A Theory of Learning Based on Constructivism and Problem Based Learning to Develop Higher Order Thinking Skills

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Abstract

The constructivist view of learning holds that meaningful learning occurs when people construct knowledge with the help of existing schemas and the viewpoints of others. Problem- based learning is one of the approaches that can be used in a constructive classroom to produce meaningful learning. In the constructivist classroom, students are not passive listeners. Students frequently engage in meaningful, problem-based activities and in such high-level cognitive processes which fosters creativity and motivation. It provides students with minds-on and hands-on experience. Problem-based learning presents students with authentic problems and requires them to discover sufficient information that they need to solve the problem through scaffolded instruction, and social interaction. This paper presents a study of the problem- based learning in a constructivist setting. The suggested elements of the theory that defines a constructivist classroom are providing guided instruction for the analysis of the problem within the zone of proximal development, providing opportunities for self-instruction using computer-supported learning tactics, providing opportunities for collaborative based inquiry approach and incorporating interdisciplinary approach to foster meaningful learning. This problem-based learning based on the constructivist theory will help students to be self-directed and for the development of thinking skills.

Key Words: Constructivism, Problem Based Learning, Self-Instruction, Learning Tactics, Collaborative based Inquiry Approach

Introduction

We live in an age of standards and accountability, especially in education. A high-quality instruction which encourages the learner as an active participant is the need of the hour in this changing society. We will need to understand and encourage the learner in every aspect of his social and cognitive development. Activities that encourage children to create new ideas or schemas through different strategies produce meaningful learning. Although concepts can be transmitted through direct instruction, knowledge is best created through the mental and physical manipulation of information. Accordingly, we need to give learner-centered activities, which include discussion, inquiry, and discovery. Providing ample materials and opportunities for students to learn on their own is vital. Instructional materials must provoke interest and curiosity

in the learners. It is essential to contextualise learning through real life and problem- based environment. Problems that are challenging and realistic should be provided. In short, education should aim at the development of self-regulated learning skills.

The acquisition of knowledge is only a part of what constitutes an appropriate education. Students should also learn how to discover, apply and evaluate what they need to know to achieve the set goals. Students need to learn how to be effective problem solvers. The recent innovations due to the technological outbursts affect our learning styles and cognitive styles (Bonk, & Cunnigham). If we are to produce a positive change in the students, schools need to invest more time and effort in teaching and encouraging the learners to be effective problem solvers. Schools should prepare students to be adaptive learners so as to make them capable of performing effectively when unpredictable situations come up and the tasks demand change (Snowman &McCown,2012).

Cognitive learning theories are useful sources for imparting meaningful learning and problem-solving skills. Meaningful learning works within a constructivist framework. Constructivism covers several views of learning. Most constructivists theories take one of the three forms: cognitive, social, and critical constructivism. Cognitive constructivism is emphasising the effect one's cognitive processes while the other two is emphasising the role of culture and social interactions on meaningful learning. Taken together, constructivism claims to provide a frame for understanding meaningful learning as the construction of knowledge (Snowman & McCown,2012).

In the constructivist classroom, students are made capable of transferring the knowledge and skills learned to similar but new situations. Constructivism concentrates on using cognitive skills to understand concepts rather than focussing on rote memorisation. Students enjoy learning more since they are not passive listeners. Learning is based on students' discovery and construction of knowledge. Enhancing the creativity develops students' abilities to express knowledge through a variety of ways. Students in the constructivist classroom are exposed to authentic, relevant tasks which stimulates them to question and views problems from multiple perspectives. Constructivism creates a positive environment promoting communication skills and collaborative learning (Nyikos & Hashimoto).

A way to implement the constructivist approach in teaching is to use problem-based learning. While using problem-based learning, students can plan and organise independently and also collaborate with others. Such kind of approach help learners to become more self-directed (Walker, Leary, Hmelo-Silver, & Ertmer). The technological outburst has increased the incorporation of technological tools into the teaching-learning process which can support the development of cognitive and social skills. In order to prepare students to face the challenges of the rapidly changing society, imparting learning through constructive approaches is important. This will help students to acquire higher order thinking skills and also help them to be autonomous learners. Problem-based learning can support instruction as it can give students direct experience while solving problems. Thus, the researcher hopes this problem- based learning can help students to become more independent.

Constructivism

The focus of a constructivist classroom is on the students rather than the teacher. The atmosphere of a constructive classroom is different from that of a traditional one. In the classroom where traditional methods such as direct instruction and lecture methods are used, the teacher just pours knowledge into a passive student (Bada &Olusegun). In the constructivist scenario, the students are to be actively involved in their process of learning. The teacher functions more as a facilitator. Knowledge is dynamic, and it's prone to change with our experiences.

The concept of constructivism has roots in many theories developed by psychologists. The Socratic dialogue as it is a form of a cooperative argumentative dialogue between individuals is still an important tool. It is based on asking and answering questions which stimulate critical thinking and helps to draw out ideas and underlying presumptions (Fisher,2007).

Piaget believed that people reach the process of equilibration when they can organize their schemas to achieve the possible adaptation to their environment. Piaget came forth with four stages of cognitive development. Piaget believed that cognitive development was more strongly influenced by peers than by adults (Mangal,2008)

Dewey proposed that education should be grounded in real experience. For constructivist learning, the essential part is discovering through an inquiry-based approach. Learning should not be just passive and theoretical but it should be relevant and practical (David,2015).

Vygotsky came forward with the social aspect of learning into constructivism. According to Vygotsky students solve problems under adult guidance or in collaboration with peers beyond their actual development. Vygotsky termed it as zone of proximal development (Snowman & McCown,2012)

Bruner proposed learning as an active, social process in which students discover new ideas or concepts based on their current knowledge (Snowman & McCown,2012).

Seymour Papert's ground-breaking work in using computers to teach children has led to the widespread use of computer and information technology in constructivist environments (Harel, & Papert, 1991)

Problem -Based Learning

"A problem is said to exist when one has a goal and has not yet identified a means for reaching that goal" (Gagne, Yekovich, & Yekovich,1993). Problem-solving is the deliberate and purposeful act on the part of an individual to realize the set goals or objectives by inventing some novel methods or systematically following some planned step for removal of the interferences and obstacles in the path of the realisation of these goals (Mangal,2008).

Problem-based learning (PBL) is a student-centered approach in which students learn about a subject by working independently or in groups to solve an open-ended problem. What drives the motivation and the learning lie in the nature of the problem presented. The problem is presented first rather than directly giving the relevant material and subsequently having students apply the knowledge to solve problems. Students need to understand and define the problem, analyze what they already know about the underlying issues related to it, find out what they need to comprehend, and where they can acquire the information and tools necessary, evaluate possible ways to solve the problem, solve the problem, and report on their findings. The steps in designing a problem-based learning involve articulating the learning outcomes of the problem, creating the

problem, establishing ground rules at the beginning to prepare students to work effectively in groups and also independently, providing the opportunity to assume various perspectives, and evaluating the problem. In an ideal case, this will be a real-life situation that students may encounter in their future careers or lives (Hmelo-Silver,2004).

Theory of Learning

Based on the constructivist approach, a theory of learning is framed which lay emphasis on problem-based learning. The theory proposes to provide a constructivist framework that will help instruction thereby resulting in enhancement of the development of thinking and creativity, development of the individual to work efficiently in groups and also help learners to be self-directed. The elements of the theory that can be used to optimise the effects of problem-solving in a constructivist approach and help students move through their zone of proximal development are devised as follows:

Providing Guided Instruction for the Analysis of the Problem Within the Zone of Proximal Development

Analysis of the problem is the breaking down of the problem into different simpler parts. It is convenient to view the problem in sequential units and different dimensions. With the help of the teacher, students can pose sub-questions related to the problem. Seeing what students know and do not know of the problem is the next step. The instructor uses prompts, cues, questions and modeling techniques to guide their thinking and to create interest and motivation to analyse the problem. The teacher can give explanations and clarifications. From the chunking of information, the students arrive at the concepts they need to understand and look into, the relevance of the problem in their everyday lives etc while solving the problem.

Providing Opportunities for Self-Instruction Using Computer Supported Learning Tactics

Constructivism theory itself emphasizes the need of constructing meaningful information independently. Learning tactic is a specific technique one can use to achieve an immediate objective. By providing opportunities for self-instruction students can make an outline of the way and the steps they need to complete the task. To make individuals autonomous, they are given the opportunity to reflect on the problem in order to get an understanding of how different concepts are related to one another and when and how existing knowledge can be applied. Students can make use of different comprehension directed tactics to help them in this process. Self-questioning

is a specific tactic. The framing of different types of questions based on the given problem demands the use and development of different thinking styles. The students can come up with their ideas and answers to the questions raised either independently or with the use of computer technology. Students are given the opportunity to write down whatever questions and reactions that might come up as they progress. This stimulates the use of higher-order thinking skills. Finally, they can identify and organise whatever ideas they have come up with which is relevant to the problem.

Providing Opportunities for Collaborative Based Inquiry Approach

Collaborative learning is an approach that involves a group of peers interacting and working together to solve a problem. Students actively participate in the inquiry by discovering the solution of the problem through peer discussions, debates, reciprocal questioning etc. The size of the group should be small and heterogeneous. Students interact with each other, exchanges information, and challenging one another's reasoning. Care should be taken to ensure the participation of each member. This approach of learning fosters the development of interpersonal skills, communication skills also make the student work effectively in groups.

Incorporating Interdisciplinary Approach to Foster Meaningful Learning

Interdisciplinary approach consciously combines and involves other disciplines to examine a problem. It helps the students to meaningfully link the concepts across different disciplines. Such an approach can create interest and motivation to the learners. It helps in further development of higher order thinking skills. Viewing the problem in different dimensions help the learner to have a broader understanding.

Discussion

The most important goal of instruction is to make students learn to think independently. The constructivist approach involves discovering, questioning, analysing and synthesising information with the guided instruction of teachers. A positive environment helps the students to create learning experiences that will facilitate the social and cognitive development. Adopting problem-based learning in the constructivist perspective incorporates collaborative learning in groups on challenging and interesting problems, fostering diverse points of view, and providing scaffolded instruction. In this challenging and ever-changing society, the researcher hopes this

problem-based learning based on constructivist approach will help students acquire more independent and creative thinking skills.

The studies on constructivism and problem-based learning done earlier have also emphasised that students learn best by constructing their own understanding of reality. Delgarno (2001) suggest that the constructivist classroom should lead students to construct a view of reality. The prominent elements that help us to define a constructivist classroom include both cognitive and social aspect. As per the study of Rakes, Fields, & Cox, (2006), there is a significant positive relationship between technology use and constructivist instructional practices. The facilitator should present and give guidelines to students but should make sure that the explanations are within the zone of proximal development as per the theory suggested by Wittwer &Renkl, (2008). According to Sternberg (2008), we should prepare students to think in an interdisciplinary way so that when they are confronted with a problem, they start with the problem rather than with their toolbox and then work with others. The review of the literature reveals that the problem-based learning in a constructivist classroom surely helps a student to be effective thinkers also to be independent learners.

Although constructivism has many advantages it has been criticized on various grounds. Some of the criticisms and challenges experienced as a teacher are reported below:

The classroom culture followed even now in our educational settings is imparting knowledge through direct instruction in which facts and concepts are transmitted by an expert. There is a set of norms which is to be followed by the teachers and students which is established prior to the beginning of an academic year. The curriculum is set in such a way that the burden is on the teacher. The instructor will be forced to complete the syllabus set within the prescribed span of time. The primary objective of the teacher will obviously be on the completion of the topic rather than using differentiated teaching methods to bring about effective learning.

Moreover, teachers must be sufficiently trained and versatile. They should be able to understand individual differences, different thinking styles, learning styles and also should have a deep understanding of the subject and different teaching methods. Such effectiveness is needed to guide the students and assess them. This is lacking to a certain extent. Even though reforms are

coming up, the execution of it is still at stake. This is due to lack of time, lack of knowledge about the right implementation of methods which cater the interests and attitudes of learners.

The challenge is to convince the authorities that the curriculum should be reformed in order to accommodate learning based on constructivism. The sole responsibility lies with the teachers to prove that constructivist approach is beneficial than the traditional approach. The rigidity of the curriculum creates this problem.

The socio-economic and family background also has an impact on the constructivist approach. In some cases, we can see that the students who are fortunate in having experienced teachers, resources, educated and committed parents, and positive home environment are found to be more successful than the disadvantaged children lacking any such resources. It is the teachers' responsibility to cater to their needs in order to make each and every individual a part of the teaching-learning process.

Collaborative approach to learning also has criticisms when the teacher is not able to make all the students contribute their views in their groups. Sometimes only a few students speak out and their interpretations only dominate the group's conclusions. The teacher has to be vigilant all the time to provide necessary guidance and support. Another drawback faced is the comparison faced when students compare the instructional strategies of different teachers. This is more evident when a subject is dealt by more than one instructor. Students usually have a tendency to adhere more towards the method they view as simple and interesting. Such a problem arises due to individual differences.

Conclusion

A constructivist approach to teaching varies from the teacher directed approach in which knowledge is transmitted through lecture and demonstration and students comprehend this knowledge through drill and practice. In constructivist approach, the teacher is a facilitator who scaffolds students and uses a variety of instructional strategies during problem-based activities. Working productively in collaborative activities and incorporating technology for constructing knowledge is beneficial. The teaching-learning process can be made for meaningful and relevant by integrating interdisciplinary approach. The researcher thus hopes that the study on the problem-

based learning and the theory developed will have a positive and significant effect on the development of higher-order thinking skills and will foster self-directed learning.

References

Ahlfeldt, S., Mehta, S. and Sellnow, T. (2005). Measurement and analysis of student engagement in university classes where varying levels of PBL methods of instruction are in use. *Higher Education Research & Development, 24* (1) 5–20. Retrieved from https://www.cte.cornell.edu/teaching/problem-based-learning.html

American Psychological Association. (2002). Publication manual. (5th ed.). Washington, DC: Author

Bada, & Olusegun, S. (2015). Constructivism Learning Theory: A Paradigm for Teaching and Learning. *IOSR Journal of Research & Method in Education,5*(6),66-70. Retrieved from http://www.iosrjournals.org

Bonk, C. J., & Cunningham, D. J. (1998). Searching for learner-centered, constructivist, and sociocultural components of collaborative educational learning tools. *Electronic collaborators: Learner-centered technologies for literacy, apprenticeship, and   discourse*, 25, 25-50.

Concept to Classroom, ("Constructivism as a paradigm for teaching and learning.," 2004). Retrieved   from http://www.thirteen.org/edonline/concept2class/constructivism/demonstration.html

Bada, & Olusegun, S. (2015). Constructivism Learning Theory: A Paradigm for Teaching and Learning. *IOSR Journal of Research & Method in Education,5*(6),66-70. Retrieved from http://www.iosrjournals.org

David, L. (2015). Constructivism in Learning Theories. Retrieved from http://www.learning-theories.com/constructivism.html.

Dalgarno, B. (2001), Interpretations of constructivism and consequences for Computer Assisted Learning. *British Journal of Educational Technology,32*(2), 183–194. Retrieved from http://onlinelibrary.wiley.com/doi:10.1111/1467-8535.00189

Fisher, R. (2007). Dialogic Teaching: Developing Thinking and Metacognition through Philosophical Discussion. *Early Childhood Development and Care,177*(7), 615-631.Retrieved from http://dx.doi.org/10.1080/03004430701378985

Gagne, E.D., Yekovich, C.W., & Yekovich, F.R. (1993). The Cognitive Psychology of   School Learning. Retrieved from https://books.google.co.in/books

Harel, I., & Papert, S. (1991). Constructionism: research reports and essays. Retrieved from

psycnet.apa.org/record/1991-99006-000

Hemlo-Silver, C. (2004). Problem-Based Learning: What and How Do Students Learn? *Educational Psychology Review,16*(3),235-266. Retrieved from https://doi.org/10.1023/B:EDPR.0000034022.16470.f3

Mangal, S.K. (2008). Advanced educational psychology (2nd ed.). New Delhi: PHI Learning

Private Limited.

Nyikos, M., & Hashimoto, R. (1997). Constructivist Theory Applied to Collaborative Learning

in Teacher Education: In Search of ZPD. *The Modern Language Journal, 81*(4),506–   517.

Retrieved from http://onlinelibrary.wiley.com/doi:10.1111/j.1540-4781.   1997.tb05518.x

Rakes, C.D., Fields, V.S., & Cox, K.E. (2006). The Influence of Teachers' Technology Use on Instructional Practices. *Journal of Research on Technology in Education,38*(4), 409-424. Retrieved from http:// www.tandfonline.com /doi/abs/ 10.1080/ 15391523.   2006. 10782467

Sjøberg, S. (2010) Constructivism and learning. *International encyclopaedia of education, 3*, 485–490. Retrieved from http://cepa.info/2962

Snowman, J., & McCown, R. (2012). Psychology applied to teaching. Wadsworth Cengage learning.

Sternberg, R.J. (2008). Interdisciplinary Problem-Based Learning: An Alternative to Traditional Majors and Minors. *Liberal Education,94*(1). Retrieved from https://www.aacu.org

Walker, A., Leary, H., Hmelo-Silver, C., & Ertmer, P. (Eds.). (2015). *Essential Readings in Problem-Based Learning: Exploring and Extending the Legacy of Howard S. Barrows*. Purdue University Press. Retrieved from http://www.jstor.org/

Wittwer, J. & Renkl, A. (2008**).** Why Instructional Explanations Often Do Not Work: A Framework for Understanding the Effectiveness of Instructional Explanations. *Educational Psychologist,43*(1), 49-64. Retrieved from https://www.researchgate.net