CONCEPT MAP: A STRATEGY FACILITATES MEANINGFUL LEARNING

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Abstract
   Cognitive structures help students make connections with prior knowledge and experience by bridging from the known to the unknown. A good understanding of one's cognitive strengths and needs can be the key to more efficient learning. This is true for all students, particularly in middle and higher levels when there is more work to do and efficiency is a key to success. Meaningful learning describes as deep understanding of the material, retaining relevant information in both visual working memory and auditory working memory, organizing it into a coherent mental structure and integrating it with relevant prior knowledge. Meaningful learning involves recognition of the links between concepts, it has the privilege of being transferred to long-term memory. The most crucial element in meaningful learning is how the new information is integrated into the old knowledge structure. Concept mapping is used to organize related information in a visual manner and this strategy helps students to learn meaningfully and effectively by making explicit the links between the concepts.
   Keywords: *Cognitive structure, Meaningful learning, Visual working memory, Auditory working memory, Mental structure and Concept map..*

Introduction

   Rote learning contributes very little to the cognitive structure of the learner and therefore cannot promote reflective thinking in more critical and abstract manner. If students can see a clear organized picture of a broad unit covering various concepts, then they would build a deeper understanding and appreciation of these concepts. The conventional methods largely encourage the students to memorize concepts even in the area of problem-solving, explanation and comprehension. Many researchers (Duffy, et al. 1986; Susan & Weidinger, 2004) emphasized that much ofthe learning in the classroom is superficial; in that facts, rules, laws and formulae are memorized, knowledge is not usually connected to a coherent frame work that would allow students to make sense of it and to apply in other new situations. Teachers are

frequently surprised by what students don't know or what they are unable to express in a meaningful way. Students either do not retain or have not formed the foundation that allows them to fit new information into an already existing framework. Loyens and Gijbels(2008)and Felix(2005) proposed that teachers adopt constructivists approach to learning in which the learner is an active participant in the learning process, and also construct his own knowledge.

Meaningful Learning

Based on constructivists, students construct their own knowledge structure through active engagement and by constructing their own representation of what they know. Students learn from thinking and doing, and thinking results from an activity. Juniu(2006) has further indicated constructivist environment, students' are challenged to become actively engaged throughout the entire learning process in various ways. Novak(1987) suggested Metacognitive strategies empower the learner to take charge of their own learning in a highly meaningful manner. Metacognitive strategies help learners in evaluating their progress in learning and thus offer good guidance (Herrera, Holmes & Kavimandan, 2011). Concept mapping as a metacognitive instructional strategy is based on the theory of meaningful learning (Ausubel, Novak& Hanesian, 1978; Gowin, 1981; Novak, 1977;Novak&Gowin, 1984).Meaningful learning means that learners can integrate new knowledge into their existing networks of concepts and propositions in their cognitive structures (Malone &Dekkers, 1984). Stoica, Moraru and Miron (2011) found that meaningful learning results when a person consciously and explicitly ties new knowledge to relevant concepts they already possess. Ausubel suggests that when meaningful learning occurs, it produces a series of changes within our entire cognitive structure, modifying existing concepts and forming new linkages between concepts. This is why meaningful learning is lasting and powerful whereas rote learning is easily forgotten and not easily applied in new learning or problem solving situations in the present science curricula.

Concept Map

Concept mapping serves as a strategy to help learners organize their cognitive frameworks into more powerful integrated patterns and to help students learn about their knowledge structure and the process of knowledge construction (Kinchin et al., 2005).Concept mapping is a form of two dimensional diagramming which emphasizes the relationships between and among important concepts (Markow&Lonning, 1998).The heuristic of concept mapping is a kind of meta-cognitive strategy supports learners in understanding concepts and relationships between the concepts (Derbentseva et al 2004; Hibberd et al 2002Novak, Gowin & Johanson 1983). In this regard, it serves as a meta-knowledge and a meta-learning strategy (Jegede et al., 1990). Indeed, many researches on concept mapping have proved that it can

improve meaningful learning and help learners learn independently(Cliburn, 1990; Heinze& Novak, 1990; Kinchin, 2003; Novak, 1990; Novak, Gowin, & Johansen, 1983).

In this way, concept maps also help the student learn, how to learn (meta-learning). It requires the learner to operate at all six levels; knowledge, comprehension, application, analysis, evaluation, and creation (synthesis) of Bloom's educational objectives of cognitive domain. According to Novak and Gowan, (1984) concept maps can make clear to the student how small the number of truly important concepts they have to learn. Concept maps externalize a student's knowledge structure and can serve to point out any conceptual misconceptions, the learner may have concerning the knowledge structure (Okebukola &Jegede, 1989; Jegede, Alaiyemola& Okebukola 1990 Markow & Lonning 1998). This explicit evaluation of knowledge and subsequent recognition of misconceptions allows for finely targeted remediation. Since concept maps are visual images tend to be more easily remembered than text. Teaching through concept mapping employs independent thinking in the students and imparts more of conceptual understanding than the usual rote learning that most of students engage themselves in. It has been found not only useful in promoting students' understanding of concepts but also in facilitating students' abilities to answer questions that require application and synthesis of concepts and to solve problems (Stewart, Vankirk& Rowell, 1979; Johansen 1983; Novak &Gowin, 1984; Ault, 1985;Cliburn, 1987; Okebukola& Jegede, 1989;Jegede, Alaiyemola &Okebukola 1990 Markow&Lonning 1998).

Concept Map as a Brain Storming Strategies

In the views of Chiou(2008)students' achievement is more if they learnt through concept mapping more than did students in the traditional expository teaching class. Conceptual formation added with traditional classroom teaching can help students use their existing knowledge to solve real life problems and develop complex skills and concepts. Concept map teaching model should be incorporated in the new curriculum to supplement existing methodologies in order to enhance student understanding and to the relationship between the concepts. Metacognitive strategies should be used by students in order to improve the learning outcomes. Metacognitive strategies help in developing skills that children already have as well as the skills that they have not acquired. Children who apply the metacognitive strategies in their performance record high grades. Steinbach (2010) identifies the strategies of metacognitive skills like planning, problem-solving, monitoring effectiveness, self-assessment, self-correction and evaluation with the view of progress. Students have the capacity of applying these processes involved inmetacognitive strategies during learning. Although the young learners may not be readily composed of these strategies, Alshammari (2015) contends that learners in various institutions depend on these strategies to realize better academic achievements.

Self-monitoring and awareness helps in developing self-learners who have the ability to plan on their studies for the rest of their learning periods. This links to the self-guidance that the process inculcates in the lives of such learners. Through this, metacognition improves and develops learning experiences in the given field of study. Through improved learning experiences, learners are able to acquire higher problem-solving and learning skills. Metacognitive approaches help learners in evaluating their progress in learning and thus offer good guidance (Herrera, Holmes & Kavimandan, 2011).Drawing a concept map can be compared to participating in a brainstorming session. As one puts ideas down on paper without criticism, the ideas becomeclearer and the mind permits to receive new information. These new information may belinked to ideas already on the paper, and they may also generate new relations leading to new concepts. Constructivist learning theory argues that new knowledge should be integrated into existing structures in order to be remembered and receive meaning. Concept mapping stimulates this process by making it explicit and by requiring the learner to pay attention to the relationship between concepts. Jonassen (1998)argues that students show some of their best thinking when they try to represent something graphically, and thinking is a necessary condition for learning Experiments have shown that subjects using concept mapping outperform non-concept mappers in longer term retention tests (Novak, Gowin, & Johansen, 1983; Jegede, Alaiymola, &Okebukola, 1990; Stoica, Moraru, &Miron, 2011)

Conclusion

Concept map helps the students brainstorm and generate new ideas.Concept map assiststo develop creative solutions to a problem; it is lateral thinking processes by which students are ask to develop ideas or thoughts. Students can then change and improve them into original and useful ideas. Brainstorming can help define an issue, diagnose a problem, making possible solutions and resistance to proposed solutions. It enabling students to gain enhanced knowledge of any topic and evaluate the information. Concept map should also be incorporated as a teaching model in the new curriculum to supplement existing methodologies in order to enhance student understanding on the relationship between the concepts.

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