The creative use of Thinking Maps to embed Blooms' Taxonomy within teaching, learning and assessment

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Abstract: In this paper, a methodology for utilizing 8 Thinking Maps that are linked to a cognitive taxonomy will be explored. Firstly, the various taxonomies focusing on cognitive processes will be elaborated upon, namely Bloom's Taxonomy as well as Barret's Taxonomy that is used in the education system. Following this, the paper will explore the questioning strategy which links questions to either taxonomy and how this strategy is currently employed in classrooms around the world. A section then follows elucidating upon the 8 Thinking Maps and what types of thought processes are associated with each map. From this, a methodology will be discussed which links the 8 thinking maps to verbs that are all associated to the previously mentioned taxonomies. Finally, an adaptive systematic methodology will be elaborated upon, which links to the information processing theory.

Keywords: Bloom's Taxonomy, Barret's Taxonomy, Thinking Maps, questioning, Information Processing Theory

INTRODUCTION

Since the publication of Bloom's original taxonomy in 1956, several theories and approaches to learning, such as Constructivism that encourages meta-cognitive, self-regulated learning has come to the fore that expect of students to be more knowledgeable of and responsible for their own learning .[1] Consequently, the use of the original taxonomy to mainly classify educational goals, objectives, and test items according to a cumulative and stringent hierarchy from simple to increasingly complex[2] tend to hold limited value for promoting the pro-active, motivational, behavioural, and meta-cognitive principles of learning that are foregrounded by constructivist, meta-cognitive and self-regulated learning approaches .[3]

[1] Aly Amer and Mohamed El-Okda, "Using Web Quests in Teaching and Learning English," *Language Learning in the Cyber Age: Innovations and Challenges, Sultan Qaboos University, Oman* (2006): 19–20.

[2] David R Krathwohl, "A Revision of Bloom's Taxonomy: An Overview," *Theory into practice* 41, no. 4 (2002): 212–218; Rani Gul, Shazia Kanwal, and Sadia Suleman Khan, "Preferences of the Teachers in Employing Revised Blooms Taxonomy in Their Instructions," *sjesr* 3, no. 2 (2020): 258–266; William Huitt, "Bloom et Al.'s Taxonomy of the Cognitive Domain," *Educational psychology interactive* 22 (2011).

[3] K R Pradeep and N C Naveen, "A Collective Study of Machine Learning (ML) Algorithms with Big Data Analytics (BDA) for Healthcare Analytics (HcA)," *International Journal of Computer Trends and Technology (IJCTT)* 47, no. 3 (2017): 149–155.

Compared to the original taxonomy, the revised taxonomy of Bloom[4] aims to incorporate the constructivist, meta-cognitive and self-regulated principles of learner-centred learning into its structure [5], consequently enabling students to be less dependent on their teachers and to become autonomous learners who are aware of and can regulate their own learning and thought processes[6]. Learners learn to take responsibility for, and play an active role in, their own learning, thus replacing the old methods of teacher instruction that obstruct discovery, construction and transformation of knowledge by students [7].

The revised taxonomy does not only appear to be beneficial to guide students through a well-arranged and systematic learning process [8], but also emphasizes the knowledge dimensions and cognitive processes that play an important role in learning that have to be acquired[9]. Also, Amer adds that the revised taxonomy presents a model to teachers according to which they in an integrative manner can plan and deliver their teaching, examine their students and evaluate their teaching.[10]

In the opinion of Amer, the effectiveness of student learning can only be judged in terms of what students learn, namely subject content knowledge, and the cognitive processes acquired to make meaning of subject content knowledge. For this reason, the revised taxonomy provides a dual perspective of learning and thinking to teachers with a clear distinction between knowledge dimensions (factual, conceptual, procedural, and meta-cognitive) and lower- and higher-order cognitive process dimensions with their related sub-cognitive processes that may overlap. Although the revised taxonomy still plays an important role in assessing and examining students, the taxonomy also sensitizes teachers to acknowledge and focus on more complex aspects of learning and thinking, thus promoting teaching and learning that goes beyond factual knowledge

[4] Krathwohl, "A Revision of Bloom's Taxonomy: An Overview."

[5] Amer and El-Okda, "Using Web Quests in Teaching and Learning English."

[6] Peggy A Ertmer and Timothy J Newby, "Behaviorism, Cognitivism, Constructivism: Comparing Critical Features From an Instructional Design Perspective," *Performance Improvement Quarterly* 26, no. 2 (2013): 43–71, http://dx.doi.org/10.1002/piq.21143; Charlotte Dignath, Gerhard Buettner, and Hans-Peter Langfeldt, "How Can Primary School Students Learn Self-Regulated Learning Strategies Most Effectively?," *Educational Research Review* 3, no. 2 (2008): 101–129, http://dx.doi.org/10.1016/j.edurev.2008.02.003; Charlotte Dignath and Gerhard Büttner, "Components of Fostering Self-Regulated Learning among Students. A Meta-Analysis on Intervention Studies at Primary and Secondary School Level," *Metacognition and Learning* 3, no. 3 (2008): 231–264, http://dx.doi.org/10.1007/s11409-008-9029-x; Charlotte Dignath-van Ewijk, Oliver Dickhäuser, and Gerhard Büttner, "Assessing How Teachers Enhance Self-Regulated Learning: A Multiperspective Approach," *Journal of Cognitive Education and Psychology* 12, no. 3 (2013): 338–358, http://dx.doi.org/10.1891/1945-8959.12.3.338; Dale H Schunk, "Commentary on Self-Regulation in School Contexts," *Learning and Instruction* 15, no. 2 (2005): 173–177, http://dx.doi.org/10.1016/j.learninstruc.2005.04.013.

[7] Dignath, Buettner, and Langfeldt, "How Can Primary School Students Learn Self-Regulated Learning Strategies Most Effectively?"; Alf Inge Wang et al., *Introducton to Gamification*, *International Journal of Computer Games Technology*, 2010; Katrin Saks and Äli Leijen, "Distinguishing Self-Directed and Self-Regulated Learning and Measuring Them in the E-Learning Context," *Procedia - Social and Behavioral Sciences* 112 (2014): 190–198, http://dx.doi.org/10.1016/j.sbspro.2014.01.1155.

[8] Karen J Ferguson et al., "Magnetic Resonance Spectroscopy and Cognitive Function in Healthy Elderly Men," *Brain* 125, no. 12 (2002): 2743–2749, http://dx.doi.org/10.1093/brain/awf278.

[9] Gul, Kanwal, and Khan, "Preferences of the Teachers in Employing Revised Blooms Taxonomy in Their Instructions."

[10] Amer and El-Okda, "Using Web Quests in Teaching and Learning English."

and the acquisition of mainly lower-order cognitive processes. Teachers are prompted to consider the type(s) of knowledge a student should acquire during a specific teaching and learning activity, as well as which cognitive processes a student needs to employ to engage successfully in the activity. Subsequently, learning becomes more than just looking at stages and levels of objective information processing.[11] The revised taxonomy helps teachers to plan and deliver teaching and learning activities in relation to a specific task that may include different knowledge dimensions and the overlapping of lower- and higher-order cognitive process dimensions [12]. Additionally, the revised taxonomy presents a strong association between assessment and teaching and learning [13], thus holding wider benefits that just guiding assessment.

Despite being beneficial to support effective teaching and learning, the research of Gul et al. [14] disclosed that teachers find it difficult to align their teaching with all the dimensions and cognitive processes in the revised taxonomy, and seem to have a preference to apply teaching methods and teaching strategies that mainly cultivate the lower cognitive processes. To obtain stronger confirmation of the afore mentioned problem, the authors employed the use of a scoping review to conduct a rapid review of existing research in order to identify how the revised taxonomy of Bloom is employed by school teachers. The taxonomy should not only be used as a tool to guide assessment, but additionally as a tool that guides teaching. The present research did not focus on reporting the findings of the scoping review as such [15], and therefore the scoping review was guided by only three of the five stages suggested by Arksey and O'Malley[16] , namely (i) identifying the research question, (ii) identifying relevant studies, and (iii) study selection, of which the clarification follows below.

Guided by the research question, *to what extent is Bloom's Revised Taxonomy employed as a teaching tool by school teachers,* our scoping review yielded the following findings. With the assistance and suggestions of the university librarian, the scoping review involved the use of EBSCO Discovery Services which provides the most comprehensive index for screening content collections, as multiple databases are searched simultaneously. The first search related to the key words, Bloom's revised taxonomy and classroom teaching, retrieved 7455 hits. The screening was narrowed and limited to Academic Journals so that the focus would fall mainly on original research.

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[11] Igor M Arievitch, "The Vision of Developmental Teaching and Learning and Bloom's Taxonomy of Educational Objectives," *Learning, Culture and Social Interaction* 25 (2020): 100274, http://dx.doi.org/10.1016/j.lcsi.2019.01.007.

[12] Louis Cohen, Lawrence Manion, and Keith Morrison, "Research Methods in Education (Eight Edition)," *Abingdon, Oxon* (2018).

[13] V Evelyn Brindha, "Creative Learning Methodology Using Revised Bloom's Taxonomy," *International Journal for Cross-Disciplinary Subjects in Education* 9, no. 1 (2018): 3368–3372, http://dx.doi.org/10.20533/ijcdse.2042.6364.2018.0450; Sónia Rolland Sobral, "Bloom's Taxonomy to Improve Teaching-Learning in Introduction to Programming," *International Journal of Information and Education Technology* 11, no. 3 (2021): 148–153, http://dx.doi.org/10.18178/ijiet.2021.11.3.1504.

[14] Gul, Kanwal, and Khan, "Preferences of the Teachers in Employing Revised Blooms Taxonomy in Their Instructions."

[15] Peter Westwood, *What Teachers Need to Know about Reading and Writing Difficulties* (Aust Council for Ed Research, 2008).

[16] Hilary Arksey and Lisa O'Malley, "Scoping Studies: Towards a Methodological Framework," *International Journal of Social Research Methodology* 8, no. 1 (2005): 19–32, http://dx.doi.org/10.1080/1364557032000119616.

Subsequently, 2022 hits were then recorded. The screening process was further narrowed and limited by the following subjects, namely teaching methods, teaching, and teachers, after which 119 hits were indicated. The 119 records were then screened for eligibility. Of the 119 records, only 13 records of international research were found to be clearly related to the focus of the present research.

Most research on Bloom's revised taxonomy and teaching between 2001 (the publication date of the Revised Taxonomy) and June 2021, foregrounds the following topics: Using the taxonomy table as a guide to:

- pitch questions during teaching that are more thought provoking;
- identify learning outcomes to be achieved during teaching[17];
- develop assignments and exercises that lead students to higher thinking;
- align learning outcomes with assessment outcomes and assessment outcomes with learning outcomes [18];
- develop conceptual and procedural knowledge simultaneously [19]; and
- reflect on the quality of classroom practices [20]

Flowing from the introduction and rational the authors formulate the following problem statement.

In the context of teaching, it appears as if Bloom's revised taxonomy is mainly used as a theoretical framework to guide and to plan outcomes for teaching, learning and assessment. There appears to be a lack of research, nationally and internationally, on how to employ and embed the revised taxonomy in a practical manner as part of teaching. The revised taxonomy is generic in nature, and it is necessary to consider ways to practically embed the taxonomy during teaching in order to tease-out and take cognizance of the various thought processes involved in diverse subject contexts[21]. Therefore, in order to align teaching and learning with assessment and vice versa [22], as

[17] Nilay T Bümen, "Effects of the Original Versus Revised Bloom's Taxonomy on Lesson Planning Skills: A Turkish Study Among Pre-Service Teachers," *International Review of Education* 53, no. 4 (2007): 439–455, http://dx.doi.org/10.1007/s11159-007-9052-1; Alejandro Echeverría et al., "A Framework for the Design and Integration of Collaborative Classroom Games," *Computers & Education* 57, no. 1 (2011): 1127–1136, http://dx.doi.org/10.1016/j.compedu.2010.12.010; Linda A Kidwell et al., "Developing Learning Objectives for Accounting Ethics Using Bloom's Taxonomy," *Accounting Education* 22, no. 1 (2013): 44–65, http://dx.doi.org/10.1080/09639284.2012.698478; Ed Leach, "Instruction-Based Action Guidelines Built on Bloom's Revised Framework: Setting Objectives for Entrepreneurship Training," *Small Enterprise Research* 14, no. 2 (2006): 74–92, http://dx.doi.org/10.5172/ser.14.2.74; Marlowe, "A Taxonomy for Teaching Music Theory: J. S. Bach and Lessons in Invertible Counterpoint," *Bach* 49, no. 2 (2018): 365, http://dx.doi.org/10.22513/bach.49.2.0365.

[18] Jamie L Jensen et al., "Teaching to the Test…or Testing to Teach: Exams Requiring Higher Order Thinking Skills Encourage Greater Conceptual Understanding," *Educational Psychology Review* 26, no. 2 (2014): 307–329, http://dx.doi.org/10.1007/s10648-013-9248-9.

[19] Chris Ferguson, "Using the Revised Taxonomy to Plan and Deliver Team-Taught, Integrated, Thematic Units," *Theory Into Practice* 41, no. 4 (2002): 238–243, http://dx.doi.org/10.1207/s15430421tip4104_6.

[20] P Ann Byrd, "The Revised Taxonomy and Prospective Teachers," *Theory Into Practice* 41, no. 4 (2002): 244–248, http://dx.doi.org/10.1207/s15430421tip4104_7.

[21] C. P. Ormell, "Bloom's Taxonomy and the Objectives of Education," *Educational Research* (1974).

[22] Peter B. Bloom and Mark P. Jensen, "An Interview with Peter Bloom," *Contemporary Hypnosis and Integrative Therapy* (2013).

well as to address the concern raised by Ormell [23], namely that the taxonomy ignores the specific nature of cognitive processes in different subjects, the authors wish to make a novel contribution. This article suggests the use of a teaching strategy, namely Thinking Maps, to enable students to connect the theory behind the cognitive processes of the taxonomy to the practice of specific subject content. Consequently, in support of Amer[24], Thinking Maps would enable teachers to assess the effectiveness of student learning in terms of what students have learned in terms of subject content knowledge, as well as cognitive processes.

LITERATURE REVIEW

Bloom's Taxonomy

In 1956, Benjamin Bloom, an educational psychologist working at the University of Chicago, developed his taxonomy of Educational Objectives. His taxonomy of learning objectives has become a key tool in structuring and understanding the learning process[25] .

He proposed that learning fitted into one of three psychological domains (see below illustration 1):

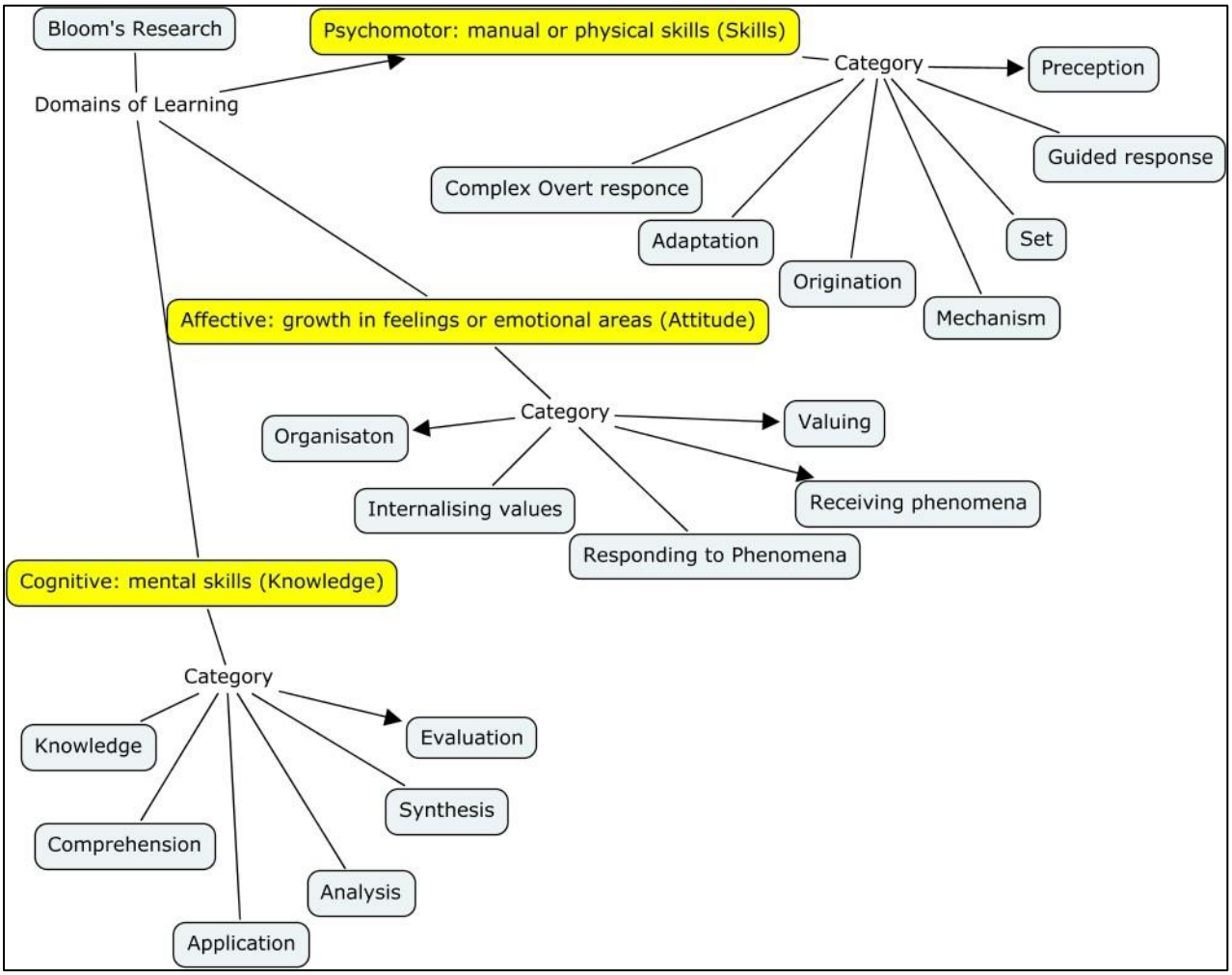
- the Cognitive domain – processing information, knowledge and mental skills
- the Affective domain – attitudes and feelings
- the Psychomotor domain – manipulative, manual or physical skills

[23] Ormell, "Bloom's Taxonomy and the Objectives of Education."

[24] Amer and El-Okda, "Using Web Quests in Teaching and Learning English."

[25] Michael D McGinnis, "From Self-Reliant Churches to Self-Governing Communities: Comparing the Indigenization of Christianity and Democracy in Sub-Saharan Africa," *Cambridge review of international affairs* 20, no. 3 (2007): 401–416.

Illustration 1: Bloom's three psychological domains



Bloom's Taxonomy focuses on the cognitive domain. This domain organises and categorises cognitive skills and objectives and is based on how people think.

Understand the concept first before it can be remembered and then applied. Therefore, from Lower Order Thinking Skills (LOTS) to Higher Order Thinking Skills (HOTS), there is a progression (HOTS). Bloom describes each category as a noun. They are ranked below in ascending order, from lowest to highest.

Lower Order Thinking Skills (LOTS)

- Knowledge
- Comprehension
- Application
- Analysis
- Synthesis
- Evaluation

Higher Order Thinking Skills (HOTS)

Bloom's Revised Taxonomy

In the 1990s, a former student of Bloom, Lorin Anderson with David Krathwohl, revised Bloom's Taxonomy and published Bloom's Revised Taxonomy in 2001 (Churches, 2007)
The key to using verbs rather than nouns for each category and rearranging the sequence within the taxonomy. They are arranged below in increasing order, from lower order to higher-order
.

Lower Order Thinking Skills (LOTS)

- Remembering
- Understanding
- Applying
- Analysing
- Evaluating (Revised position)
- Creating (Revised position)

Higher Order Thinking Skills (HOTS)

Anderson and Krathwohl [26] considered creativity to be higher within the cognitive domain than evaluation. Anderson and Krathwohl [27] revised Bloom's taxonomy to meet more outcome-focused current educational aims, including changing the names of the levels from nouns to active verbs and reversing the order of the two highest levels. Eskelinen [28] illustrated the changes mentioned above, as shown in figure 1 below.

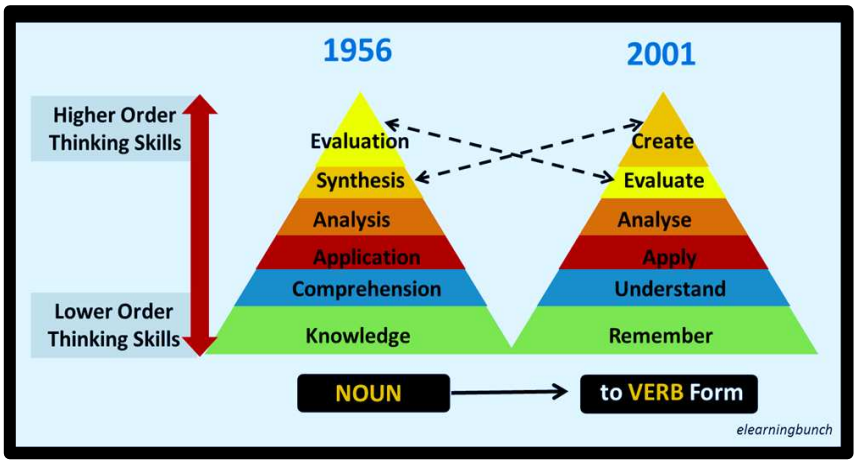


Figure 1: The differences between Original Bloom's Taxonomy and Revised Bloom's Taxonomy

[26] Krathwohl, "A Revision of Bloom's Taxonomy: An Overview."

[27] David R Krathwohl and Lorin W Anderson, *A Taxonomy for Learning, Teaching, and Assessing: A Revision of Bloom's Taxonomy of Educational Objectives* (Longman, 2009).

[28] Satu Eskelinen, "Learning Outcomes: Revised Bloom's Taxonomy and Critical Thinking in Two Examples of Unit Design" (2019).

The important change of the new taxonomy is that it is two-dimensional instead of one-dimensional. The verb and noun forms are separated from each other into two dimensions: Knowledge Dimension and Cognitive Process Dimension [29].

The knowledge dimension is a different type of knowledge:

Factual (knowledge of terminology, knowledge of specific details and elements), conceptual (knowledge of classifications and categories, knowledge of principles and generalisations, knowledge of theories, models, and structures), procedural (knowledge of subject-specific skills and algorithms, knowledge of subject-specific techniques and methods, knowledge of criteria for determining when to use appropriate procedures), and metacognitive knowledge (strategic knowledge, knowledge about cognitive tasks, including appropriate contextual and conditional knowledge, self-knowledge). This dimension focuses on content as types of knowledge, and according to Krathwohl and Anderson (2001), to lie along a continuum, from concrete in factual knowledge to abstract in metacognitive knowledge.

The cognitive processes dimension is intended to provide a comprehensive set of classifications for students' cognitive processes included in objectives (Krathwohl & Anderson, 2001). The categories in this dimension are remember, understand, apply, analyse, evaluate and create. Thus, this dimension represents a continuum of increasing cognitive complexity, from lower-order thinking skills (remember) to higher-order thinking skills (create)(Amer, 2006; Krathwohl, 2002).

Linking questioning to Bloom's Taxonomy

The cognitive levels within Bloom's Taxonomy provides a useful theoretical framework for designing successive educational objectives with the aim of enabling learners to refer to a more complex thought process ranging from lower order to higher order thinking skills (Mrah, 2017). As this paper focuses on teaching strategies that can be applied to develop thinking, a practical manner in which it can be implemented needs to be elucidated upon. The manner in which this will be done is through the use of questioning.

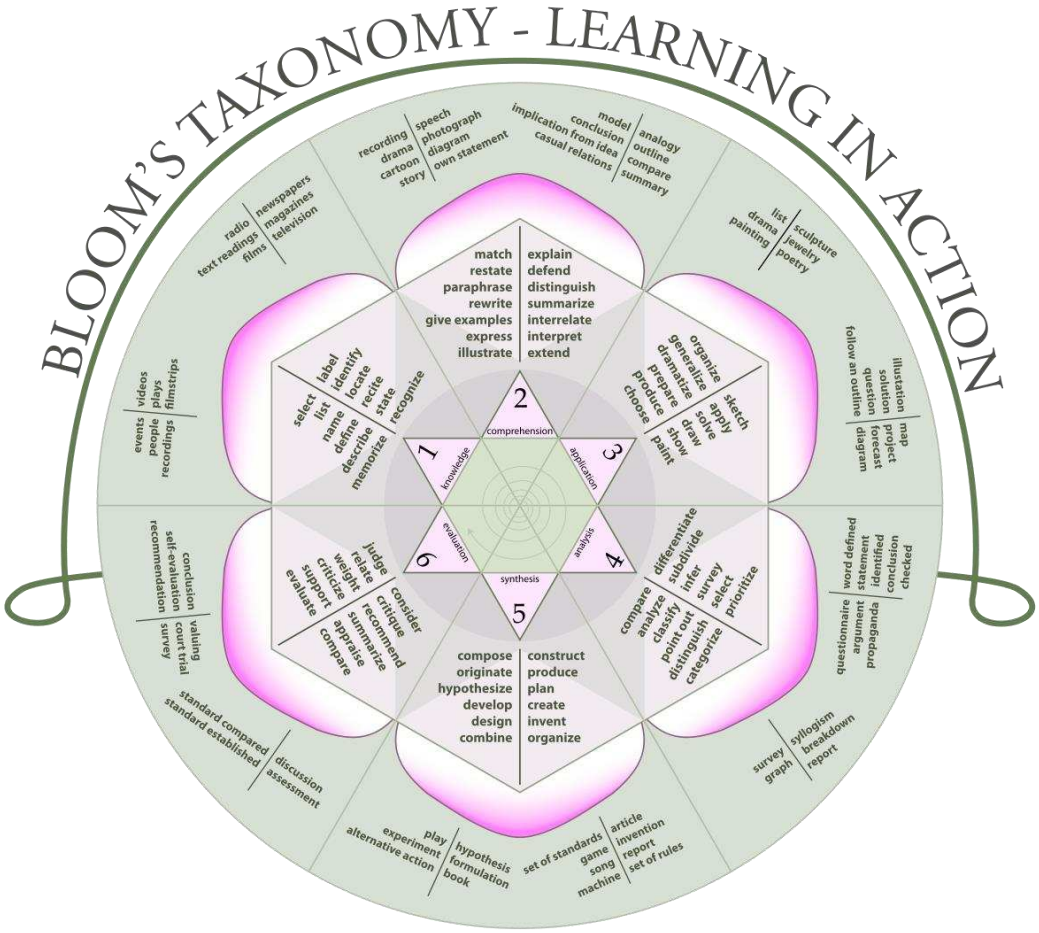
Within education, the method of asking questions has always been utilized in tests and examinations. Questioning is described by Aizikovitsh-Udi, Clarke & Star (2013) as "an expression of inquiry that invites or calls for a reply". The purpose of questioning is to gauge the level of understanding (Walsh & Sattes, 2011) of students and whether or not they have mastered the content. Therefore, the adoption of this particular strategy will be easy to accomplish.

Each level of Bloom's Taxonomy relates to a thought process. These thought processes can relate to any school content or subject. It is possible for an educator to use questions to prompt a student to think on a certain level of Bloom's Taxonomy (Patil & Gaurshettiwar, 2016 & Krathwohl, 2002).

The manner in which prompts can be structured into questions depends on the verbs used. Each level in Bloom's Taxonomy has specific verbs associated with it. The following diagram,

[29] "Appendix B: Taxonomy of Educational Objectives (Bloom 1956; Krathwohl, Bloom and Masia 1964)," *AAHE-ERIC/Higher Education Research Report* 3, no. 1 (2009): 59–60, http://dx.doi.org/10.1002/aehe.3640030109; Amer and El-Okda, "Using Web Quests in Teaching and Learning English."

known as Bloom's Rose (Aainsqatsi, 2008) illustrates these different verbs and their associated cognitive levels.



Examples of questions for the different levels:

Level 1
Define the concept "communism". (1)

Level 2
Explain how Stalin's Five Year Plans worked in practice. (2)

Level 3
Organize the following important events during World War II into a timeline. (5)

Level 4

Differentiate between the New Economic Policy (NEP) and War Communism that Lenin introduced after the Russian Revolution.

(10)

Level 5

"Hitler's actions were responsible for the outbreak of the Second World War." Evaluate the validity of the statement.

(15)

Level 6

Hypothesize what could have happened if, during World War II, Hitler decided not to invade the USSR, and upheld the Nazi-Soviet Pact and maintained his plans to invade Britain. Would the outcome of the war be any different?

(20)

Note how the mark allocation increases as we move up to the higher order questions.

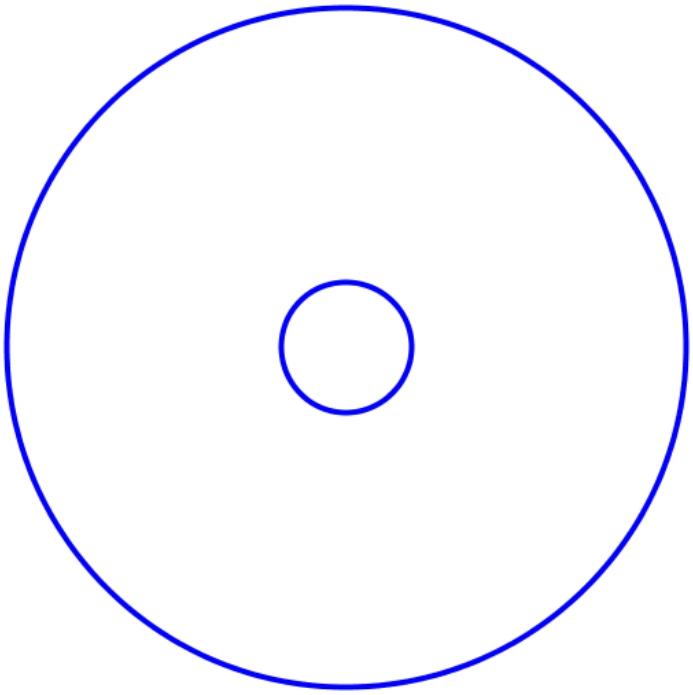
Thinking Maps

Wang & Jacobson (2011) endorses that knowledge visualization is used to construct and convey complex insights for improving understanding and communication. Okada, Shum & Sherborne (2014) describes mapping as one of the oldest forms of human communication, it enables one to surpasses the limitations of ones thinking and mediate the inner mental world and outer physical world. Thinking Maps are a set of graphic organizer techniques used in education to visually assemble content, solve problems and make decisions (Hyerle, 2014). Eight diagram types are proposed to match with eight different essential thinking processes. These diagrams provide a common visual language similar to the information structure often employed when students take notes during a content lesson (Hyerle & Yeager, 2007).

By linking each thinking skill to a unique and dynamic visual representation, the language of Thinking Maps becomes a tool set for supporting effective instructional practice and improving student performance. Educators and students, therefore, independently apply thinking skills for their own learning while also having a common visual language for cooperative learning. By having a rich language of visual maps based on thinking processes, students are no longer confused by poorly organized brainstorming webs or an endless array of static graphic organizers. They are enabled to move from concrete to abstract concepts, think with depth, and directly apply their thinking to complex tasks.

All 8 Thinking Maps are defined below (Hyerle & Alper, 2011).

Circle Map - used for defining in context



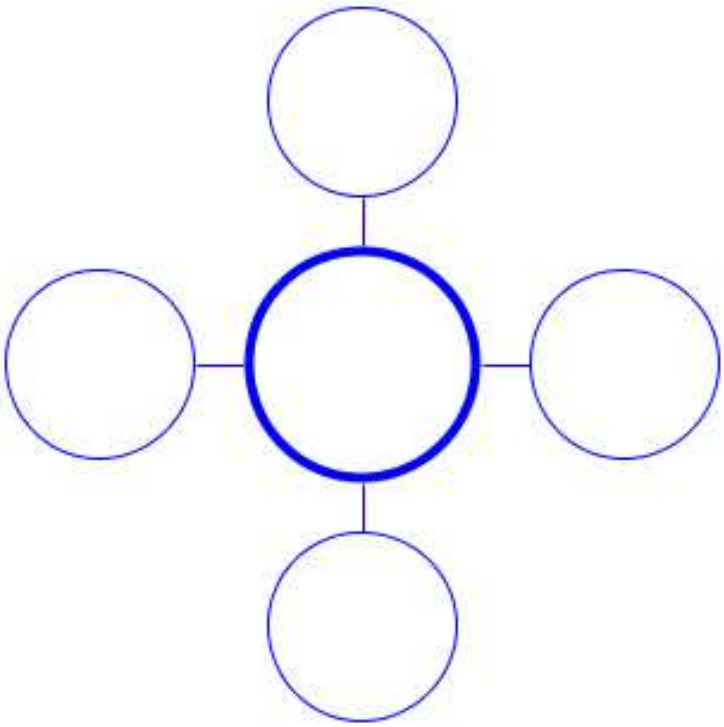
In a circle map, the chosen theme or topic is placed within the center circle, the student the adds possible ideas associated with main theme or topic in the outer circle (Long & Carlson, 2011). The notion would be that the student with more background or prior knowledge will come up with more ideas to add to the outer circle.

However, it is important to note that even though students may write out a lot of ideas, many of these ideas could only be partially linked or not linked at all to the central theme or topic. It would be recommended that the circle map would be used as the starting point for any given lesson, so that the educator can gauge prior knowledge and eliminate incorrect background knowledge (Ohst, *et al.,* 2014).

Another idea would be to do the circle map in stages. Give students the key concept and ask them to write down their own ideas in a specific pen color for 5 minutes. Afterwards, students must consult their peer sitting next to them and compare their ideas. The ideas that are unique from the peer's circle map can then be added to the student's own in a different color pen.

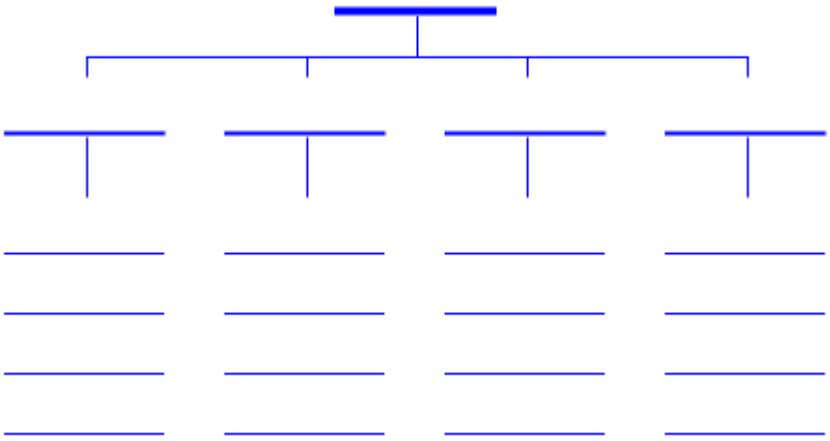
Lastly, once the educator has explained the content, give the students an opportunity to check their circle maps once more, so that they can either add ideas from the educator's lesson that they were not aware of in the beginning, or remove ideas that were actually wrong from the beginning.

Bubble Map - used for describing with adjectives



Long & Carlson (2011) states that the Double Bubble Map "allows students to visually compare and contrast ideas using a series of bubbles connected to their topic." Thus the central concept is expanded on by using a variety of single adjectives (Long & Carlson, 2011), thus student is required to develop elaborative thinking and the use of improved vocabulary with this technique. Certain adjectives can convey certain emotions, which is crucial to convey a certain point of view.

Tree Map - used for classifying or grouping

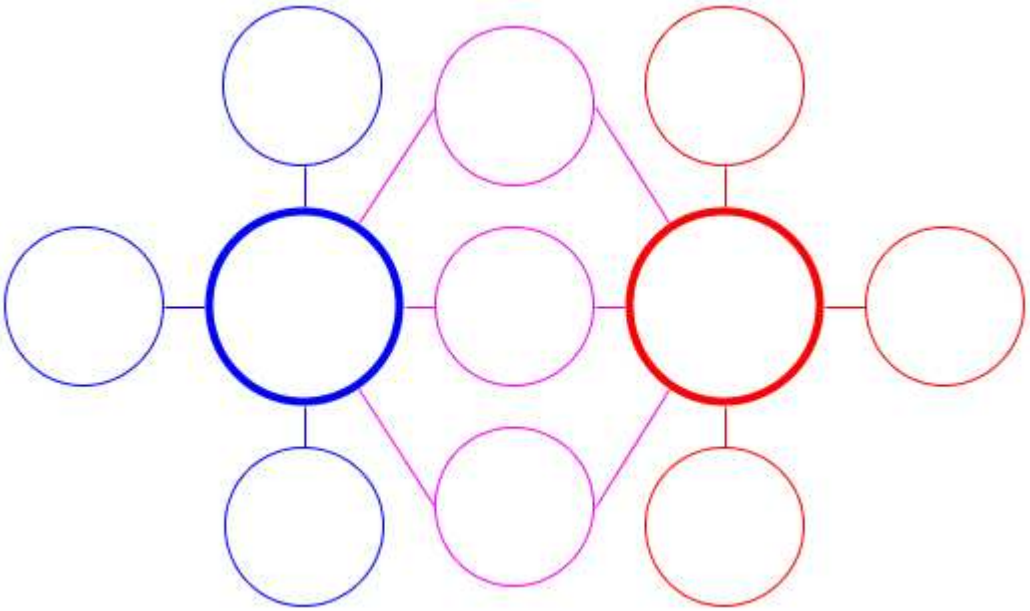


In the above example, the core theme is placed at the top of the Tree Map. A tree map can be used as a visual outline for any content or written project (Velarde, 2018). This map links very well with the Circle Map, as the Circle Map's concepts can be very random and unorganized. Therefore, the Tree Map can be used to categorize and group all the ideas to make better sense of them (Hyerle & Alpe, 2011).

Flow Map - used for sequencing and ordering events

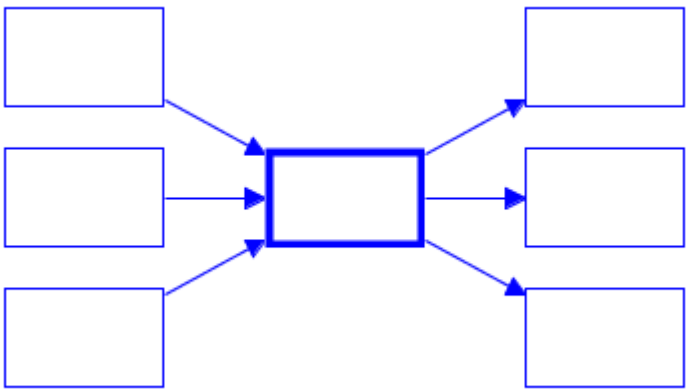
Flow maps display a chronological progression or sequence over time, and determine the cause and effect of events. It can also be used to prioritize information in order of most important to least important. This map requires sequential thinking and logic, so that the correct ideas are placed in the correct part of the sequence (Long & Carlson, 2011). This could imply a chronological progression (ie. timeline), a ranking progression (best to worst, fastest to slowest, biggest to smallest etc.) or an organizational progression (ie. stages or steps to be taken).

Double Bubble Map - used for comparing and contrasting



The double bubble map is used to compare concepts for similarities and differences (Omar, *et al.,* 2016). The middle circles show the similarities and the outer circles show the differences. This map requires analytical skills in order to discern the differences and similarities, making it a higher order thinking map.

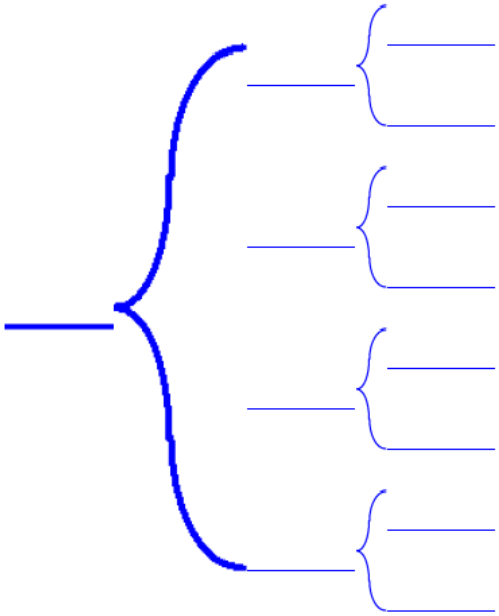
Multi-flow map - used for analyzing causes and effects



A multi flow map displays the causes and effects relationship of the core concept in the middle. Causes are placed on the left side, and effects are placed on the right side (Hakim 2018). Examining causes and effects entails very high order thinking and reasoning skills. To elaborate

on why something happened due to a certain cause, or to evaluate the significance of the effects of something are extremely complex thinking processes.

Brace Map - used for identifying part/whole relationships



The above Brace Map example expands the core concept on the leftmost side into its defining components (Omar, *et al.,* 2016). Nouns should be used for this purpose. The brace map contains more information to explain the nouns. The process whereby ideas are broken down into segments utilizes the analysis skill, making this a higher order thinking map.

Bridge map - used for illustrating analogies

The above displays a Bridge Map. Hakim (2018) state that the Bridge Map is "used for creating, seeing and interpreting analogies", this requires relative and associative thinking, wherein links need to be made between multiple concepts, unlike the Double Bubble Map, which can only use two concepts. The key to using a Bridge Map is to find a relating factor between the concepts.

METHODS

This paper is inherently conceptual in scope. According to Jaakkola [30], in conceptual papers, novel connections are generally offered between structures, such that logical and comprehensive arguments are developed on these links, rather than being experimentally tested [31].

Hirschheim [32] has first taken up a framework established by the British philosopher Toulmin, who asserts three essential components: claims, grounds and warrants, in an attempt to evaluate what forms a strong argument [33]. Claims relate to the explicit declaration or thesis that the reader should accept as the study conclusion. The rationale utilized to reinforce the reader's opinion are the grounds. The grounds are based on prior studies instead of primary data in a conceptual article. Finally, warrants are the underlying assumptions or assumptions which connect motives with assertions [34].

There is no common interpretation of fundamental research methodologies in terms of conceptual papers, excluding literature reviews and meta-analyzes, as opposed to empirical research. This study takes one of four key concepts into consideration in this area: Theory Synthesis, Adaptation Theory, Typology and Model Papers.

This paper is considered to be a model paper. The model paper attempts to establish a theoretical framework for the connection of ideas. An entity describes a conceptual model and specifies the issues to be considered: an occurrence, object or process may be described and explained how the conceptual model works by providing an antecedent, results and contingencies relating to the focal structure[35] . This usually includes a theoretical technique, which tries to build a nomological network around the focus subject (in this case, Bloom's Revised Taxonomy), with a formal analysis method to study and describe the casual relationships and mechanisms involved . A model paper discovers previously undiscovered linkages between structures, proposes new structures, or illustrates why process factors lead to a certain conclusion[36].

By outlining an entity, the model paper advances existing knowledge: its purpose is "to delineate, characterize, define or represent an entity and its connection to other entities" [37]. In a conceptual paper, the creative scope is freed from data limits that enable scientists to study and analyze emergent phenomena where limited empirical information is available (Yadav 2010). The model paper usually contributes by giving a blueprint for the entity concerned by defining the

[30] Elina Jaakkola, "Designing Conceptual Articles: Four Approaches," *AMS Review* 10, no. 1–2 (2020): 18–26, http://dx.doi.org/10.1007/s13162-020-00161-0.

[31] Lucy L Gilson and Caren B Goldberg, "Editors' Comment," *Group & Organization Management* 40, no. 2 (2015): 127–130, http://dx.doi.org/10.1177/1059601115576425.

[32] Rudy Hirschheim, "Some Guidelines for the Critical Reviewing of Conceptual Papers," *Journal of the Association for Information Systems* 9, no. 8 (2008): 432–441, http://dx.doi.org/10.17705/1jais.00167.

[33] Jaakkola, "Designing Conceptual Articles: Four Approaches."

[34] Ibid.

[35] Deborah J MacInnis, "A Framework for Conceptual Contributions in Marketing," *Journal of Marketing* 75, no. 4 (2011): 136–154, http://dx.doi.org/10.1509/jmkg.75.4.136.

[36] Joep Cornelissen, "Editor's Comments: Developing Propositions, a Process Model, or a Typology? Addressing the Challenges of Writing Theory Without a Boilerplate," *Academy of Management Review* 42, no. 1 (2017): 1–9, http://dx.doi.org/10.5465/amr.2016.0196; Ingrid Smithey Fulmer, "Editor's Comments: The Craft of Writing Theory Articles—Variety and Similarity in AMR," *Academy of Management Review* 37, no. 3 (2012): 327–331, http://dx.doi.org/10.5465/amr.2012.0026.

[37] MacInnis, "A Framework for Conceptual Contributions in Marketing."

focus idea, how it evolves, the methods as to how it works or the circumstances that can impact on it .

This study sought to answer the following research question:

To what extent is Blooms Revised Taxonomy applied as a teaching tool?

In order to answer the research question, a particular methodology was employed. This study made use of a scoping review as a means to justify and rationalize the use of the Thinking Maps model. According to Arksey & O'Malley [38], scoping reviews summarize current literature and other sources of information, and they frequently incorporate results from various research designs and techniques.

The vast extent of the data makes formal meta-analytic approaches difficult, if not impossible, to use. The scope of information found is frequently the focus of a scoping study, and quantitative assessment is generally restricted to a tally of the number of sources reporting a certain issue or proposal .

According to . Peters et al., systematic reviews, on the other hand, frequently choose information sources by necessitating certain study types, such as randomized controlled trials, and setting quality requirements, such as appropriate allocation concealment, and focusing on data synthesis to answer a specific research question. The synthesis component of a systematic review generally takes the form of a meta-analysis, in which the findings of several scientific research are integrated to create a summary conclusion, such as a common effect estimate, as well as an assessment of its heterogeneity across studies.

According to Munn et al. [39], a scoping review may become especially helpful if the material on a topic is not well understood or complicated and diversified. Munn et al. suggested benefits that could be achieved using the scope evaluation framework, such as with identifying types of evidence existing in a particular area, clarifying key concepts or literature definitions, examining how research on a certain subject is performed, recognize key features in relation to a particular subject, and identify knowledge gaps. It is vital that the aim of the review is consistent with the review's indication or objective when deciding to employ a scope review technique.

In order to optimize collection and reproducibility of the essential information and reduce potential bias in improper execution, the thorough and organized literature surveys such as systematic reviews require extensive and structured inquiry. Arksey and O'Malley have created the methodological framework for scope reviews and Levac et al. (2010) and Peters et al. (2017) from the Joanna Briggs Institute have further improved it. The scope review framework of Arksey and O'Malley (2005) comprises 6 phases:

[38] Arksey and O'Malley, "Scoping Studies: Towards a Methodological Framework."

[39] Zachary Munn et al., "Systematic Review or Scoping Review? Guidance for Authors When Choosing between a Systematic or Scoping Review Approach," *BMC medical research methodology* 18, no. 1 (November 19, 2018): 143, https://pubmed.ncbi.nlm.nih.gov/30453902.

Arksey and O'Malley (2005) Framework Stage	Description
1: Identifying the research question	Defining the research question serves as a road map for the future steps. Key points of the issue must be well stated since they affect search techniques. The research questions are wide in scope since they attempt to cover a wide range of topics.
2: Identifying relevant studies	In this phase, the appropriate studies are identified and a decision plan is developed for finding what terms to utilize, which sources to look for, time period and language. In the search, completeness and range are crucial. Sources include computer databases, reference lists, hand searches of significant papers, and conferences and organisations. Length is crucial; nevertheless, the search features are also significant. Time, finance, and people resources are possible limiting constraints, and choices regarding how they will influence the search must be addressed ahead of time.
3: Study selection	The selection of the study includes criteria for post-hoc inclusion and exclusion. These criteria are based on research specifics and newfound knowledge about the issue from reading the articles.
4: Charting the data	A dataset form for extracting the data from each study is designed and used. In order to draw contextual or process focused information from each research, a 'narrative review' or 'descriptive analytical' approach is utilized.
5: Collating, summarizing, and reporting results	To offer a general overview of the depth of the literature, but not a synthesis, an analytical framework or theme structure is used. The breadth and type of research utilizing tables and charts are analyzed numerically. A topical analysis is thereafter given. When reporting outcomes, accuracy and uniformity are needed.
6: Consultation (optional)	Offers possibilities for participation by consumers and others to provide new references and to offer insight outside literature.

The above stages were adopted in this study, however stage 6 was excluded. The research question was formulated, whereupon several relevant studies were selected based on the topic of Bloom's Revised Taxonomy as a teaching tool since 2001. Several databases were consulted, such as Jstor and Ebscohost. The reports of the summaries from the relevant studies have been presented in tables in the previous section.

The following section seeks to delineate the process for linking Thinking Maps to Bloom's Taxonomy.

Linking Thinking Maps to Bloom's Taxonomy

It is quite possible to make a connection between the 8 Thinking Maps and Bloom's Taxonomy. The way in which this can be done is by linking each map to a specific level of Bloom's Taxonomy. As each map requires a specific type of thinking, it is possible to classify the maps into categories that require lower and higher order thinking.

As the circle map requires basic generational or recall thinking when it comes to ideas, we can classify it as a Knowledge Level 1 map. Verbs such as "define", "recall", "brainstorm", "generate", "name" and "specify" are all linked to the Circle Map (Long & Carlson, 2011).

The bubble map requires one to describe ideas using adjectives. Any kind of thinking that requires further elaboration or detail on a concept can be linked to the Understanding Level 2 of Bloom. Verbs such as "describe", elaborate", "discuss" and "illustrate" are all linked with the Bubble Map (Long & Carlson, 2011).

The tree map requires organizational and categorical thinking. This can best be linked with Application Level 3 of Bloom. Verbs such as "classify", "categorize", organize", "label" and "list" are all linked with the Tree Map.

The flow map requires sequential thinking. This can best be linked to Application Level 3 of Bloom. Verbs such as "sequence", "order", "prioritize", "arrange" and "sort" are all linked with the flow map (Long & Carlson, 2011).

The double bubble map requires differential thinking in which comparisons are made. This can best be linked to Analysis Level 4 of Bloom. Verbs such as "compare", "correlate", distinguish" and "discriminate" are all linked with the double bubble map (Omar, *et al.,* 2016).

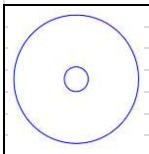
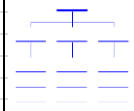
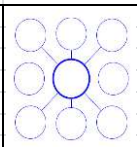
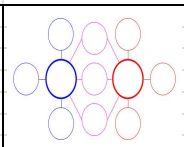
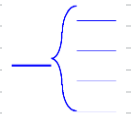
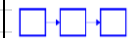
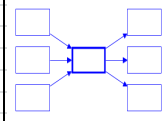
The brace map requires deductive thinking in which information is broken up into segments. This can best be linked to Analysis Level 4 of Bloom. Verbs such as "analyze", "examine", "investigate", "deduce" and "break down" are all linked with the brace map (Omar, *et al.,* 2016).

The multi-flow map requires thinking in the form of cause and effect, or how concepts influence each other. This requires reasoning skills. This can best be linked to Evaluation Level 5 of Bloom. Verbs and keywords such as "reason", "attribute", "cause", "effect", "influence" and "result" are all linked with the multi-flow map (Hakim 2018).

The bridge map requires associative or relative thinking. This requires the synthesis of information. This can best be linked to Create Level 6 of Bloom. Verbs and keywords such as "associate", "relate", integrate", "link", "connect" and "affiliate" are all linked to the bridge map (Hakim, 2018).

The underlying table summarizes the 8 different Thinking Maps as well as the verbs that point to the cognitive processes associated with each map (Bunt & Grosser, 2013).

Thinking Maps and associated verbs and keywords

							
Circle Map:	**Tree Map:**	**Bubble Map:**	**Double Bubble Map:**	**Brace Map:**	**Flow Map:**	**Multi-Flow Map:**	**Bridge Map:**
Define	Classify	Describe	Similarities and differences	Analyze	Sequence	Cause and effect	Associate
Brainstorm	Categorize	Discuss	Compare and contrast	Determine	Order	Origins and consequences	Link
Generate	Organize	Explain	Correlate	Examine	Prioritize	Continuity and change	Connect
Come up with	Group	Elaborate	Divide	Investigate	Chronological	Reason	Combine
Name	Label	Illustrate	Equate	Extend	Arrange	Influence	Merge
Recall	List	Motivate	Scrutinize	Expand	Plan	Effects	Fuse
Conceive	Catalogue	Persuade	Separate	Break down	Sort	Impact	Synthesize
Contextualize	Couple	Convince	Weigh	Dissect	Rank	Implications	Analogize
State	Allocate	Suggest	Contradict	Inspect	Assemble	Result	Join
Identify	Assort	Detail	Distinguish	Deduce	Course	Attribute	Affiliate
Select	Index	Express	Discriminate	Segment	Collate	Contribute	Blend
Conceptualize	Compartmentalize	Narrate	Converge and diverge	Fragment	Collect	Modify	Relate
Specify	Cluster	Present	Disimilar	Component	Execute	Convert	Equivalence
Retrieve	Structure	Evaluate	Juxtapose	Part	Step	Alternate	Coalesce
Recognize		Assess	Agree and disagree	Section	Stage	Manipulate	Amalgamate
Locate		Judge	Deviate	Whole	Phase	Change	Integrate
Search			For and against	Lay out	Chronicle	Transform	Unite
Find				Characteristics			Relationships
				Features			

Assessment of Thinking Maps

Rubric for assessing the Thinking Maps in terms of relevancy and elaboration (detail)

1 0-29%	Not achieved	The Thinking Map displays **misconceptions** regarding the subject content.
2 30-39%	Elementary achievement	The Thinking Map displays a **limited understanding** of the subject content.
3 40-49%	Moderate achievement	The Thinking Map displays a **simplistic understanding** of the subject content.
4 50-59%	Adequate achievement	The Thinking Map displays a **basic understanding** of the subject content.
5 60-69%	Substantial achievement	The Thinking Map displays a **basic understanding** as well as **new ideas** about the subject content.
6 70-79%	Meritorious achievement	The Thinking Map displays **basic** and **new ideas** as well as **finer detail** about the subject content.
7 80-100%	Outstanding achievement	The Thinking Map displays a **deeper understanding** of the subject content and supplies **rich, diverse** and **creative ideas** about the subject content.

Thinking Maps Checklist

Criteria	Complete		Incomplete	
Sufficiency / fluency	The thinking map displays evidence of multiple concepts / ideas		The thinking map displays evidence of minimal or no concepts / ideas	
Thought process (Verb or keyword linked to Thinking Map)	The thought processes utilized are correctly linked to the thinking map		The thought processes utilized are incorrectly linked to the thinking map	
Collaborative Development	The thinking map displays evidence of extensive collaborative consultation		The thinking map displays evidence of minimal or no collaborative consultation	
Flexibility	The concepts / ideas presented in the thinking map vary significantly from one another		The concepts / ideas presented in the thinking map are all very similar and do not differ	
Originality	The student made his/her thinking map their own, utilizing a variety of colors, symbols, pictures etc.		The student did not make his/her thinking map their own, simply utilizing the basic structure	
Elaboration	The student's written answer displays a direct correlation with the thinking map		The student's written answer displays minimal or no connection with the thinking map	
Layout	The technical structure of the thinking map is laid out correctly		The technical structure of the thinking map is laid out incorrectly	

The checklist and rubric above (Bunt & Grosser, 2013), serve only as an example of how the Thinking Maps could be assessed. A specific criterion that an educator can use to scrutinize the maps could be whether sufficient ideas are present within the map or not. Too few ideas on a map could mean that the student does not understand the concept or has a limited understanding of a concept, hampering the fluency of ideas.

An educator can also assess the strategy of Thinking Maps linked to Bloom's Taxonomy, where the verbs used in a question would prompt the student to use a specific Thinking Map. If the question asked the students to "classify" and the student drew a Bubble Map, then the wrong type of map was used to process their thinking. It is important that educators do not always tell students which maps to use.

Another criterion would be to look for evidence of collaborative development. The strategy of having students compare their maps with their peers, and adding new information in a different color, could work here.

Criteria for flexibility of ideas can also be addressed. The Thinking Map should display a deeper understanding of the subject content and supply rich, diverse and creative ideas about the subject content (Torrance, 1977).

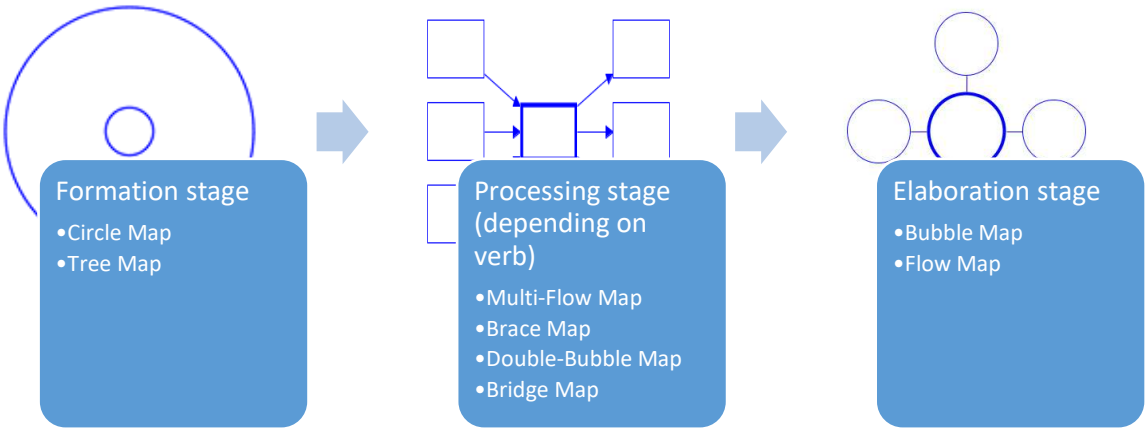
Originality of ideas or of the map itself can be assessed. If the map contains creative ideas or the student made use of symbols, drawings, color etc. it indicates creativity (Torrance, 1977).

The ability to elaborate on the Thinking Maps can also be assessed. A Thinking Map provides a visual structure to a student that could guide the student in writing up the information represented by the map. Elaborate thinking can also imply the amount of descriptive detail added to ideas, so the assessment of descriptive vocabulary used in the paragraph can also be used (Torrance, 1977).

Lastly, an educator can assess the structure of the map itself. All Thinking Maps have a specific structure and cannot be altered. If the student draws square blocks in a bubble map, for example, it means that the structure was not adhered to.

Adaptive systematic method for using Thinking Maps

Below is a methodology for utilizing the thinking maps. The method entails using at least 5 maps for any question that has a verb associated with it. As in the previous discussion on linking thinking maps to Bloom's Taxonomy, the verbs used will guide the learner in answering the question by drawing the appropriate map. However, in the below model, a 3 stage approach is taken, which is similar to the information processing theory.



Formation stage:

In essence, in answering any question, the Circle Map and Tree Map will always be used first. In the case of lower order questions, the remainder of the stages will not need to be done, as in the example: Define communism. In this question, a circle map will be used to generate ideas surrounding the concept communism. A tree map then follows to categorize the information in the circle map. No further cognitive processing is required to answer the question, and therefore all the information from the tree map can be used to write out the answer.

However, if the level of questioning is higher-order, then further cognitive processing is required, based upon the verb used. This means that the remaining stages need to be used.

Processing stage:

An example question could be "Analyze the causes and effects of colonialism on Africa". The first step would be to identify the verb and content. As the verb is "analyze", the question clearly falls under the analysis level of Bloom's Taxonomy. In order to answer this question, a learner would first undergo the formation stage, using a circle map and a tree map, to gather all prior knowledge relating to the content, colonialism in Africa. However, this information is not enough to answer the question. The next stage, the processing stage, will take this information presented in the tree map and process it accordingly. The verb will indicate which processing map to use, namely the multi-flow map, based on the part of the question that states "causes and effects".

Now the learner will need to use the multi-flow map and take the information in the tree map and process it accordingly. This ensures that the learner is using the correct thinking when answering questions. Time and again, educators state that their learners are not sure how to answer

questions. In this methodology, it becomes immediately apparent as to how a learner needs to think in order to complete a question.

Elaboration stage:

However, the question is still not complete, as the information has only been processed. The specific map now needs to be elaborated upon in a sequenced, coherent manner, in order to phrase it correctly. This entails using the flow map and the bubble map. The learner will now take the information used in the processing stage (in the example, the multi-flow map) and sequence the information into a flow map. This allows the learner to visually plan as to how their answer will be sequenced. The bubble map is used to elaborate on the information that was processed. The learner would describe certain aspects of the previous map (multi-flow map) with adjectives, promoting improved vocabulary usage. An example of this could be: An cause of colonialism is exploitation of resources. Now the learner takes this cause and describes it, for example: Exploiting is unfair, vile, cruel, immoral etc. This connects emotional feelings with the content. One these maps are completed; the learner knows how to sequence their answer as well as how to describe the information in their answer.

CONCLUSION

The above mentioned methodology could prove to be invaluable if used correctly. When an educator employs this method, the educator could easily deduce where the problems lie in any learner's learning with any given topic. As each stage is dependent upon the previous one, it becomes clear that if a learner is unable to complete the first circle map and tree map, then they cannot process their knowledge to answer the question. This would highlight that the learners do not possess sufficient prior knowledge to answer the question, or in some instances, that their prior knowledge is incomplete or incorrect.

If the second stage is done incorrectly, it would immediately become apparent that the learners do not know how to process their knowledge to answer a question. The verbs used in questions are the key to solving this problem, and if learners are taught which Thinking Maps to use with those specific verbs, then this problem will be solved.

If the final stage is not completed properly, it would indicate language barriers that the learners are unable to articulate, sequence or describe their thoughts in written form. This final stage could therefore be used to develop the language usage of learners in any given subject, to assist them in formulating answers.

We see great potential in using this approach. Further research will still be conducted on the practical implementation and efficacy of this method.

REFERENCE

Amer, Aly, and Mohamed El-Okda. "Using Web Quests in Teaching and Learning English." *Language Learning in the Cyber Age: Innovations and Challenges, Sultan Qaboos University, Oman* (2006): 19–20.

Arievitch, Igor M. "The Vision of Developmental Teaching and Learning and Bloom's Taxonomy of Educational Objectives." *Learning, Culture and Social Interaction* 25 (2020): 100274. http://dx.doi.org/10.1016/j.lcsi.2019.01.007.

Arksey, Hilary, and Lisa O'Malley. "Scoping Studies: Towards a Methodological Framework." *International Journal of Social Research Methodology* 8, no. 1 (2005): 19–32. http://dx.doi.org/10.1080/1364557032000119616.

Bloom, Peter B., and Mark P. Jensen. "An Interview with Peter Bloom." *Contemporary Hypnosis and Integrative Therapy* (2013).

Brindha, V Evelyn. "Creative Learning Methodology Using Revised Bloom's Taxonomy." *International Journal for Cross-Disciplinary Subjects in Education* 9, no. 1 (2018): 3368–3372. http://dx.doi.org/10.20533/ijcdse.2042.6364.2018.0450.

Bümen, Nilay T. "Effects of the Original Versus Revised Bloom's Taxonomy on Lesson Planning Skills: A Turkish Study Among Pre-Service Teachers." *International Review of Education* 53, no. 4 (2007): 439–455. http://dx.doi.org/10.1007/s11159-007-9052-1.

Byrd, P Ann. "The Revised Taxonomy and Prospective Teachers." *Theory Into Practice* 41, no. 4 (2002): 244–248. http://dx.doi.org/10.1207/s15430421tip4104_7.

Cohen, Louis, Lawrence Manion, and Keith Morrison. "Research Methods in Education (Eight Edition)." *Abingdon, Oxon* (2018).

Cornelissen, Joep. "Editor's Comments: Developing Propositions, a Process Model, or a Typology? Addressing the Challenges of Writing Theory Without a Boilerplate." *Academy of Management Review* 42, no. 1 (2017): 1–9. http://dx.doi.org/10.5465/amr.2016.0196.

Dignath, Charlotte, Gerhard Buettner, and Hans-Peter Langfeldt. "How Can Primary School Students Learn Self-Regulated Learning Strategies Most Effectively?" *Educational Research Review* 3, no. 2 (2008): 101–129. http://dx.doi.org/10.1016/j.edurev.2008.02.003.

Dignath, Charlotte, and Gerhard Büttner. "Components of Fostering Self-Regulated Learning among Students. A Meta-Analysis on Intervention Studies at Primary and Secondary School Level." *Metacognition and Learning* 3, no. 3 (2008): 231–264. http://dx.doi.org/10.1007/s11409-008-9029-x.

Echeverría, Alejandro, Cristian García-Campo, Miguel Nussbaum, Francisca Gil, Marco Villalta, Matías Améstica, and Sebastián Echeverría. "A Framework for the Design and Integration of Collaborative Classroom Games." *Computers & Education* 57, no. 1 (2011): 1127–1136. http://dx.doi.org/10.1016/j.compedu.2010.12.010.

Ertmer, Peggy A, and Timothy J Newby. "Behaviorism, Cognitivism, Constructivism: Comparing Critical Features From an Instructional Design Perspective." *Performance Improvement Quarterly* 26, no. 2 (2013): 43–71. http://dx.doi.org/10.1002/piq.21143.

Eskelinen, Satu. "Learning Outcomes: Revised Bloom's Taxonomy and Critical Thinking in Two Examples of Unit Design" (2019).

Ewijk, Charlotte Dignath-van, Oliver Dickhäuser, and Gerhard Büttner. "Assessing How Teachers Enhance Self-Regulated Learning: A Multiperspective Approach." *Journal of Cognitive Education and Psychology* 12, no. 3 (2013): 338–358. http://dx.doi.org/10.1891/1945-8959.12.3.338.

Ferguson, Chris. "Using the Revised Taxonomy to Plan and Deliver Team-Taught, Integrated, Thematic Units." *Theory Into Practice* 41, no. 4 (2002): 238–243.

http://dx.doi.org/10.1207/s15430421tip4104_6.
Ferguson, Karen J, Alasdair M J MacLullich, Ian Marshall, Ian J Deary, John M Starr, Jonathan R Seckl, and Joanna M Wardlaw. "Magnetic Resonance Spectroscopy and Cognitive Function in Healthy Elderly Men." *Brain* 125, no. 12 (2002): 2743–2749. http://dx.doi.org/10.1093/brain/awf278.
Gilson, Lucy L, and Caren B Goldberg. "Editors' Comment." *Group & Organization Management* 40, no. 2 (2015): 127–130. http://dx.doi.org/10.1177/1059601115576425.
Gul, Rani, Shazia Kanwal, and Sadia Suleman Khan. "Preferences of the Teachers in Employing Revised Blooms Taxonomy in Their Instructions." *sjesr* 3, no. 2 (2020): 258–266.
Hirschheim, Rudy. "Some Guidelines for the Critical Reviewing of Conceptual Papers." *Journal of the Association for Information Systems* 9, no. 8 (2008): 432–441. http://dx.doi.org/10.17705/1jais.00167.
Huitt, William. "Bloom et Al.'s Taxonomy of the Cognitive Domain." *Educational psychology interactive* 22 (2011).
Jaakkola, Elina. "Designing Conceptual Articles: Four Approaches." *AMS Review* 10, no. 1–2 (2020): 18–26. http://dx.doi.org/10.1007/s13162-020-00161-0.
Jensen, Jamie L, Mark A McDaniel, Steven M Woodard, and Tyler A Kummer. "Teaching to the Test…or Testing to Teach: Exams Requiring Higher Order Thinking Skills Encourage Greater Conceptual Understanding." *Educational Psychology Review* 26, no. 2 (2014): 307–329. http://dx.doi.org/10.1007/s10648-013-9248-9.
Kidwell, Linda A, Dann G Fisher, Robert L Braun, and Diane L Swanson. "Developing Learning Objectives for Accounting Ethics Using Bloom's Taxonomy." *Accounting Education* 22, no. 1 (2013): 44–65. http://dx.doi.org/10.1080/09639284.2012.698478.
Krathwohl, David R. "A Revision of Bloom's Taxonomy: An Overview." *Theory into practice* 41, no. 4 (2002): 212–218.
Krathwohl, David R, and Lorin W Anderson. *A Taxonomy for Learning, Teaching, and Assessing: A Revision of Bloom's Taxonomy of Educational Objectives*. Longman, 2009.
Leach, Ed. "Instruction-Based Action Guidelines Built on Bloom's Revised Framework: Setting Objectives for Entrepreneurship Training." *Small Enterprise Research* 14, no. 2 (2006): 74–92. http://dx.doi.org/10.5172/ser.14.2.74.
MacInnis, Deborah J. "A Framework for Conceptual Contributions in Marketing." *Journal of Marketing* 75, no. 4 (2011): 136–154. http://dx.doi.org/10.1509/jmkg.75.4.136.
Marlowe. "A Taxonomy for Teaching Music Theory: J. S. Bach and Lessons in Invertible Counterpoint." *Bach* 49, no. 2 (2018): 365. http://dx.doi.org/10.22513/bach.49.2.0365.
McGinnis, Michael D. "From Self-Reliant Churches to Self-Governing Communities: Comparing the Indigenization of Christianity and Democracy in Sub-Saharan Africa." *Cambridge review of international affairs* 20, no. 3 (2007): 401–416.
Munn, Zachary, Micah D J Peters, Cindy Stern, Catalin Tufanaru, Alexa McArthur, and Edoardo Aromataris. "Systematic Review or Scoping Review? Guidance for Authors When Choosing between a Systematic or Scoping Review Approach." *BMC medical research methodology* 18, no. 1 (November 19, 2018): 143. https://pubmed.ncbi.nlm.nih.gov/30453902.
Ormell, C. P. "Bloom's Taxonomy and the Objectives of Education." *Educational Research* (1974).
Pradeep, K R, and N C Naveen. "A Collective Study of Machine Learning (ML) Algorithms with Big Data Analytics (BDA) for Healthcare Analytics (HcA)." *International Journal of Computer Trends and Technology (IJCTT)* 47, no. 3 (2017): 149–155.
Saks, Katrin, and Äli Leijen. "Distinguishing Self-Directed and Self-Regulated Learning and

Measuring Them in the E-Learning Context." *Procedia - Social and Behavioral Sciences* 112 (2014): 190–198. http://dx.doi.org/10.1016/j.sbspro.2014.01.1155.
Schunk, Dale H. "Commentary on Self-Regulation in School Contexts." *Learning and Instruction* 15, no. 2 (2005): 173–177. http://dx.doi.org/10.1016/j.learninstruc.2005.04.013.
Smithey Fulmer, Ingrid. "Editor's Comments: The Craft of Writing Theory Articles—Variety and Similarity in AMR." *Academy of Management Review* 37, no. 3 (2012): 327–331. http://dx.doi.org/10.5465/amr.2012.0026.
Sobral, Sónia Rolland. "Bloom's Taxonomy to Improve Teaching-Learning in Introduction to Programming." *International Journal of Information and Education Technology* 11, no. 3 (2021): 148–153. http://dx.doi.org/10.18178/ijiet.2021.11.3.1504.
Wang, Alf Inge, Bian Wu, D. Burgos, Pablo Moreno-ger, J. L. Sierra, Baltasar Fernandez-Manjon, M. Specht, et al. *Introducton to Gamification*. *International Journal of Computer Games Technology*, 2010.
Westwood, Peter. *What Teachers Need to Know about Reading and Writing Difficulties*. Aust Council for Ed Research, 2008.
"Appendix B: Taxonomy of Educational Objectives (Bloom 1956; Krathwohl, Bloom and Masia 1964)." *AAHE-ERIC/Higher Education Research Report* 3, no. 1 (2009): 59–60. http://dx.doi.org/10.1002/aehe.3640030109.