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Achieving Objectives of Science Teaching Using Constructivist Approach

Dr. Monika Davar*

Abstract: Objectives of science teaching emphasize more on the processes of science rather than the product. Development of scientific attitude and providing training in scientific method are the major objectives which have been emphasized at the primary, secondary and senior secondary stages of school. But unfortunately the present system of education focuses more on cramming and memorization of facts and principles rather than conceptual understanding and hands on activities. The present paper aims to explore the use of constructivist approach in achieving the objectives of science teaching. The paper discusses the Implementation of Constructivist teaching strategies such as Inquiry learning, project method, problem solving method, laboratory method and cognitive apprenticeship for achieving objectives of science teaching. Strategies to be followed for teaching learning from home in view of the current pandemic situation are also discussed in the concluding portion of the research paper.

1. INTRODUCTION

As per position paper of 'National Focus Group on teaching science 'published by NCERT following are some of the main objectives of science teaching:

1. To help the learners in the acquisition of skills related to scientific processes.
2. To enable learners to comprehend the the processes and methods of generating scientific knowledge.
3. To make learners relate to the natural environment, artifacts and people at the local and global level
4. To help learners acquire the technological and practical skills which will equip them for entry into world of work.
5. To instill in learners the scientific temper (which includes the characteristic features of critical thinking, objectivity and freedom from prejudice)
6. To arouse curiosity, develop creativity and aesthetic sense in learners in context of Science and Technology.

Following are the objectives of science teaching at various levels:

Objectives at Primary stage

1. To involve the child in hands on activities, exploration, drawing classification, measurement and estimation
2. To arouse curiosity about the world including its natural environment, people and artifacts
3. To help the child in internalising the values of honesty, cooperation cleanliness, concern for life and environment.
4. To enable the child to develop a framework for observing the world. Emphasis will be on development of language through learning science.

Objectives at Upper primary stage

1. To help learners reach the concepts through hands on activities and experimentation.
2. To engage learners in investigating problems. Investigation are to be conducted in groups.
3. To develop the capability in learners to collect information from various relevant sources, organise it and exhibit it in the classroom.
4. To develop self learning skills in the learners. The focus will be on developing process skills.

Objectives at Secondary stage

1. To enable learners to grasp or comprehend the concept, principles and laws of Science and not just know the formal definitions (at the knowledge level).
2. To develop in learners the skills to evaluate critically epistemological status of scientific facts

**Assistant Professor, Maharaja Surajmal Institute; monikadavar@msi-ggsip.org*

3. To equip the learners with skills to perform experimentation as a tool to verify principles of science.

4. To encourage learners to participate in extended activities and projects related to the local issues. Problem solving approach in science may be used.

Objectives at Senior secondary stage

1. To help the learners gain an in-depth understanding and not just knowledge of the core areas and aspects of science.

2. To equip the learners with problem solving and investigatory skills for different scientific topics.

3. To encourage learners to take part in science fairs at National level, conduct investigatory projects and use the problem solving approach to resolve local issues.

A critical analysis of the above objectives of science teaching makes it very evident that objectives of science teaching emphasize more on the processes of science rather than the product. Development of scientific attitude and providing training in scientific method are the major objectives which have been emphasized at all the stages. But unfortunately the present system of education focuses more on cramming and memorization of facts and principles rather than conceptual understanding and hands on activities. The present paper aims to explore the use of constructivist approach in achieving the objectives of science teaching mainly the inculcation of scientific attitude and provision of training in scientific method and processes.

2. CONSTRUCTIVIST APPROACH

Constructivism is an approach according to which people create their own meaning, by combining their existing knowledge with new experiences. Constructivist approach considers brain as an active agent which continuously draws meaning and interpretation on the basis of information received by it. Learning is an active process of constructing knowledge rather than acquiring it. Also instruction is the process of supporting knowledge construction rather than direct communication of knowledge by the teacher.

Forms of constructivism

There are two forms of constructivism: individual constructivism and social constructivism. According to individual constructivists like Piaget and Ausubel, an individual constructs his own understanding whenever he has new experiences in the environment, using his previous knowledge and beliefs.

Social constructivists like Vygotsky and Gergen believe that cultural tools, activity and social interaction play a role in individual's learning. Learners co - construct meaning through social interaction.

3. CONSTRUCTIVIST STRATEGIES FOR ACHIEVING OBJECTIVES OF SCIENCE TEACHING

1. Inquiry learning

Through inquiry learning methods learners try to discover and find out something which was unknown to them before. Learners explore, investigate and discover new knowledge through conducting experiments, solving problems and doing projects. Learners construct their own meaning, as the inquire into the problem and solve it.

2. Project based learning

Project is a purposeful activity which involves students in cooperative investigation in a natural or social environment, provides them opportunity to construct their own knowledge and ends in some finished product (like a project report, model or PowerPoint presentation). Projects engage students in activities and learners get real life experiences in social settings.

3. Problem solving method

Scientists adopt a logical and empirical approach to solving problems. This method is known as the scientific method. It involves solving problems through systematic observation, classification, interpretation of data and using other scientific processes.

Steps in scientific method are as follows:

1. Defining the problem in context of the given situation
2. Collecting data from various relevant sources
3. Formulating hypothesis or tentative solutions to the problem
4. Selecting the most likely hypothesis and testing it through experimentation
5. Drawing conclusions (on the basis of experimental results) and making generalizations
6. Applying the generalization to real life situations.

Laboratory method

This method involves conducting experiments and activities in the laboratory. After determining the objectives of laboratory work and proper preparation, the teacher gives instructions for

the laboratory work. As students conduct laboratory work, the teacher asks questions which encourage critical thinking. Students are encouraged to record their accurate observations even if they are not getting accurate results and try to find out reasons for the same.

Cognitive Apprenticeship

In this strategy, a learner enhances his knowledge and skills by getting guidance from an expert teacher. Teacher demonstrates solving of problems (modelling) and students observe it. They compare their own problem solving abilities with that of the teacher. Then students are provided the opportunity to solve the problems and they are provided feedback by the teacher or expert.

4. CONCLUSION

Learners are active participants in all constructivist teaching strategies. As they conduct hands on activities, investigation and experimentation to solve problems, they construct their own knowledge. Alongside constructing their own knowledge, the learners also learn the processes of science and develop a scientific attitude. Scientific attitude characterized by curiosity, inquisitiveness, open-mindedness tolerance is developed as the students work together in groups and conduct investigation. They also learn how to formulate hypothesis, collect data, conduct experiments and reach to conclusion thus getting a training in scientific method. Using these constructivist teaching strategies the students comprehend the concepts and develop higher order thinking skills rather than just cramming and memorization of facts. Thus Constructivist teaching strategies can help in achieving the objectives of science teaching.

Also, in view of the current situation of pandemic and resulting lockdown, following strategies can be adopted to achieve the objectives of science teaching (while teaching from home) :-

1. Use of flipped classroom approach:
   Students can be asked to go through the study material, collect data and conduct simple exploratory activities at home followed by a discussion in the online classes
2. Simple activities and experiments to be performed by the students as home assignment (using locally available material), followed by submission of its report. After that students can be given feedback by the teachers.
3. Project work to be done during vacations- students can be divided into groups and collaborate online to complete project work. Students can be asked to give presentation in the online classroom after completing the project.
4. Use of simulation to imitate the real life experiences (to be provided to the students)

Use of above strategies would not only help in achieving the objectives of science teaching but also revolutionize the way science is being taught at present. It would lead to a paradigm shift making teaching learning of science more joyful, effective and sustainable.

REFERENCES

[1] Davar Monika (2012), Teaching of Science, Prentice Hall of India, New Delhi.

[2] Dogra, Bharati, 2010, Constructivist Classroom Activities for Biology Learning, *JIE*, Vol.36 (1), May 2010, NCERT, New Delhi.

[3] Kumar, Rajesh and V.K. Gupta, 2009, An Introduction to Cognitive Constructivism in Education, *JIE*, Vol.35(3), Nov.2009, NCERT, New Delhi.

[4] NCERT 2005. *National Curriculum constructivist approach research paper Framework*, New Delhi. School curriculum/ framework 05, 2005, *National Focus Group on Teaching of Science*, 2006, NCERT, (P.8). *National Focus Group on Examination Reforms*, 2006, NCERT, (P.2).

[5] National Council of Educational Research &Training NCERT, 2014. **"Position Paper: National Focus Group on Teaching Science,"** Working Papers id: 5991, eSocialSciences.

[6] Woolfolk Anita (2006), Educational Psychology, Pearson Eduction, New Delhi.Thirteen ed 'Constructivism as a paradigm for teaching and learning' http://www.thirteen.org/edonline/ concept2class/constructivism/index_sub2.html