Vol. 6 No. 2 March 2018 ISSN: 2320-2653 UGC Approval No: 44213 Impact Factor: 3.008

7E LEARNING CYCLE MODEL: A PARADIGM SHIFT IN INSTRUCTIONAL APPROACH

Article Particulars
Received: 24.02.2018 Accepted: 07.03.2018 Published: 27.03.2018

SHALINI SHARMA
Research Scholar, Department of Education
Panjab University, Chandigarh, India

Dr. ANURAG SANKHIAN
Supervisor and Associate Professor
Government College of Education, Sector 20 D, Chandigarh, India

Abstract

Technology has influenced all spheres of education and science. Almost every aspect of scientific exploration has been touched in some or other way by technology and much of today's science would not be possible without it. Science is considered as the expanding, dynamic body of knowledge consisting of new domains of scientific methods and experiences. Present world is shaped profoundly by science and technology and thus bringing about scientific revolution to the society. In other words science can be defined as the practical and intellectual activity that includes the study of the behavior and structure of the universe systematically through experimentation and observation. In today's science curriculum the constructivist approach as a teaching methodology is being implemented in the classroom with an objective to provide the students ample opportunities to construct their own knowledge rather than becoming a passive absorber of science concepts. One of the constructivist approach is 7E learning cycle model which has given due importance to the concept of transfer of learning which is an essential component in science education. Present paper throw lights upon the 7E learning cycle model and review the different research studies related to it. Research studies support that with this model students' problem solving ability, achievement level and scientific process skills can be enhanced.

Keywords: *Constructivist approach, Problem solving ability, Scientific process skills, Achievement, 7E learning cycle model, Transfer of learning.*

Introduction

We are in the era of scientific revolution where the world is shaped profoundly by science and technology. The scientific knowledge is expanding at an exponential rate and thus bringing revolution to the society. Undoubtedly the effects of scientific revolution can be seen everywhere and in every aspect of our lives right from path breaking discoveries in atomic sciences, to discovery of new vaccines in life sciences, to technological advancements in the field of communication. Science has left no

aspect of human untouched, hence we really cannot underestimate the function and scope of science. It is a backbone of human existence. According to NCERT(2006) the imaginative and inquiring human mind has responded in various ways by observing the biological as well as the physical world closely. This human endeavor is what we call science. Science is not confined to just absorbing the facts and reproducing the same but it is something beyond than this. The science education in today's education scenario should aim at understanding the nature of science (NOS) and the nature of science can be learned by doing science or learning through science. Understanding the nature of science is also a necessary ingredient for full realization of a human being.

Science is a practical activity which involves systematic study of behaviour and structure of the universe through experimentation and observation. All societies in the world are making great efforts to ensure that their young learners become full and active participants of their society and can significantly contribute to the nation's development.(Savater,2004)

Teaching science by conventional method will not lead to meaningful students learning. No osmosis phenomenon should work in today's science education scenario where the knowledge gets transmitted from more knowledgeable person(*The teacher*) to the lesser knowledgeable person(*The student*) without much efforts on the part of both teacher and the student as this will be considered as passive absorption of the concepts. The science education system should be remodeled according to the needs and demands of the society so that learners can freely participate in the global issues. This can be achieved by strengthening the school science education by upgrading the existing teaching methods or by implementing innovative pedagogical approaches in the science curriculum.

Purpose of Science Education

The most important purpose or aim of science education is to prepare the scientists of tomorrow. Broadly there are four purpose of science education which has been discussed below-

- Preparing learners to continue their career in science.(Pre-professional training)
- Learners to be equipped with practical skills.(Utilitarian purpose)
- Building learners' scientific literacy so as to enable them to actively participate in science related debates.(Democratic purpose)
- Development of learners' skills in scientific thinking as part of intellectual enculturation.(Intellectual purpose)

Constructivism

NCF prepared by working group of NCERT (2008) explicitly highlighted the importance of constructivism as a teaching approach for understanding the nature of

science. Constructivism is a broader pedagogical approach used in science education. It brings about paradigm shift from teaching to learning, focuses on knowledge construction rather than knowledge reproduction. By adopting such pedagogical approach students will be able to understand or develop various processes involved in doing science since students are given spaces for their own ideas and imagination. Constructivism approach may act as a catalyst for the learners to understand the nature of science and it is based on a belief or philosophy that students are not empty vessels that need to be filled rather their prior knowledge acts as strong background for learning new knowledge. In this approach the learners create their own knowledge after undergoing various science processes involved in doing science experimentation and thus reflecting on those experiences.

The increase in interest in constructivism has led to the incorporation of this approach into more practically focused learning and teaching programs and development of number of revised learning strategies. In this teaching approach the teachers are the key players. They play a vital role in teaching learning process in terms of guiding, facilitating and addressing the students during the learning process. According to Oh and Yager (2004) the constructivist learning environment is considered vital in the classroom. It also provides aspiration to science educators to improve student's engagement in the classroom.

Characteristics of Constructive Learning-According to Alam(2016) following are the characteristics of constructive learning-

- Objectives and goals are derived by the students or in negotiation with the teacher.
- Learners' prior belief and attitude is taken into consideration in knowledge construction.
- Teacher serves as a coach, mentor, tutor or a guide.
- Activities and opportunities are provided to encourage self-analysis, meta-cognition,self-regulation,self-awareness and self-reflection.
- Students play a key role in mediating and controlling the learning.
- Knowledge construction is emphasized rather than knowledge reproduction.
- Teachers need to be more skilled and well equipped for implementing the teaching approach.

Learning Cycle

The learning cycle model as a pedagogical approach is based on constructivism where the learners construct their own knowledge. Mecit(2006) advocated that researchers in science education field have tried to develop learner centered teaching approach and one of the best way to use learner centered pedagogical approach in the classroom situation is by using learning cycles which involve series of

planned strategies used by the instructor during the teaching learning process. The learning cycles are based on mental development theory given by Jean piaget (1980).According to him the mechanism involves three steps of learning given as under:

Assimilation: It involves embedding new experience into an existing schema.

Accommodation: In this step with new experience existing schema is revised.

Equilibrium: Through assimilation and accommodation it seeks cognitive ability.

Significance of Learning Cycle

Learning cycle offers new approach to science educators. According to Ozmen (2004) The learning cycle methodology is much more effective in teaching tangible concepts in science. Edmund (2008) in his study explained that learning cycle as pedagogical approach is a best way to structure inquiry in science. The learning cycle model occurs in various planned and sequential manner. According to the author the learning cycles are important because these are theory based design for inquiry that works effectively if implemented adequately.

7E Learning Cycle Model

7E learning cycle model is a useful recommended instructional approach in science curriculum and in today's science curriculum scenario the instructors or the teachers should be encouraged to incorporate this model into their teaching (Balta & Sarac, 2016).Arthur Eisenkraft (2003) also recommended that sometimes the existing learning models should be amended to maintain its value after new knowledge has been gathered. Curriculum of science education at a school level demands that highly successful 5 E learning cycle model should be expanded to a 7 E learning model. Such change in 5 E models is not suggested to add complexity but to ensure the instructors not to omit crucial components for learning. The importance of 7E model lies in the fact that it greatly emphasized on the importance of eliciting previous knowledge or understanding of the learner and secondly transferability of learning which is the utmost part in science education.7E learning cycle model is a series of seven planned and interconnected phases in which the learner goes through various scientific investigations by exploring teaching material, build the concept after arriving at a certain conclusion and finally apply the concept or a principle in a novice situation. The description of each phase of the 7E model is given as under:

Elicit Phase

Present researches in cognitive science have shown that eliciting prior knowledge or understanding is a necessary element of teaching learning process as it creates strong background for other phases. The main objective of this phase is to provide an opportunity to the learners to express their intuitive knowledge as students are not an empty vessel that needs to be filled rather their prior understanding serves as a strong

foundation for learning new knowledge. This phase activates the student's existing knowledge. Beginning abruptly from engage phase can be thought as deficient in supporting the thinking abilities, hence it is must to revive the older information possessed by the learners. The role of both the teacher and the student at each phase is described under separate headings.

What the Teacher Does

The teacher play an active role during the eliciting phase. The teacher may provide external stimulus in the form of concept cartoons, incomplete mind maps or concept maps by giving them the central idea.KWL(Know Want Learn) charts can also be presented among the students. Elicit phase should stand alone as a reminder of its importance in constructive learning.

What the Student Does

Students will actively participate during the elicit phase. As the central idea about the concept is provided to them students will try to connect the given concept with their previous knowledge. In this phase the students will be given spaces for projecting their own ideas and creativity.

Engage Phase

The expansion of 5 E model does not exchange the elicit phase with the engage phase. The engage phase is still a necessary component. In this phase the instructor will make students to engage in this phase through eliciting phase.

What the Teacher Does?

The teacher will try to generate interest and stimulate excitement of the students towards the concept in whatever ways possible like by showing them small science activities. In this phase student's previous misconception will be identified by the teacher.

What the Student Does?

Students will do brainstorming during the engage phase. They will use think-pair-share technique to express their ideas to their peer groups. This phase will raise many questions in students' minds. They will ask to themselves some questions like what do I already know about this?, why this thing happened?, and what can I conclude from this?.

Explore Phase

In this phase the students are given various opportunities to think freely but within the limits of the activities. The student's role in this phase is vital and the teacher will play a passive role though he will address and guide the students towards building a new concept during this phase.

What the teacher does?

The teacher will encourage the learners to work together in a collaborative and cooperative manner. He may ask probing questions for redirecting the learner's investigation. The teacher will provide time for the learners to puzzle with the problem given to them. In short the teacher in explore phase will act as a consultant for the students and will create need to know setting for them.

What the student does?

The students will test predictions. They will make certain hypotheses based on the evidence collected, record data and interpreting the data and finally organizing their findings. In this phase peer discussion is given due importance, students will discuss their findings with their peer groups.

Explain Phase

In this phase students are given opportunities to verbalize their conceptual understandings. Both the teacher and the student will play an active role in this phase.

What the teacher does?

The teacher will encourage the students to explain the concept in their own words. He will ask for clarification and justification from the students. The teacher will then formally introduce the definitions or the scientific terms. Students' growing understanding will be assessed by the teacher.

What the student does?

In this phase students try to comprehend their explanations. They will explain possible alternatives or solutions. They will listen critically to their peer group explanation. Students can also question other's explanation. They will be given an opportunity to assess their own understanding.

Elaborate Phase

This phase helps in extending learner's conceptual understanding. Students will get deeper understanding of the concepts by performing similar kinds of activities. Their practical skills will be enhanced and refined through this phase.

What the teacher does?

The teacher will help the students to think of alternative explanation of the concept. More opportunities will be provided to the students to enhance and refine their practical skills. Similar activities can be shown to the student in order to get deeper understanding of the concept.

What the student does?

Students uses their previous knowledge to ask more questions, make decisions, propose solutions etc. They will tend to draw reasonable conclusion from the evidence.

Evaluate Phase

What the teacher does?

In this phase teacher will assess student's understanding of the concept with formative as well as summative evaluation. The change in students' thinking abilities will be observed. The teacher may ask open ended questions, may provide mind map, concept cartoons or KWL chart to complete the information they have learned during the process.

What the student does?

Students will answer open ended questions asked by the teacher. They may be asked to interpret data. Similarly other evaluation tools may be used to evaluate their understanding by completing the mind map or KWL chart. Students may also be asked to complete a summary report during the evaluation phase.

Extend Phase

Some researches reviewed that expert learners are much more adapt at the practice of transfer of learning which is required in good instruction (Bransford and Cocking, 2000).The aim for adding this phase is to inform the teachers that applying traditional assessment ways is not the last process. The addition was intended to remind the science educators explicitly the importance of practicing the transferability of learning.

What the teacher does?

Science educators need to make sure that the concept studied by the students is not just confined to elaboration and evaluation but once a particular skill or a concept is learned, it must be applied in a novice or an unfamiliar situation.

What the student does?

In this phase the students will practice transfer of learning. They tend to apply the skill or a principle learned in the classroom in a new situation. The transfer of concepts in a new situation will help students to retain the topic for a longer duration.

Relevance of 7E Learning Cycle Model in School Science Education

7E learning model is a useful instructional approach and it should be introduced in the science curriculum and since the effects of 7E learning strategy is high that the science educators should be encouraged to implement this approach into their teaching(Balta & Sarac,2016).The instructional material prepared using 7E model was

successfully able to enhance the critical thinking abilities of junior high school students(Rahmayani, Jatmiko & Susantini,2016).In other study the implementation of 7 E learning cycle was able to improve the student's concept mastery and critical thinking ability.(Indrawati, Suyatno & Yuanita,2017).

Turgot, Colak and Salar (2016)concluded in their study that the course material prepared according to 7E learning model was effective in building the concepts among high school physics students. Another experimental study was conducted to improve the 9th grade student's achievement in biology using 7E learning model and the results showed that the student's achievement level was enhanced with 7E model as compared to traditional instructional approach (Shaheen & Kayani,2015). Erlina (2016) advocated that the physics course material developed in accordance with 7E learning model was effective in enhancing the problem solving ability of high school students.

Gok(2014) investigated the effects of 7E learning model on sixth grade student's conceptual understanding and science process skills and concluded that the 7E model was effective in enhancing the science process skills and conceptual understanding of the students. Another experimental study was conducted on 11th grade students using 7E learning instructional model with metacognitive technique and the findings showed that the experimental group of students gained high score on achievement, integrated science process skills and critical thinking ability (Sornsakda,Suksringarm&Singseewo,2009).Student's attitude towards chemistry was came out to be positive among secondary school students with 7E learning model (Adesoji&Idika,2015).

Conclusion

The above review of literature on 7E learning cycle model reflects that the 7E learning cycle model is much more effective than those of traditional methods as this instructional strategy will beable to enhance the achievement level,critical thinking abilities and positive attitude towards science among the students, hence we can conclude that this instructional strategy is an important intervention and more researches should be conducted on 7E model using other important variables in Indian education setting as this will add volume to good researches conducted in the education field which could be a significant contribution not only in the field of education but also to the nation's development.

References

1. Adesoji, F. A., & Idika, M. I. (2015).Effects of 7E learning cycle model on secondary school students learning outcomes in chemistry. *Journal of the International Society for Teacher Education*, *19*(1), 7-19.

2. Alam,M.(2016).Constructivism: A paradigm shift from teacher centered to learner centered approach .*International journal of Indian psychology,4*(1),79.
3. Balta, N., & Sarac, H. (2016).The effect of 7E learning cycle on learning in science teaching: A meta-analysis study. *European Journal of Educational Research*, *5*(2), 61-72
4. Bransford,J.D.,Brown,A.L.,&Cocking,R.R.(2000).*Howpeoplelearn*.Washington,D.C:National.AcademyPress.RetrievedonJanuary20,2018fromhttp://www.nsta.org/publications/news/story.aspx?id=48547
5. Edmund, A. M. (2008).Why the Learning Cycle. *Journal of Elementary Science Education*, *20*(3), 63-69.
6. Eisenkraft, A. (2003). A 7E model emphasizes transfer of learning and the importance of eliciting prior understanding [Blog post].*The science teacher*, *70*, Retrieved on January 15,2018 from http://blogs.uww.edu/outreach/files/2014/08/Eisenkraft.pdf
7. Erlina, N., Jatmiko, B., &Raharjo, R. (2016).Developing physics learning material based on 7E learning cycle model to improve problem solving skills. *Journal of Science Education*, *5*(2), 1032-1038.
8. Gok, G. (2014). *The effect of 7E learning cycle instruction on 6th grade student's conceptual understanding of human body systems, Self-regulation, Scientific epistemological beliefs and science process skills*. Doctoral Dissertation, Middle East Technical University, Ankara: Turkey. Retrieved on February 5,2018from http://etd.lib.metu.edu.tr/upload/12618164/index.pdf
9. Indrawati, W., Suyatno, S., &Yuanita, Y. S. (2017).The effectiveness of 7E learning cycle model on student's concept mastery and critical thinking skills. *Journal of Science Education, 5*(1), 788-794.
10. Mecit,O.(2006*).The effect of 7E learning cycle model on the improvement of fifth grade student's critical thinking skills*. Unpublished Dissertation, Middle East Technical University, Ankara: Turkey. Retrieved on January 25,2018 from http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.632.9464&rep=rep1&type=pdf
11. National Council of Educational Research and Training.(2006). *Position paper: National focus group on teaching of science (*1st ed.).New Delhi: NCERT Press. Retrieved on February 11,2018from http://www.esocialsciences.org/Download/repecDownload.aspx?fname=A2014725105216_20.pdf&fcategory=Articles&Aid=5991&fref=repec
12. National Council of Educational Research and Training.(2008). *National curriculum framework for school education*. New Delhi: AravaliBooks. Retrieved on January 25,2018fromhttp://www.ncert.nic.in/rightside/links/pdf/framework/english/nf2005.pdf

13. Oh, P. S., &Yager, R. E. (2004). Development of constructivist science classrooms and changes in student attitudes toward science learning. *Science Education International*, *15*(2), 105–113.
14. Özmen, H. (2004). Learning theories and technology supported constructivist learning in science education. *The Turkish Online Journal of Educational Technology, 3*(1), 100-111
15. Rahmayani, A., Jatmiko, B., &Susantini, E. (2016). Learning software development using 7E learning cycle to increase critical thinking of students. *Journal of Science Education, 5*(2), 957-961.
16. Savater, F.(2004).*El valor de Educar*, (The Value of Educating) Barcelona Editorial Ariel.
17. Shaheen, M. N. U. K., &Kayani, M. M. (2015). Improving student's achievement in biology using 7E instructional model: An experimental study. *Mediterranean Journal of Social Sciences*, 6(4), 471.
18. Sornsakda, S., Suksringarm, P., &Singseewo, A. (2009). Effects of learning environmental education using the 7E-learning cycle with metacognitive techniques on learning achievement, integrated science process skills and critical thinking of mathayomsuksa students with different learning achievement. *Pakistan Journal of Social Sciences*, 6(5), 297-303
19. Turgut, U., Colak, A., &Salar, R. (2016). The effect of 7E model on conceptual success of students in the unit of electromagnetism. *European Journal of Physics Education*, *7*(3). Retrievedon February 12,2018 from
20. http://search.proquest.com/openview/bf72b9b40919b0b979dc402892e78059/1?pq-origsite=gscholar&cbl=1946345