong to the generation of "digital natives" who have grown up with computers, video games, the Internet and social networks, they are mainly raised by the generation of "digital immigrants" "who speak an out-dated language (that of the pre-digital age), are struggling to teach a population that speaks an entirely new language" (Prensky, 2001, p. 2).

On one hand this made contemporary generations far more skilled in the use of digital devices compared with their parents and teachers, but they often use them in a superficial manner. The reason is very simple: there is nobody to teach them how to use these technologically advanced and easily accessible media for serious discussions on social issues, as well as for essential learning and creativity. It is very difficult for young people to learn that without the involvement of the older generations who are, unfortunately, often reluctant to use digital media. Even if they use them (i.e. taking part in social networks such as Facebook or Twitter), they often adopt infantile mode of communication of younger generations.

In order for students to learn how to participate seriously in the discussions, it is necessary that discussions become an integral part of the teaching process, not only in the framework of one course, but on different occasions throughout different courses. We believe that this can be achieved because the students were mostly satisfied with their participation in the discussions, and they also believe that the discussions should be used in higher education.

Teaching students how to participate in the discussions is particularly important in the democratic societies. From the data presented (Graph 4) it is possible to observe that the students point out that one of the most important advantages of the discussion is freedom of expression of thoughts and feelings which is a fundamental precondition for the development of the democratic relations. "In this minidemocracy, all have the right to express themselves as well as the responsibility to create spaces that encourage even the most reluctant speaker to participate" (Brookfield & Preskill, 1999, p. 3).

Constructivist learning is just one of the theoretical approaches to establish e-learning. In addition to constructivism, e-learning can be based on behaviourism and cognitivism (Holmes & Gardner, 2006) and connectivism (Anderson & Dron, 2012). We believe that in education the special attention should be given to creativity, and to learning through the implementation of socially relevant changes. In this case, the discussions ended with the assignment in which the students should devise a plan of action aimed at solving the educational problems that have been encountered in the discussion. However, they were not expected to implement their plans. We believe that already in the next year we could link the discussion with the activities, or projects, so that the students can plan and achieve substantial changes after or during their participation in the discussions. Through active contribution to the realization of the planned changes students will modify their understanding of the problems they are dealing with, but they will also develop their professional competences, as well as themselves.

Finally, it is important to note that the discussions resulted in the final grades that deviate from the standard Gaussian curve, which is considered the ideal way of evaluation by many. But then we fail to observe the fact that in this case, most of the students achieve average results, and certain percentage of students is even doomed to failure. In contrast to this Glasser believes that, in schools and in other areas of life we should strive for excellence: "Quality product is not an average or minimum product. Would you like to be operated by an average surgeon or to eat an average lunch in a restaurant? Nobody wants anything average so why would we be content with the average quality in schools?" (Glasser, 2005, p. 97). We believe that the results achieved

by the students participating in the discussion (Graph 5) are close to the Glasser's ideal of excellence, although we are not yet fully satisfied with the achieved.

Conclusion

The discussion has proved to be a suitable method for the realization of the constructivist e-learning. This way of learning recognised the students' previous knowledge and experience that they upgraded or changed through interaction with their peers and teachers. The discussions were based on the activities of the students themselves who, autonomously solving specific professional problems and taking care of their cognitive strategies, exercised essential learning. This learning "has a quality of personal involvement... It is self-initiated... It is pervasive. It makes a difference in the behaviour, the attitudes, perhaps even the personality of the learner. It is evaluated by the learner... Its essence is meaning." (Rogers, 1969, p. 5)

Our research has shown that the students, despite their ease at using the e-learning system, may have difficulties in serious discussions with their peers. It is possible to change that only if they are given more opportunities to participate in similar activities during their university education. Encouraging fact is that the students are ready for such an approach:

At first I did not know what to expect from this course, but I was completely surprised when the professor introduced discussion. I really liked the discussion because we were free to express our opinion and views on certain topics....

Such discussions gave me a good foundation for my future profession as a teacher, and somehow, developed my creativity. I've learned a lot and I am very proud that this approach to children will stay forever on my mind because I didn't "cram" it by heart. (Student M.B., personal communication, February 3, 2015)

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