Concept Attainment Model: Fostering Science and Mathematics Learning in Students with Visual Impairment

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Abstract- *Teaching Science and mathematics to students with visual impairment is very challenging. The importance of science and mathematics learning in students with visual impairment is now recognised by all educationists. Science and mathematics is an important subject of school curriculum and is also important in daily living as well as in the study of other subjects. This paper is an attempt to understand the problem of visually impaired students in learning science and mathematics and foster their Science and mathematics learning with the help of concept attainment model. Science and mathematics learning today is becoming increasingly complex and abstract. It is therefore important that new methods and techniques i.e. concept attainment model of teaching must be introduced in order to make the teaching of science and mathematics learning in students with visual impairment more effective and efficient.*

Keywords: Concept Attainment Model, Science and Mathematics Learning, Students with Visual Impairment

Introduction

In the present scenario learning of science and mathematics on all school subjects is crucial for building the base of any subject. Both subjects are important in daily living as well as in understanding psychological dimensions. Learning of science and mathematics in students with visual impairment takes priority, because mastery over these subjects manifests an individual's ability of speed, accuracy, neatness, systematic and predictability. It also projects an individual's capacity of critical, logical and analytical thinking and reasoning. Learning of science and mathematics subject help individuals in analyzing and solving not only day-to-day problems but also problems related to social and economic development of the society. Teaching of science and mathematics to students with visual impairment is not only concerned with the knowledge of the subject but also concerned with the selection of the appropriate content which will be fruitful in their life. So while teaching science and mathematics to students with visual impairment, one should use the appropriate teaching methods, strategies and pedagogic resources that are much more fruitful in gaining adequate responses from the students with visual impairment. We know that the teaching and learning of science and mathematics is very challenging for students with visual impairment and many others factors determine the success of their activity. The nature and

quality of instructional material, the presentation of content, the pedagogic skills of the teacher, the learning environment, the motivation of the students with visual impairment are all important and must be kept in view in any effort to ensure quality in teaching-learning of science and mathematics. Teachers of these students have to use of special teaching methods which help students with visual impairment. Morse and Wingo (1968) viewed the teaching as "understanding and guiding of children as individual and as groups. It means the providing of learning experiences that will enable each learner to grow continuously and sequentially towards an important role in society" (cited in Rajesh Kumar Pandey, 2012).

Concept Attainment Model: Concept and theoretical framework

According to the Dictionary of Education (2002), concept attainment model is class room teaching concept. The basic steps, as in any lesson, are planning activities, implementation of activities and evaluation. In planning the following steps are involved: Identification of goals, selection of examples and selecting the appropriate medium for presenting the examples (i.e. pictures, models, specimens, etc.). The implementation activities involve presentation of examples (in the proper sequence) and the analysis of characteristics. The final step in implementation stage is 'closure' that results in the definition of the concept and the giving the additional examples, etc. At the evaluation stage, the attainment is tested. (Page no-85). The concept attainment model is a type of structured inquiry that helps students to determine the differences between positive and negative examples, observe, classify, and draw conclusions (Saskatoon Public Schools, 2009; Stem Resource, cited in Mayer, 2012). The Concept Attainment Model of Teaching was developed by Bruner, Goodrow and Austine in 1956. This model belongs to the category of information processing models and named as Bruner's Concept Attainment Model. It is a teaching strategy that helps to attain concepts with the help of positive and negative examples. Concept Attainment Model is built around the study of thinking conducted by Bruner. The Bruner's Concept Attainment Model states that the role of teacher is to create situations in which students can learn on their own rather than to provide packaged information to students. It provides an efficient method for presenting organized information from a wide range of topics to students at every stage of development (Patel, 2014). Concept Attainment Model is designed to teach concepts and to help students become more effective at learning concepts (Wanjari, 2005).

Basic elements of Concept Attainment Model

- **Focus:** it is the fundamental aspect of a teaching model. It describes the main objectives or goals of the teaching.
- **Syntax:** it refers the way of presentation of teaching material or the main actions in the model.
- **Social system:** it describes the interactive role and relationships between the teacher and the students and the kinds of norms that are encouraged and the student behaviour that is rewarded.

- **Principle of reaction:** it deals with the reactions of teacher as to how they regard the learner and how they respond to what the learner does.
- **Support system:** it refers to the use of other teaching aids, special skills, knowledge and capacities and technical facilities.
- **Application:** it deals with the feasibility of the model in varying contexts, achieving specific educational goals and demanding specific work environment.

Procedure of the concept attainment model

The concept attainment model developed by Bruner and his associates has three variations. These three models have the same conceptual base but each has slightly different set of activities. These three different models are: 1. Reception model, 2. Selection model, 3. Unorganized material model.

The researcher has chosen the reception model of concept attainment model on her research and this article is based on her research work so description of the model is given here: this model mainly focuses on the clarification of the events and activities. Clarification is mainly done by classifying the special attributes of the concept.

Syntax: Syntax of the model describes the main steps of teaching through the model. The three phases have been given for the development of the model.

Phase I. Presentation of data and identification of attributes

The teacher presents labelled examples in yes and no form. Students compare the attributes in positive (yes) and negative (no) examples and identify the common attributes of yes examples. The students generate hypotheses and state a definition according to the essential attributes of the positive examples.

Phase II. Testing attainment of the concept Phase III. Analysis of thinking strategy

The unlabelled examples are presented to the students. The students identify the correct examples of the given concept from unlabelled examples. The teacher confirms name of the concept and restate the definition according to essential attributes. The students are also required to generate their own examples

Phase III. Analysis of thinking strategy

The students describe their thoughts and discuss the role of hypothesis and attributes. Students also discuss how they attain the concept.

Need for concept attainment model

Several studies highlighted that teaching through concept attainment model influence the achievement of students in different subject and different educational level. Luckpoteea and Narod (2012) explains using varied resources and strategies to present the positive and negative exemplars during implementation of the CAM not only helps students to learn about the concept but actually challenges them to build up knowledge about the concept from multiple angles. The

use of CAM as a strategy has been able to motivate the students, increase their level of participation, enhance conceptual understanding and help to improve performance of students. Patel (2014) concluded that CAM helps in strengthening the cognitive structure of the students. It can be used with all the categories of the students' viz. high, average and low intelligent students. Swain (2016) found that CAM is the most effective strategy in enhancing the understanding level of students. Alam (2017) reveals that concept attainment model was effective in terms of understanding of concepts of sciences. It plays a significant role in improving the achievement of students and helps in strengthening the cognitive structure of the students. Solanki (1995) concluded that concept attainment model was effective in acquiring the concept of science and raising achievement of the pupils. Mayer (2012) found that the concept attainment model is an effective teaching method to engage students in creating their own definitions and had a positive effect on their attitudes and motivations in class. Anjum (2014) reveals that Concept Attainment Model of teaching is effective in terms of geometric concepts understanding of students and suggested CAM will encourage the students to engage in learning activities with maximum eagerness and this will help them to understand the subject matter more clearly. CAM will also help the students to learn the theory and apply the newly acquired knowledge simultaneously. Several studies have investigated that teaching through concept attainment model influence the attitude, critical thinking and learning of students. Joshi (1998) conducted concept attainment model as a technique of remedial teaching in science for students of std. VIII & concluded that approximately 60% of the students improved through remedial teaching using CAM after the first session. Almost 90% of the students improved through remedial teaching using CAM over 3 sessions. Wanjari (2005) found that concept attainment model is effective in developing reasoning ability, scientific creativity among students and found that concept attainment model is effective to promote favourable attitude of the students towards science. In the science and mathematics learning of students with visual impairment is influenced by a student' gender, culture, skill, special needs, ability, interests and teaching approaches in order to learn science and mathematics. It is necessary to use this teaching model i.e. concept attainment model in account of science and mathematics learning of students with visual impairment.

Concept attainment model for students with visual impairment

Tripathi (2006-2007) explained that vision is an important aspect of gaining knowledge because 80% of knowledge is gained through vision. It helps the integrating the information into meaning form which is received by other modalities. The students with visual impairment receive information through other senses like touch, smell, hearing etc. but the lack of vision does not affect the aspiration level of visually impaired students and also suggested that visually impaired students can learn mathematics like general students if they are taught in appropriate manner because most of the problems related to inappropriate teaching methods, and non- availability of teaching learning materials and equipments. Singh (2007-2008) also found that inadequate methods of teaching, insufficient reference materials hinder the mathematics learning of visually impaired students. Tiwari (2012-2013) also suggested that both male and female students with

visual impairment have average to high interest in mathematics therefore proper facilities should be created at the school level so that the students with visual impairment can choose mathematics as a subject in higher level. Joyce also promote teaching strategies and stated, "To provide an all-round development to design suitable instructional strategies which helps students grow emotionally, physically, socially and intellectually (cited in Kumar and Mathur, 2013). Concept attainment model is an important method which incorporated better learning, understanding and retention of learning task. This model could serve as instructional approach to manage the class room activities according to the pre disposition of the learners in order to achieve a variety of educational objectives (Amita, 2009). This model helpful in overcoming hindrance in understanding the learning concept and motivating students with visual impairment need to eagerly participate in teaching learning process. Joyce and Weil (1985) defined teaching as a process by which teacher and students create a shared environment including sets of values and beliefs which in turn colour their view of reality (cited in Rajesh Kumar Pandey, 2012). CAM can help to engage students with visual impairment into formulating a concept through positive and negative examples which makes teaching learning process effective. It serves as an evaluation tool which can improve learning of Science and mathematics concepts and help build connections among abstract concepts.

Conclusion

Science and mathematics learning play an important role in students with visual impairment. It is considered as the vehicle for students with visual impairment in gaining opportunity for better job in their life. By using concept attainment model technique, the teacher not only assesses the understanding of students with visual impairment but also encourages science and mathematics learning in students with visual impairment. CAM increases students' interest and motivation and helps students with visual impairment to better identify similarities and differences between the positive and negative examples. It helps in strengthening the cognitive structure of the students with visual impairment. So, it is clear that concept attainment model can help in better learning of Science and Mathematics in students with visual impairment through positive and negative examples. Through this method, students with visual impairment can evaluate themselves with their response on positive and negative examples and improve their confidence level.

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