

CONCEPT MAPS: AN INNOVATIVE APPROACHE FOR TEACHING SCIENCES

Pradeep Kumar¹ & Prof. S.K. Verma², Ph.D.

¹Research Scholar, M. J. P. Rohilkhand University, Bareilly

²Dept. of B.Ed. /M. Ed, M.J.P. Rohilkhand University, Bareilly

Abstract

Teaching of science at upper primary level of education is most crucial. Middle school education is a decisive stage of individual's entire academic tenure ; at this level any ambiguity regarding concepts may deprive an individual intellectually and potentially. The objective of this study were to analyze the current methods of content presentation of science , commonly used to teach in upper primary level classroom. The another purpose of this study is to evaluate the traditional methods of teaching science as well as concept maps method. Basically teaching must include two major components sending and receiving information. Ultimately, a science teacher tries his best to impart knowledge as the way he understood it. So, any communication methods that serve this purpose without destroying the objective could be considered as innovative methods of teaching. Concept maps is one of those innovative method that is used for Teaching science .In teaching science , concept mapping has been widely recommended and used in variety of ways . It has been used to help teachers and students to build an organized knowledge base in a given discipline (Pankratius,1990) or on a given topic (Kopic,Wood & Brody,1990). It has been used to facilitate middle level students' (sixth, seventh, & eighth grade) learning of science content (Gaustello etc. all..2000, Hawk, 1986; Ritchie & Volki; 2000, Simmons et. all, 1988; Willerman & Mac Harg, 1991 ; Sungur et.al.2001; Duru & Gurdal.2000)

Key words: *Concept maps, Innovative approaches, teaching of science, Upper primary level*



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Introduction

Man is a social being and his survival without society can hardly be imagined .To enable an individual to develop harmony with social life, expansion of knowledge is very important by equipping him with certain information, skills, attitudes, and concepts. Science education having a methodology to turn our native curiosity into knowledge, gives us the power and possibility of invention, of finding solutions to problems. So science becomes a priority area in education. Science education is supposed to perform a two- field task. The prime objective is cultivate of scientific temper in an individual, which include a sprit of enquiry, a disposition to reason logically, a habit of judging beliefs and opinions on available evidence, readiness to reject unfounded theories and principles, the courage to admit facts etc. It is also expected of science education that it would give individuals' a firm grasp of the concept and

processes of science and impart to them the ability to use scientific method of problem solving in handling the problems of life.

Science education being an important component of the education system of any country, should contribute to the solution of the problems of the country by the development of cognitive, Affective and Psychomotor domains of its people. As regards the importance of science education The Ministry of Human Resource and Development of India is obligating the schools to apply the newly developed science and technology curriculum (NCF 2005). According to this new curriculum, every student must develop a thorough knowledge of basic science concept, which they can apply in a wide range of situations. The students must also develop the broad-based skills that are so important for effective functioning in the world of work. They must learn to identify and analyze problems and to explore and test solutions in a wide variety of contexts. This firm conceptual base and these essential skills are at the heart of the newly developed science curriculum and must be the focus of teaching and learning in the classroom.

The Hand book of Research on Science Education demonstrates that science education is alive and well illustrates its vitality. It is an essential resource for the entire science education community, including veteran and emerging research, university faculty, graduate students, professionals outside of universities, (Sandra K. Abell & Deborah Hanuscin, 2007).

One of the primary justifications for the inclusion of the nature of science in science education comes from Schwab (1964) who was both a philosopher and science educator . He correctly observed that science is taught as an ‘ unmitigated rhetoric of conclusion in which the current and temporal constructions of scientific knowledge are conveyed as empirical, literal and irrevocable truths (p.24).

There are two major aims of science teaching ; one is knowledge , and the other is enterprise . From science course , pupils should acquire a useful command of science concepts, and principles. Science is more than a collection of isolated and assorted facts.... A student should learn something about the character of scientific knowledge, how it has been developed, and how it, is used. (Hurd,1960, p.34)

Sharma (1980) stated that the importance of science education is essential in the school curriculum because besides satisfying the usual needs for its inclusion as a subjects in the curriculum such as intellectual, cultural, moral, aesthetic, utilitarian as well as vocational

values, science teaching provides training in scientific method and also helps to develop a scientific attitude of mind in the learner. The training in the scientific method and scientific attitude can be applied in daily life situations. For this, science must be given the highest priority in school curriculum.

Need and Significance of the study

The way of imparting knowledge and its ultimate effect on the learner is more important than the quantity of subject matter. It is in this context that the method of teaching deserves special attention. This is more rightly emphasised in the education commission report, (National Policy on Education, 1986). If science is poorly taught and badly learnt, it is little more than burdening the mind, with dead information, and it could generate even into a new superstition.

Instruction and learning in the class room must be pursued according to the methods scientists use. Students should be placed in the position of the scientists and proper atmosphere should be given to think and act, like a scientist. Children must have opportunities for free exploration and should be given chances to practice actively in the learning activity and to process information. To develop an enquiry mind, pupil should engage in the free exploration and should be provided opportunities for activities such as observation, classification, discrimination, interpretation, experimentation etc.

Education reforms in recent years emphasised the need and significance of using innovative approaches for making the teaching-learning process less formal and more interesting. Attempts were made in advanced countries to develop innovative approaches such as outdoor learning, Discovery learning, self learning strategies, Computerised instruction, Concept mapping etc. to make the educational process more liberal and meaningful. Experiments and studies have shown that learning can be made more meaningful, effective and interesting by adopting concept mapping method.

The results of this study revealed that the concept maps for teaching science is not used effectively at upper primary level in India till now. Many methods for teaching science had been adopted in India for many years, but there is no satisfactory result for effectiveness of these different methods in teaching science.

Traditional method of Teaching of Science

In India teaching method that is , commonly used to teach almost all subject including science subjects , is lecture method . This method provides least chance to student's participation . This method is more popular especially in public/ government schools where strength is very large and it seems difficult rather impossible to teach them through experimentation or hands on approach. And there is lack of separate science laboratory. Due to over crowdedness of class , only few students can get opportunity to do practical or experiments by themselves , otherwise students just observe how teacher do it before them. Science subject teaching can not be confined to classroom lecture but these subjects also require experimentation and demonstration with full involvement of students. Students can learn better if they observe things happing before them and by doing them practically. As the Chinese proverb say :

“ I listen ,I forget it

I see , I remember it

I do , I understand it”

So lecture method can not be made useful teaching method if it is incorporated with experimentation in its true sense. (Mrs. Sangeeta Arya ,N.D).

Innovative Approaches of teaching Science

A teaching strategy implies to any method , approach or a carefully and skilfully designed classroom interactive that can facilitate teaching of any concept, idea or a lesson to the students. If any strategy is combined with some new thought, creativity and novelty than it becomes innovative strategy. Regina M.O Samba, Emmanuel E. Achor, Josiah A.Ogbeba (2010) quoted the explanation of innovative approach given in Macmillan English dictionary (2007):

“An innovative approach is a design that is full of new or Purposively reconstructed existing idea.”

Innovation in teaching strategies can be taken in two perspectives, one to design some new technique which is different to already existing techniques another meaning of innovation may be to use existing approaches but in different setting and in different style. So strategy may not be necessarily be new but its use and implication may be novel. In brief actual

purpose is to use various appropriate teaching strategies to ensure better understanding and effective teaching .

Teacher can only bring innovations in his teaching when is well aware of existing developments in education theory and teaching strategies . Science teachers usually encounter with difficulties in order to transmit knowledge to students most effectively because either they are not acquaint with new and innovative teaching strategies or unable to use them. Another reason of lacking novelty in teaching science may be workload of teacher who are expected to accomplish specific content in a limited period of time and get no time for experimenting new methods . Besides all these constraints it is fact that some methods are better and more facilitative than others and teachers should learn how to incorporate different methods in his teaching according to the nature of lesson. Inappropriate method not only harm teaching but also put negative effect on students' learning. Learning difficulties may arise when queries become unsolved in the mind of students and these gradually become the area of student's weakness, so to overcome these weakness and to enable students to excel specifically in science subjects innovative strategies are imperative. (Regina M.O Samba, Emmanuel E. Achor, Josiah A. Ogbera 2010) .

New approaches to Teaching Science

Science education can only be promoted and inculcated among students of Upper primary level when it will be made simple and understandable . To create attraction for students to learn science subjects, generally following approaches must be catered:

- Life oriented
- Lecture cum demonstration and activity oriented
- Use of available resource to make teaching interesting
- Developing understanding of concepts rather than rote memorization
- Learner Centered
- Care about students needs rather than their interest
- Provoking though process
- Motivation for participation

So keeping in view the importance of teaching science , special attention must be given to make it interesting, perceivable, understandable and enjoyable for students by using innovative practices...(Mrs. Sangeeta Arora, N.D)

Role of science teacher is bit different than of other subjects . He should not have command over subject only but be aware of the techniques to manage the construction of knowledge among students of diverse nature in the classroom.

Novelty in Teaching Science

Teaching and learning of science involves transmission of knowledge which developed in result of extensive experimentation so students must comprehend the purpose, nature and necessity of the particular subjects. Teacher should make his teaching innovative to fulfil requirements of the subjects and to make students understand how the subject is developed and how this development process can be continued.(Surendra Prasad ,N.D)

For fulfilment of this purpose an important technique which can help in teaching science and making lecture method effective is development of ‘Concept Maps’. This technique is not used by Upper primary school teachers , so it is intended to develop concept maps which may guide teachers how to incorporate this technique in their teaching.

Concept Mapping

Novak and Gowin have invented a device for development of knowledge known as Concept maps .Concepts are inference of an individual’s mind. It refers to abstract thought based on human perception . Jazlin V. Ebenezer and Sylvia Conner (1998), pg. 49, quoted the definition of concept given by Joseph D. Novak (1991) that

“ A perceived regularity in events or objects , or records of events or objects, designated by a label”.

Leon Pines (1985) as quoted by Jazlin V. Ebenezer and Sylvia Conner (1998), termed it as “the furniture of the conscious mind”

Concept maps actually correspond to ideas or mental images about any topic and represent not only pictorial image but also helps to comprehend interrelated concepts. A concept map is a device that explains relationship among various concepts but in hierarchal manner.

Concept Mapping for Teachers

It is very useful strategy for teachers to learn because it facilitates presentation of lecture in a sequence . It is equally beneficial for students and teacher can train them to design concept maps to organize or arrange their own thought.

Concept maps are very effective technique that facilitate planning of teaching learning process and also help teacher to understand concepts of students.(Jazlin V.Ebenezer and Sylvia Conner 1998,pg 50).

Concept mapping is a beneficial strategy for brainstorming and offer long lasting memory.(N.Kumar ,2009,pg 336,337)

Use of Concept Maps

Concept maps can be useful in various aspects , few are as follows :

Through concept map a teacher can easily teach lengthy chapter in a more understandable and comprehensive way.It can also be used as advanced organizer that can help students to link map with the name of the chapter and can understand what is to be taught.

Teacher can use concept maps to assess students' prior knowledge about the particular concept and can judge baseline of students' knowledge. Development of collaborative relationship. Formation of concept maps helps to develop good relationship between students and teacher because they are expected to share their scientific ideas. It also develops sound relationship among peers when they share their experiences and ideas to each other.

Concept maps are useful activity but unfortunately it is not being used at Upper primary level by science teacher in India.

Significance of the Study

This study is based on the investigation regarding current methods of content presentation of Science and introducing new innovative strategies to overcome the short coming of traditional methods. This study is significant in three ways:

1. This study will introduce innovative and novel content presentation technique for Science at Upper primary level in form of Concept maps.
2. It will help teachers to teach respective subject more efficiently with the help of Concept maps strategy and make rote learning meaningful.
3. This innovative technique will help students at Upper primary level to learn better and ensure more involvement in learning activities.

So hopefully it will be a worthwhile and significant study as for as teaching of Science is concerned.

Design of the Study

This study was of Qualitative in nature . It deals with the current content presentation strategies commonly used for teaching science at Upper primary level and to suggest better techniques in the light of prevailing methodologies.

Population

Population of the study was all relevant literature available in form of books, periodicals, research papers, research articles, thesis, dissertations, magazines, generals etc. regarding the techniques, frequently used for content presentation of Science at Upper primary level.

Delimitation of the Study

Due to the time and financial constraints , this study was delimited to,

- The qualitative study
- The subject of Science
- The Upper primary level only
- The literature available,

Educational Implication

There are several implications for the results of this study. Firstly, this study provides evidence that Concept mapping is a very innovative approach for teaching science , and it is very useful strategies in area of education and research. It can be concluded from the study if a teacher use concept maps specially in teaching science then he/she get a fruitful result in entire teaching learning process. The other implication of this study is if science teacher adopting a concept mapping strategy can significantly improve students' learning achievement compared to using a traditional expository teaching method.The finding of the present study also project the need to introduce concept mapping method for teaching science at Upper primary level as soon as in India.

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