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EFFECTIVENESS OF CONCEPT ATTAINMENT MODEL (CAM) OF TEACHING ON THE ACHIEVEMENT OF SECONDARY SCHOOL STUDENTS IN BIOLOGICAL SCIENCE

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ABSTRACT

The present study intends to study the effectiveness of Concept Attainment Model of teaching on the achievement of class X students in biological science. A sample of 100 students of Secondary Schools was randomly selected for the study for each controlled and experimental group, out of sixty students 50 were male and 50 female students were selected as sample for the study. Descriptive and inferential statistics were used to compare the means between the groups and 't' test was calculated to find the level of significance between the calculated means. The finding of the study revealed that the concept attainment model is useful in terms of achievement of students in the teaching of biological sciences. This study provides an additional insight into prior research conducted in concept attainment and its effect on learning. The findings reveal that concept attainment has a noticeable impact on students' achievement in biological science so it should be promoted as a strategy of teaching science.

Keywords: Concept Attainment Model, Biological Sciences, Achievement

1. INTRODUCTION

The process of teaching learning aims at transmission of knowledge imparting skills and formulation of attitudes, values and behaviour. Teaching is a complex activity, which is a cluster of different roles and responsibilities. A teacher has to master multiple roles in order to become more professional. The professional competence can be expanded in two ways: first by increasing the range of teaching strategies that are needed to be employed; second by becoming increasingly skilful in the case of these strategies (Joyce and Weil, 1972). The purpose of teaching is to maximize learning (Gagne 1963). National education aims to develop the potential of learners to become human beings who believe and piety to God Almighty, noble, healthy, knowledgeable, capable, creative, independent, and become citizens of a democratic and responsible. Education is also the most important element in improving human resources. Through human education will master the science that can improve human resources and can solve the problems faced. This is in line with the national education system that the national education functions to develop the ability and form the character and civilization of a dignified nation in order to educate life of the nation.The ultimate responsibility of information processing has been enshrined by the society in teachers. Thus, a theory of teaching must attempt to set forth the means of maximising learning in the part of children. For achieving needed learner behaviour, intellectual developments and acquisition of knowledge and specific mental processes like reasoning, logical thinking, deductive reasoning and scientific creativity be primary concerns for effective and efficient information processing.

A variety of teaching approaches have been evolved to design instruction but which approach/ model of teaching is most appropriate having a better impact, active, efficient and exciting can only be answered through research keeping each model's instructional nurturing effects in view. A theory of teaching must attempt to set forth the means of maximizing learning, needed learner behaviour, intellectual development and acquisition of knowledge and specific mental process like reasoning, logical thinking, deductive reasoning and scientific creativity be primary concerns for effective and efficient information processing.

Teaching of science is based on abstract ideas and concept. It is therefore important that new methods and techniques of teaching must be introduced to make the teaching of science more effective and efficient. Hence the learners must be prepared to process information suitably and meaningfully so that the information can be retained for a longer time and can be used in different situations of life. Because of the importance of concept attainment model of teaching for youngsters' achievement in academics, it is apparently relevant to effectiveness of concept attainment model of teaching on achievement in biological science among secondary school students.

2. CONCEPT ATTAINMENT MODEL

Concept attainment is the process of defining concepts by determining the attributes that are absolutely essential to the meaning and discriminate between what is and what is not an example of the concept. The concept attainment model is historically linked with the work of Jerome S. Bruner and his associates. The concept attainment model is designed to teach concepts and help students become more efficient at learning and creating concepts and effective in defining, comprehending, applying, and using concepts. This model is designed to lead students to a concept by asking them to compare and contrast the examples that contain the characteristics or attributes of the concepts with examples that do not contain these attributes. It is based on the assumption that one of the best ways to learn a concept is by observing examples of it. Concept attainment model is a search for "listing of attributes that can be used to distinguish exemplars from non-exemplars" of various categories (Joyce & Weil 2007).

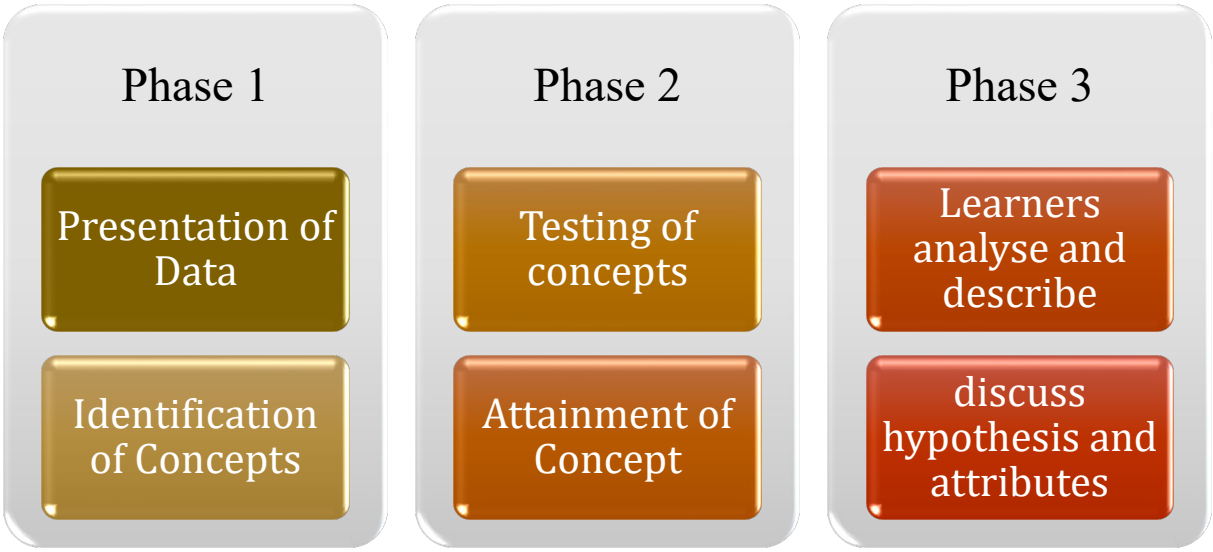

Fig: Three Stages of Bruner's Concept Attainment Strategy

Concept attainment is designed to clarify ideas and to introduce aspects of content. It engages students into formulating a concept through the use of illustrations, word cards or specimens called examples. Students who catch into the idea before others can resolve the idea, and these are invited to suggest their models, while other students are still trying to form the concept. For this reason, concept attainment is well suited to classroom use because all thinking abilities can be challenged throughout the activity. With experience, children become skilled at identifying relationships in word cards or specimens. With carefully chosen examples, it is possible to use concept attainment to teach almost any concept in all subjects.

Concept Attainment Model is very useful in teaching the concepts through the inductive reasoning. Different difficult concepts of various disciplines can be learnt easily by the learner with the help of Concept Attainment Model. The model works wonders in classroom for language teaching and general subjects. The concepts formed in minds of the learners can be retained by them in the mind for a long time. Concept Attainment Model helps the students to work together in groups to present information.

3. NEED FOR CONCEPT ATTAINMENT MODEL IN SCIENCE EDUCATION:

Several studies were conducted to support concept attainment model in science 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. The concept used as the subject matter was classification of bones. 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 science teaching. 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 (2016) found that Concept Attainment Model is effective strategy in developing critical thinking ability among University students and also reveals that Concept attainment model is very relevant in the teaching of science because the CAM can encourage understanding and appreciation of students to the concepts, principles and grows the power of reason, logical & criticalthinking (Mustamin , 2005 cited in Angraini, Kartasasmita&Dasari ,2010). Anjum (2014) reveals that Concept Attainment Model of teaching is effective and 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.

According to Luckpoteea and Narod (2017) 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 science education which enable group of students to actively participate in learning science and promote equity and inclusiveness in education.

4. REVIEW OF RELATED LITERATURE

Vyas (2018) reported that the effect of concept attainment model of instruction was significantly high on the over, standard and underachiever students, in her study, concluded that there is a relationship between preschool children learning who trained statistical mathematics concepts by concept attainment and children in the traditional group.

Anuj Pretha (2017) conducted the study on the effectiveness of concept attainment model in teaching English at the high school level.The objectives of the study were to determine the effectiveness of concept attainment model in teaching English in the total sample and to determine the effectiveness of concept attainment model in teaching sex base. The study was conducted on a sample of 62 students of IX standard of Evans Higher Secondary School, Parassala, TVPM and experimental method was adopted. The study concluded that teaching of the concept attainment model is more effective than the traditional method for achievement in English. Shamnad (2005), in his research, found that the concept attainment model is more effective than the conventional method in teaching Arabic grammar in 9th class.

Thomas (2015) conducted the study on the effectiveness of concept attainment model and test book method in chemistry at HS level. The objective of the study was to determine the effectiveness of concept attainment model in learning chemistry in the total sample. The study was conducted on a sample of 110 students of standard XI of three divisions in Govt. Higher Secondary School, Karapusha, Kottayam, experimental method was used. The study concluded that teaching through the concept attainment model is more effective than the textbook method for the achievement of chemistry.

Sreelekha and Nayar (2014) conducted a study to compare the achievement level between the traditional approach and concept attainment model concerning knowledge objectives, understanding objectives and application objectives. They found that the concept attainment model is effective in improving the overall level of achievement in chemistry. Verma (2001) reported that the concept attainment model improves the inductive reasoning ability of the students.

Antonym (2010) compared the effectiveness of concept attainment model and active teaching model in math achievement at the secondary level. The objectives of the study were to determine the effectiveness of concept attainment model in performance in maths and to compare the efficacy of the concept attainment model in achievement in mathematics based on sex. The study was conducted on a sample of 80 students of 8th standard of two divisions in SHCGHSS Chalakudy, Trissure, experimental method was adopted. The study concluded that teaching of the concept attainment model is more effective than the traditional method for achievement in English.

Researches conducted on concept attainment model depict that student achievement improves when taught through this model. However, studies determining the effectiveness of concept attainment model on the performance of the student in biological science teaching at the secondary school level is nil or negligibly small. Therefore, this little research inspired the investigator to undertake the present study to ascertain the effectiveness of concept attainment model of teaching on the achievement of secondary school students in biological sciences.

5. OBJECTIVES OF THE STUDY:

The following objectives were formulated for the study:

1. To Study the difference in achievement in the mean pre-test scores of control group and experimental group of secondary school students in biological science.
2. To Study the difference in achievement in the mean post-test scores of control group and experimental group of secondary school students in biological science.

6. HYPOTHESES OF THE STUDY:

Based on the review of the literature and the objectives mentioned above, the researcher formulated the following null hypothesis (H0):

1. There exists no significant difference in achievement in the mean pre-test scores of control group and experimental group of secondary school students in biological science.
2. There exists no significant difference in achievement in the mean post-test scores of control group and experimental group of secondary school students in biological science.

7. DELIMITATIONS OF THE STUDY

The study is limited to

1. The secondary school students who were studying in 10th class only.
2. The sample size selected for this study was of 100 only.
3. Achievement is compared to those who fall in the average intelligence group.

METHODOLOGY:

The experimental method was used to conduct this study, two group pre-test post-test design was used.

8. SAMPLE OF THE STUDY:

The present study was conducted on a sample of 100 students of 10th class selected using purposive sampling technique from Government and Private schools of Tamluk Sub-Division.

9. TOOLS USED:

The researcher used the following devices for collecting the data to study the research in hand:

1. Group Test of General Mental Ability (GTMA) 1972 by Jalota.
2. Achievement test in Biological Science prepared by the Investigator.

10. PROCEDURE OF DATA COLLECTION:

In the present study experimental method was used to collect data. Pretest- Post-test matched group experimental design was used in the study. Purposive sampling technique was used. The study was conducted on the sample of 100 students of class X.

1. The students were divided into two groups, i.e. experimental group and control group.
2. Students of both experimental and control groups were selected on the basis of their intelligence test scores.
3. Intelligence test, developed by Dr. S.S. Jalota was used for selection of groups.

The experimental group was taught through concept attainment model and the control group was taught through traditional method (lecture method). The effectiveness of concept attainment model on academic achievement in biological science was determined by administering the achievement test on both the groups of students. Self-constructed achievement test was used for finding the achievement of students in selected concept of biology.

11. ANALYSIS OF THE COLLECTED DATA:

Statistical techniques like mean and standard deviation were used to compare group on pre-test scores, and post-test scores and inferential statistics 't' test was applied to compare the mean post-test scores of experimental control groups to ascertain the effect of concept attainment model in achievement in sciences.

12. RESULTS AND DISCUSSION:

The comparison of the samples was made by testing the significance of the difference between mean pre-test scores and post-test scores, and inferential statistics 't' test was applied to compare the mean post-test scores of experimental and control groups to ascertain the effect of concept attainment model on academic achievement in biological sciences.

Hypothesis 1: There exists no significant difference in achievement in the mean **pre-test scores** of control group and experimental group of secondary school students in biological science.

Table 1: 't' value of Mean Pre-Test Scores of Control Group and Experimental Group of Secondary School students in Biological Science.

Groups	N	Mean	SD	df	t-value	Level of Significance	Result
Control	50	35.91	8.63	98	0.127	0.05 & 0.01 level	Not Significant
Experimental	50	36.23	7.76				

Table -1 reveals that the mean pre- test scores of control group and experimental group are 35.91 and 36.23 and their SDs are 8.63 and 7.76 respectively. When the t-test was calculated to compare the mean pre-test scores of both the groups, t-value is found to be 0.127, which is found insignificant at both the level (0.05 & 0.01) of significance. This shows that there exists no significant difference between the mean pre-test scores of control group and experimental group of class X students. Hence, the null hypothesis 1 is accepted that there exists no significant difference in achievement in the mean pre-test scores of control group and experimental group of secondary school students in biological science.

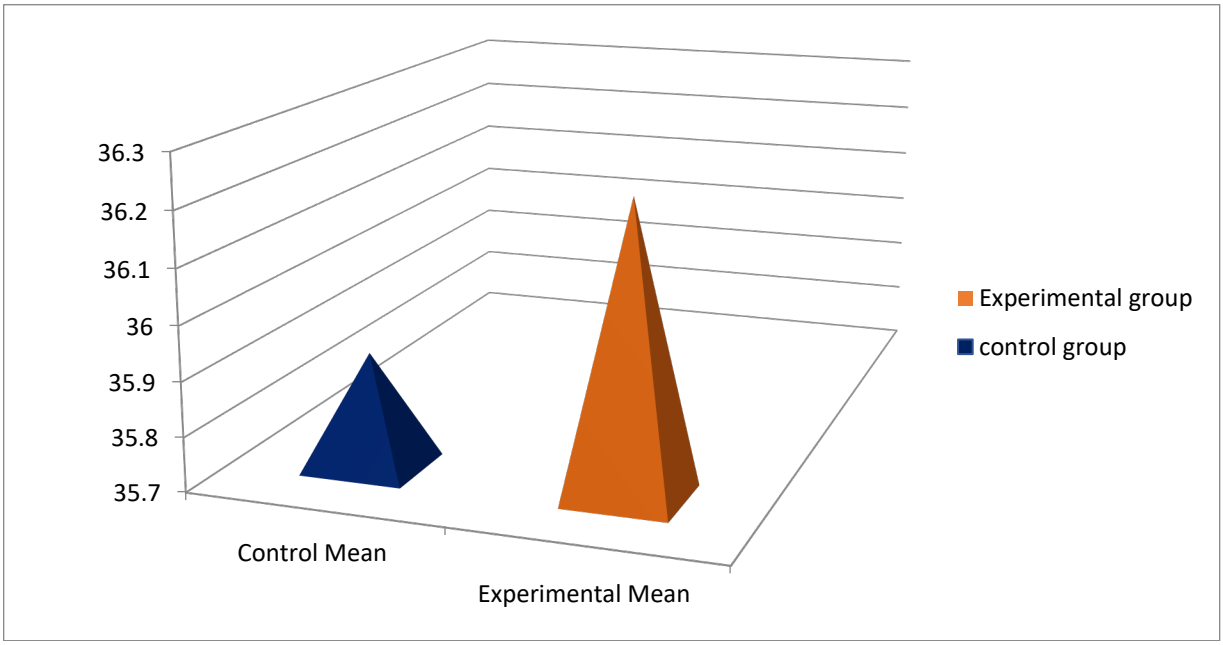

Fig 1: Mean Pre-Test Scores of Control Group and Experimental Group of Secondary School students in Biological Science.

Hypothesis 2: There exists no significant difference in achievement in the mean post-test scores of control group and experimental group of secondary school students in biological science.

Table 2: 't' value of Mean Post-Test Scores of Control Group and Experimental Group of Secondary School students in Biological Science.

Groups	N	Mean	SD	df	t-value	Level of Significance	Result
Control	50	34.55	7.89	98	4.16	0.05 & 0.01 level	Significant at 0.01 level
Experimental	50	40.27	5.67				

Table -2 reveals that the mean pre-test scores of control group and experimental group are 34.55 and 40.27 and their S. Ds are 7.89 and 5.67 respectively. When the t-test was calculated to compare the mean pre-test scores of both the groups, t-value is found 4.16, which is significant at 0.01 level of significance favouring the later. This suggests that the experimental group has higher mean post-test scores as compared to the control group. It can, thus, be inferred that the experimental group is more encouraged and enthusiastic in learning, applying and correlating the concepts simultaneously, resulting in their better achievement. Hence, the null hypothesis 2 is rejected.

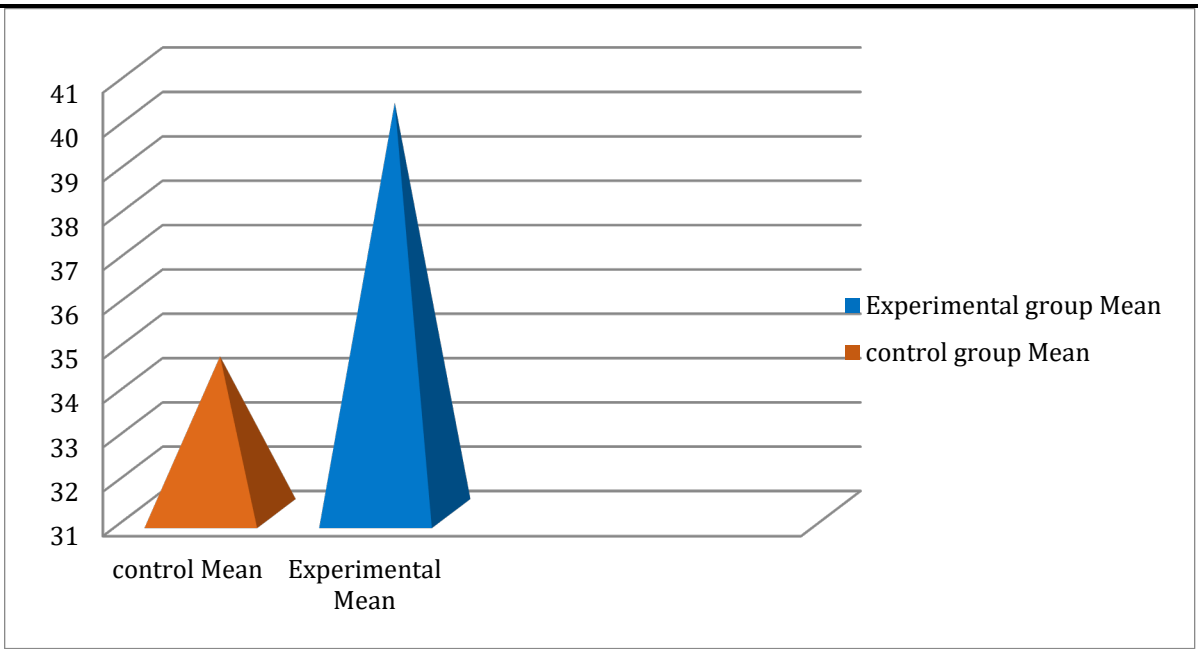

Fig 2: Mean Post-Test Scores of Control Group and Experimental Group of Secondary School students in Biological Science.

13. FINDINGS OF THE STUDY:

1. No significant difference is found in achievement in the mean pre-test scores of control group and experimental group of secondary school students in biological science.
2. The significant difference is found in achievement in the mean post-test scores of controlgroup and experimental group of secondary school students in biological science.
3. The findings reveal that concept attainment has a noticeable impact on students' achievement in biological science so it should be promoted as a strategy of teaching science.

14. CONCLUSIONS:

In the study an attempt has been made to explore the effectiveness of concept attainment model on achievement of secondary school students in biological science. Concept attainment model was found to be effective in influencing the achievement level of class X students in science. It helps to clarify ideas and to introduce aspects of content. Achievement level of the students in biology taught through concept attainment model was found to be higher than the achievement level of students taught through the traditional method. The students of experimental group were looking well motivated and ready to learn through the concept attainment model. The findings of this study have significant implications for parents, teachers, educational planners and learners. They need to know the causes affecting students' achievement level and build on their strength to sustain their motivation.

15. EDUCATIONAL IMPLICATIONS:

Concept attainment model should be used by school teachers in classroom teaching in general and education of biological science in particular. CAM helps in strengthening the cognitive structure of the students. It helps to clarify ideas and to introduce aspects of content. To orient the interest of teachers towards the of CAM in classroom teaching, workshops and seminars should be organised.

In the present days, with a rapidly changing educational scenario, the role of teacher and the teaching are changing fast wherein she is enshrined with the responsibility of promoting fruitful learning and stimulating the students by adopting appropriate strategies. Teaching by concept attainment model and inquiry training model will decrease rote learning. It will also decrease the pressure on memory. The present study will also useful in developing scientific attitude of the students. Teaching strategy is an important aspect of educational system. Concept attainment model as a teaching strategy which encourages Science education and comprehend of scientific concepts on the basis of positive and negative

examples. This study provides an additional insight into prior research conducted in concept attainment and its effect on learning. The findings reveal that concept attainment has a noticeable impact on students' achievement in biological science so it should be promoted as a strategy of teaching science.

CONFLICT OF INTERESTS

None

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REFERENCES:

Amita. 2009. Effectiveness of concept mapping model and concept attainment model in Biology teaching at Ninth grade. Ph.D. Thesis, Ch. Charanh Singh University, Meerut Retrieved from http://shodhganga.inflibnet.ac.in/handle/10603/37009.

Angraini L.M., Kartasasmita B., and Dasari D. 2017. The Effect of Concept Attainment Model on Mathematically Critical Thinking Ability of the University Students. IOP Conf. Series: Journal of Physics: Conf. Series 812(2017) 012010 doi:10.1088/1742-6596/812/1/012010

Anjum, S.K. 2014. A Study of Effect of Concept Attainment Model on Achievement of Geometric Concepts of VIII Standard Students of English Medium Students of Aurangabad City. Scholarly Research Journal for Interdisciplinary Studies, Nov- December, 2014. Vol-II/XV, retrieved from www.srjis.com.

Ahuja Amit (2007). Effectiveness of Concept Mapping in Learning of Science. Doctoral Thesis, Delhi University, India.

Bala, R. 1997. Effect of mastery learning strategy and concept attainment model on pupil's achievement in science, their self-concept and class-room trust behaviour. Ph.D Thesis, Department of Education Maharshi Dayanand University Rohtak.

Brinkmann, A. (2002). Knowledge Maps - Tools For Building Structure in Mathematics. Available at astrid.brinkmann@math.edu.de

Caldwel, W.H. (2006). Developing A Concept Mapping Approach to Mathematics Achievement in Middle School. Proceedings of the Second Conference on Concept Mapping at San Jose, Costa Rica.

Carvalho, M., Arguedas, M., Eskridge, T., et al. (2001). Concept maps: Integrating knowledge and information visualization. In S.O. Tergan& T. Keller (Eds.), Knowledge and information visualization: Searching for synergies (205-219). Heidelberg/NY: Springer LectureNotes in Computer Science.

Chandradinesh Mayuri (2008). To Make Science Learning Joyful. Paper presented in III National Science Teachers' Conference inKolkata, India.

Joyce, B. and Weil, M. 1992. Models of Teaching. (4th- Edition), New Delhi: Prentice-Hall of India Ltd

Kharatmal M. and Nagarjuna G. (2006). Knowledge Organizers of Cell Biology.Knowledge Representation, Homi Bhabha Center for Science Education, TIFR, Mumbai, India, 124-125.

Luckpoteea M. and Narod F.B. 2012. An Investigation into the Use of the Concept Attainment Model in Teaching the "Periodic Table" at 'O'-Level through an Action Research. In M.G. Bhowon et al. (eds.), Chemistry for Sustainable Development, DOI 10.1007/978-90-481-8650-117, © Springer Science C Business Media B.V. 2012

Mary R. Sahay and Raj I. Paul (2007). Effectiveness of Concept Mapping as a Strategy to Enhance the Performance of B.Ed. Trainees in Environmental Studies. University News, 45(44), 67-72.

Moon B.M., Hoffman R.R. and Canas A.J. (2011). Applied Concept Mapping: Capturing, Analysing and Organizing Knowledge. CRC Press.

Nadeem (2011). Using Concept Mapping for Needs Analysis for a Social Support System in Learning Network. International Journal of Interactive Mobile Technologies (IJIM), 5(1).

Patel, M. 2014. Effect of Concept Attainment Model of Teaching on Achievement in Chemistry at Higher Secondary Stage. International Journal for Research in Education, Vol. 3, Issue: 7, December: 2014. Retrieved from www.raijmr.com

Prabakaran and Rao. 1998. Concept Attainment Model in Mathematics Teaching. Discovery Publishing House, New Delhi.

Pongodi N. (2000). A Study about the Use of Concept Mapping in Concept Attainment in Chemistry among Students of Standard IX. Doctoral Thesis, Department of Educational Technology, Bharathidasan University, Tiruchinapalli, India.

Snead Donald S. and Wanda L. (2004). Concept Mapping and Science Achievement of Middle Grade Students. Journal of Research in Childhood Education.

Srivastava, N. 2014. A study of the effectiveness of teaching through Concept Attainment Model for visually impaired students studying in class 8th. Unpublished dissertation, Department of Education, Banaras Hindu University, Varanasi.

Swain, A. 2016. Conceptual Understanding through a Gender Neutral Strategy: An Evaluation of Concept Attainment Model. International Contemporary Research Journal in Management and Social Science, ISSN: 2394 -7691, Volume 2, Issue 2, March 2016

Wanjari, S.S. 2005.Effectiveness of concept attainment model and inductive thinking model of teaching on students' achievement in science, scientific creativity and attitude towards science. Ph.D Thesis, Faculty of Education. Sant Gadge Baba Amravati University, Amravati. Retrieved from http://shodhganga.inflibnet.ac.in/handle/10603/28405.http://www.igi-global.com/science education

Wandersee, J. (2000). Using concept mapping as a knowledge mapping tool. In Fisher, K., Wandersee, J., & Moody, D. (Eds.), Mapping Biological Knowledge, 127-142. Dordrecht: Kluwer.

Xiufeng Liu (2004) studied on using concept mapping for assessing and promoting relational conceptual change in science. Science Education, 373-396.