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Strategies to Improve Concept Development

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Abstract: ***Understanding of the concepts is the basis of education. However, the numerous research studies have shown that many students' at all educational levels have difficulties in understanding the concepts. For more meaningful learning there is need to identify errors, mistakes and misconceptions because prevalence of misconceptions among students not only presents an obstacle to learning but also interfere in further learning. The strategies given in this paper will enable teachers to recognize misconceptions among their students. The concept development in students will be in a holistic manner and there will be decrease in the rote learning of concepts.***

Keywords: Concept, Concept Development, Misconceptions, Rote Learning.

1. Introduction

Traditionally, teaching and learning strategies are becoming increasingly ineffective with a generation of secondary school students that have instant access to information and are accustomed to managing their own acquisition of knowledge. Commonly referenced in curriculum of all grades, concept learning is valuable and necessary in a student‟s education and growth. However, no matter how often the teaching of concepts may be emphasized by the educator, concept-centred curriculum is often a challenge for students to learn. A common challenge for teachers is that while students may retain principles and facts, understanding of concepts and how to apply that knowledge often goes overlooked.

But in reality, concepts and facts require different approaches and different learning strategies. The problem is that facts and concepts often get lumped into the same category, making students unable to distinguish the differences between them. This results in students‟ incomplete understanding of subjects and lessons.

The learning cycle has been used as constructivist approach which in turn is based on Piaget‟s theory of intellectual development. According to this , development is structured by three teaching phases: exploration, concept invention/ introduction and application. Through this sequence students‟ thinking is expected to progress from concrete thinking to formal abstract level.

To understand how to better help students with concept learning, let‟s begin with the definition of a concept.

2. What is a Concept?

Concepts are basic elements of thought. A concept is not observable. It cannot be an observable stimulus or a set of objects, or an observable response. Concept is the cognitive structure which each individual builds for himself in his continuous effort to impose meaning on/upon the chaotic world of his sense. A concept then is, an abstraction and achievement of the concept is demonstrated by the use of the abstraction for classification, communication and problem solving, according to the standard of the culture. In concept learning an individual can discriminate, describe characteristics, use words and apply the knowledge (Vaidya, 1997).

In case of human learning, concept formation is a valued goal. Throughout our instructional arrangement we intend to organize examples and situations in such a way that the learner will be able to acquire concepts. This process of concept formation or concept development involves an abstraction or a perceptual drawing out of the common elements in things and ideas. Generally we designate a concept by its name, such as tree, friendship, honesty, ugly, truthfulness etc. In all these concepts we find a reference to a category or classes of stimuli. Thus the term „tree‟ does not refer to a specific „tree‟ but a whole class of such things is known as „tree‟.

When reading texts, students often try to rotely learn big words, facts and details instead of trying to understand ideas. They learn so that they can „report back‟ information but not apply it (Roth, 1994). Many learners are impeded by the perceived difficulty of concepts presented to them and in the mode of presentation. So, student‟s conceptual structures are studied in all curricular areas in the hope of remediating such impediments to learning.

It is a well known fact that despite the best efforts made by teachers, students do not grasp fundamental ideas covered in the class. Even some of the students give the right responses but are only using correctly memorized words. When questioned more closely these students reveal their failure to understand fully the underlying concepts (Mestre, 1999). Hestene and Halloun(1995) and Eryilmaz and Surmeli (2002) revealed that sometimes students give correct answers but they do not have scientific conceptions. In contrast to it, sometimes students give incorrect answers but when questioned deeply these students reveal the correct scientific conceptions to be termed as mistakes. When a teacher tries to find out the extent to which the students have learned a particular concept teacher finds that students make many types of errors. It is very important for a teacher to identify the error patterns so that he may distinguish between errors, mistakes and misconceptions which help him to proceed in the right direction for the concept development.

3. Errors, Mistakes and Misconceptions

Barrass (1984) wrote of „mistakes" or „errors" and „misconceptions" or „misleading ideas". Eryilmaz and Surmeli(2002), Haki(2005) and Kutuluay(2005) revealed that errors among secondary school students were due to mistakes, lack of knowledge and misconceptions. While identifying errors and misconceptions among students they referred mistakes as the incorrect answers given by the students who have correct scientific conceptions while lack of knowledge as the incorrect answers given by the students who have incorrect scientific conceptions and have no confidence for their wrong conceptions, in case the students have confidence for their wrong conceptions theses were referred as misconceptions

Children come to school already holding beliefs about how things happen, and have expectations – based on past experiences- which enable them to predict future events. Science educators who were interested in conceptual development have used a variety of terms to describe the situation in which students" ideas differ from those of scientists about a concept, like student"s misconceptions, naïve theories, alternative conceptions and alternative frameworks (Blosser, 1987).

Students do not come to the classroom as "blank slates" (Resnick, 1983). Instead, they come with the theories constructed from their everyday experiences. They have actively constructed these theories and use these to make sense of the world are, however, incomplete half truths (Mestre, 1987). These are misconceptions. Misconceptions are any unfounded belief that does not embody the element of fear, good luck, faith or supernatural intervention. Further it has been reported in a number of researches that repeating a lesson or making it clearer will not help students to overcome misconceptions (Champagne, Klopfer and Gunstone, 1982; McDermott 1984; and Resnick, 1983). Rather students who even overcome misconceptions after ordinary instructions often return to misconceive only a short time later.

4. Strategies to Improve the Process of Concept Development

Following strategies can be adopted by teachers to improve the process of concept development.

- The misconceptions resist to change and obstruct the learning process. The teachers are required to take students misconceptions into account. The more the teachers know about their students' misconceptions the more guidance they will be able to provide them to learn. This could contribute to the professional development of science teachers. Smith and Anderson (1993) and Lawrenz (1986) advocated that during (preservice and inservice) teacher education programmes the teachers should be given chances to identify misconceptions held by the pupils in their classrooms.
- It is found that the High achieving students have misconceptions in some aspects as compared to the low achieving students. Therefore, the teachers should consider that even if the students have high scores in the examination, they may have as many misconceptions as the students with low scores (Baweja, 2008). Therefore teachers should emphasize on the conceptual understanding of the students. The constructivist approach is important in terms of encouraging students to think about the scientific concepts and their conceptions.
- A teacher should focus on students cognitive level to eliminate misconceptions, because most of the students in high schools and all students in elementary and junior high schools are in concrete levels; therefore, the major focus of instruction for those students should link between concept and concrete experiences and expect difficulties on linking concrete experiences to abstract concepts When students create this linkage in their mind, they are going to correct their misconceptions and develop meaningful understanding of new concept (Turkman and Usta, 2007). Abraham, Williamson and Westbrook (1994) suggested that if we want to decrease misconceptions, we have to increase experiences. Therefore, the highest priority for a teacher should be to pay attention to cognitive development with the help of activities because experience makes concepts more believable and understandable.
- Class room instructions may be organized in a manner that takes into account students" conceptions. When directly confronted with conceptions that students realize are not scientifically acceptable and through discussion with the teacher and with peers in small groups, students may lead to arrive at more fruitful understanding of concepts of environment. Engel Clough and Wood Robinson (1985) have also suggested providing more structured opportunities for students to talk through ideas at length, both in small groups and whole class discussions.
- Models of conceptual change imply that the learners" ability to refuge links between prior knowledge and sensory input is likely to be of critical importance in learning. Teachers" can assist learners by providing the kinds of information and experiences which will enable them to bridge the gaps between sensory input and prior knowledge. Ideas to be taught should always be related to the relevant frameworks held by the learner and revision of the key parts of such frame works should not be undertaken lightly.
- Explanations of any links between new information and prior knowledge should be made in a variety of ways so that learners are presented with visual, verbal and/ or a diagrammatic format of the principles to be taught. Whenever, concepts are to be introduced teachers should provide significant numbers of examples and non-examples. Generally students study very hard to process information and reach at their ideas. It is not easy to deconstruct these ideas and let go of incorrect ones. Teachers should use a multidisciplinary approach that integrates technology with effective learning and teaching practices to overcome misconceptions. Technology as a part of class room activities motivates and allows students to learn, communicate, and share their knowledge and understanding in a wide variety of ways. Research studies show that treatment with technology decrease misconceptions.
- Concept mapping is a valuable visual learning and thinking technique that helps students understand and communicate a concept and its connections between

examples and ideas.Concept mapping is a valuable theory of learning that teachers can use to evaluate a student‟s level of understanding.

- The use of concept cartoons as a means of enabling restructuring of ideas to occur seems particularly significant.

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