CONCEPT ATTAINMENT MODEL: PROMOTING EQUITY AND INCLUSIVENESS IN MATHEMATICS EDUCATION

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Abstract*:* Mathematics education is an important aspect for development in all areas. It is a basic subject which leads to other subject knowledge. Concept attainment model one of the best teaching methods which can improve teaching and learning process and also enhance the quality of identifying any concept with their important feature. In this strategy students identify the attributes of given positive and negative examples, and distinguish examples according to identified attributes and which will be further categorise in common and uncommon examples. This method is useful in classroom curriculum. It is also useful for students with special needs. It is basically learner centred which can more helpful in enhancing learning in mathematics education of students with special needs. This paper is based on my research work, other Ph.D. theses and article cum papers. This paper is also highlights how concept attainment model are important for both students and students with special needs to give the opportunity to learn by doing, to involve actively in problem solving and in promoting equity and inclusiveness in mathematics education.

Index Terms- Concept attainment model, equity and inclusiveness, mathematics education

I. INTRODUCTION

Mathematics education is an important aspect for all- round development of students with special needs. Now- a day's mathematics education is very wide, comprehensive and abstract. It concentrates on the teaching of mathematics concepts and addressing misconceptions that students may grasp regarding mathematics concepts. Mathematics education may be defined as field of mathematics that is concerned with sharing of mathematics content and the process of teaching mathematics pedagogy in order to provide expectations for the development of understanding part of scientific community. It includes subjects like algebra, calculus, geometry and topology etc. If we talk about inclusive setting of school where general and special both students come and gain knowledge but due to lack of proper technique and process, the students with special needs suffer from conflict and confusion in several mathematics concepts and do not perform according to their capability and mostly lag behind from other students. Today era of inclusion so for equality and inclusiveness in education system, the appropriate teaching technique needs to be applying to meet the needs of the students with special needs. Students with special needs, within the limits of their abilities and problems, are able to pursue the mathematics education if appropriate teaching technique and resources are applied. The mathematics education of both general students and students with special needs is all about selection of content to be included, selection of processes and skills to be practiced, and selection of appropriate activities to familiarize the students. Keeping in the mind the immense course content of the mathematics education and need of students with

special needs some new teaching methods must be adopted by the teacher. It has been observed that the students tend to depend on memorization of mathematics concepts instead of applying their rationale and reasoning. Such learning is rarely consolidated and easily forgotten. Thus to avoid rote learning and promoting equity and inclusiveness is to use concept attainment model as a teaching strategy. The concept attainment model was first suggested by Joyce and Weil (1972), is based on the work of Bruner, Goodnow and Austin in 1956. 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 help students with special needs in learning mathematics education. According to Mayer (2012) 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. 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. Anjum (2014) suggests CAM encourage the students to engage in learning activities with maximum eagerness and help them to understand the subject matter more clearly.

II. NEED FOR CONCEPT ATTAINMENT MODEL IN MATHEMATICS EDUCATION

Several studies were conducted to support concept attainment model in mathematics education. Klausmeier and Feldman (1973) reported the effects on concept attainment at the classificatory level of providing a concept definition, a rational set of examples and non examples, a definition and a rational set, and a definition with three rational sets. The concept used as the subject matter was equilateral triangle. It was designed for Fourth grade children. It was found that children learned a significant amount from each of these instructional conditions. Prabhakaram and Rao (1998) explain Concept Attainment Model is more effective in mathematics teaching. Minikutty (2005) studied effect of concept attainment model of instruction is achievement in mathematics of academically disadvantaged students of secondary schools in the Kerala state and found that concept attainment model of instruction is effective over conventional teaching method in terms of the Scores achieved by students in mathematics and also reveal that the concept attainment model helps teachers to cultivate in students power of observation, discrimination, identification and creation of information through inclusion of concrete examples and non-examples of concepts. It is designed to lead students to a concept by asking them to compare and contrast examples that contain the characteristics or attributes of the concepts and other examples that do not contain these attributes and plays a significant role in improving the achievement of students and helps in strengthening the cognitive structure of the students. Angraini, Kartasasmita &Dasari (2010) found that Concept Attainment Model is effective strategy in developing mathematically critical thinking ability among University students and also reveals that Concept attainment model is very relevant in the teaching of mathematics because the CAM can encourage understanding and appreciation of students to the concepts, principles and grows the power of reason, logical & critical

thinking (Mustamin , 2005 cited in Angraini, Kartasasmita &Dasari ,2010). 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. Swain (2016) found that CAM is the most effective strategy in enhancing the understanding level of students. Bala (1997) the students taught through concept attainment model also achieve significantly higher than those taught through conventional method. Concept attainment model helps the students to acquire concepts and thus improve their comprehension power and thought process which enables them to make responsible choices and decisions in their life. The concept attainment model holds promise for future because the schools of the future will be designed not only for 'learning' but for 'thinking. Salvi (1991) reveals that CAM produced higher level of understanding of concepts and encouraged independent thinking, active student involvement and interaction among them. It was found to be equally suitable to the students of either sex and of all levels of self- concept. Majority of the students opined that CAM was better than usual methods of teaching and they would like to learn other subjects through CAM. In the inclusive setting which is influenced by diversity of the students as students' gender, ability, culture, special needs, interest etc. Mathematics education is based on abstract ideas and concept. It is for that reason new methods and techniques of teaching must be introduced in order to make the teaching of mathematics more effective and efficient. According to Luckpoteea and Narod (2012) use of CAM as a strategy which motivate the students, increase their level of participation, enhance conceptual understanding and help to improve performance of students. In this strategy students identify the attributes of given positive and negative examples, and distinguish examples according to identified attributes and which will be further categorise in common and uncommon examples. Minikutty (2005) found in his study that the Concept Attainment Model of instruction was very effective to develop cognitive ability of academically disadvantaged students. It has an important role in bringing about enhancement in teaching process; it could serve as instructional approach to manage the class room activities according to the nature of the students in order to achieve a variety of educational objectives(Amita, 2009). Thus it is necessary to use concept attainment model as a teaching strategy in mathematics education which enable group of students to actively participate in learning mathematics and promote equity and inclusiveness in mathematics education.

III. METHODOLOGY

This paper has been prepared by analysing my research work, other Ph.D. theses and article cum papers. The population of my research work included visually impaired students of class VII studying in U.P. board special schools of Uttar Pradesh. The sample was selected purposively and in this paper sample consisted of 14 visually impaired students of seventh class from Hanuman Prasad Poddar Andh Vidyalaya of Varanasi city. This paper is based on the pilot study of my research work. The pilot study was done for one week (6 days). The first day researcher introduced with process of concept attainment

model to visually impaired students and the next four days researcher explained mathematics concept i.e. area of rectangle through concept attainment model with teaching – learning materials (flash card, real objects, embossed diagram and model). The last day of pilot study researcher discussed the roles of this model and any problems that they faced during the explanation of concept. On the basis of the pilot study researcher discuss following responses of the visually impaired students.

IV. FINDINGS

4.1 Identification of Concept

The concept attainment model helps visually impaired students to learn any concept by determining the attributes of a concept. Firstly Researcher gave labelled positive and negative examples related to rectangle. Researcher showed positive examples of rectangle for example rectangle model and real objects. Visually impaired Students compared the attributes of the positive and negative examples of rectangle then described what they observe as similar and what they observe as different. For example as positive examples – book , A-4 sheet, pencil box, Braille slate, match box and negative examples- sugar cube, stylus, pencil etc. Researcher gave positive and negative examples one by one and showed it with activity. On the basis of positive and negative examples they identified the common attributes of the given concept and approximately three- fourths of visually impaired students identified concept. After that researcher provided some flash cards of example for identifying the concept i.e. area of rectangle. For example- 1. What should we measure if book occupy some places? 2. How many wires required for covering all the side of rectangular park? 3. What should be length of the plastic sheet required to cover the swimming pool? Visually impaired students identified basic difference between positive and negative examples. Various views had been reported by the visually impaired students and approximately six of total visually impaired students identified name of the concept.

4.2 Attaining concept

The researcher gave unlabelled positive and negative examples related to area of rectangle. The examples provided to visually impaired students one by one. Researcher provided positive and negative examples in flash cards. 100% visually impaired students responded by comparing and identifying common attributes in given examples and identified unlabelled examples as ‘yes’ or ‘no’. For confirming the attainment of concept researcher provided some questions based on length and width. Visually impaired students responded over the questions. Researcher confirmed their respond and also confirmed the concepts. In this section visually impaired learned mathematics concept through activity which support learning by doing activity.

4.3 Analysis of thinking strategy

On the basis of positive attributes of concept, visually impaired students described their thought and also discussed how positive and negative examples help them in identifying the concept. Various views had

been reported by the visually impaired students as approximately two- fourths of visually impaired students observed that size and shape of objects changed in positive examples. Visually impaired students also discussed how they identify the common attributes among positive examples. They had mentioned that by comparing and contrasting between the positive and negative examples make concept more comprehensible. The visually impaired students also discussed that activity in identifying attributes enhances their learning efficiency.

V. DISCUSSION

The finding revealed that learning through Concept Attainment Model (CAM) helped the visually impaired students to judge their own competency and change their attitude towards mathematics education. Srivastava (2014) also supported concept attainment model for understanding of concepts to visually impaired students, she also discussed in her study that the concept attainment model was better than traditional method for visually impaired students in terms of concept attainment. The findings showed that positive and negative examples of the given concept have provided better understanding of visually impaired students in the mathematics concept. Visually impaired students compared and contrast the common attributes among positive examples independently which enhanced the confidence level of the visually impaired students. Salvi (1991) also explained in her study that CAM produced higher level of understanding of concepts and encouraged independent thinking, active student involvement and interaction among them. During pilot study, it was noticed that most of the visually impaired students responded on unlabelled examples after comparing the attributes with labelled examples or applying the activity on real objects. Singh (2011) also discussed in his study that concept attainment Model of teaching was effective in developing reasoning ability among students. The findings also showed that visually impaired students focused in performing activity which make classroom environment dynamic. Minikutty (2005) also supported Concept Attainment Model for academically disadvantaged students, and suggested that CAM could manage the class room activities according to the needs of the students and helped in achieving the educational goals. In this study the concept attainment model helpful in learning mathematics concept of visually impaired students and other review also indicates that this model was useful for general students as well as academically disadvantaged students. On the basis of the study the concept attainment model can be apply on other special needs students in learning mathematics concept concerning their needs.

VI. CONCLUSION

Teaching strategy is an important aspect of educational system. Concept attainment model as a teaching strategy which encourages mathematics education and comprehend of mathematics concepts on the basis of positive and negative examples. It promotes problem solving, creativity, critical thinking & understanding in mathematics concept and enhances generalization, giving knowledge of facts, for answering ‘why’ and to tell reasons. It provide a wide range of learning mathematics through activities including discrimination of data on the basis of attributes, selection of concept, generate hypothesis and state a definition according to the essential attributes. It allows teachers to give proper support and

guidance related to mathematics concepts of all group of students. As a result all groups of students participate in learning mathematics through concept attainment model which ensure equity and inclusiveness in mathematics education.

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