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Effect of the 7E Learning Cycle Model on Students' Achievement in the Subject of Science at the Elementary School Level

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Abstract: *Innovative teaching strategies help students get an opportunity to think critically and reflect. This study aimed to investigate effectiveness of 7E learning model to teach the science subject to grade VIII students. This quantitative study was carried out at Govt. Girls High School 90 SB Sargodha using intact group sampling. Control group students were taught science subject by traditional instruction method, while experimental group students were taught with respect to sequence of 7E (Elicit, engagement, explore, explain, elaborate, & evaluation) learning cycle model for twelve weeks. Science Achievement Test (SAT) was used as pre-test and post-test. SAT was pilot tested and validated by the science teachers before administration to experimental group. Reliability of test was .92, measured by split-half method. Performance of both groups was compared using t-test. Students taught through 7E instructional strategy scored higher in posttest as compared to students of control group. Findings of this study are useful for developing curriculum material, lesson plans and improving classroom practices. Incorporation of 7E learning cycle model in science curriculum is necessary, so students can construct their knowledge themselves by actively participating in class and create ideas to solve everyday problems.*

Key Words: 7E Learning Model, Students' Achievement, Science Literacy, Traditional Instructional Model

Introduction

In the current era of science and technology, scientific knowledge is increasing, technological innovations advancing rapidly, to get along with the developing world, science and technological education has vital role for the future of societies and impact of science and technology can be clearly seen in every field of life today (Karamustafaoglu, 2010). Moreover, science literacy that helps individuals to develop socially acceptable behavior is also essential to compete with the highly competitive and integrated world economy. Science learning plays fundamental role in understanding the world because it develops in people capacity to clarify ideas, think critically and ask questions, test explanations through observation and measurement, and use results to establish the worth of a concept or idea. Science can be regarded as the integral part of human life and relevant to everyone. Attitude towards learning, subject, teaching methods and utilization of knowledge gained in the past as well as finding future possibilities are fundamental for learners as they strongly influence learning process (Safdar, 2007). The instructive methods used are not fulfilling the demands of twenty-first century's learners.

Science educators desire to improve student learning and increase positive engagement in the classroom by employing more effective instructional strategies. In the old-style teaching methods, the important decisions about what to teach; in which context; what instructional techniques to be used; and how the work of students to be evaluated are made by the curriculum designers (Gros, 2002). Henceforth, the main improvement in the educational field is the exploration of the ways by which the students get an opportunity to think critically and reflect. Since many years the science educators are trying to develop

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the student-centered instructional strategies (Mecit, 2006). One way is to use the learning cycles that promote learning and student engagement.

Past research showed that students bring with them their perception of scientific concepts when they are exposed to new learning situations (Resnik, 1983; Strike, 1983). According to Vighnarajah, Luan, and Bakkar (2008), learners consider the new ways and possibilities of creating and organizing information by constructing their own patterns of knowledge. Carvallo and Laubach (2001) described that instructional model as "a teaching method is concerned about the nature of science which is based on inquiry and the way in which children learn naturally". Various instructional models of teaching science curricula have been developed that ranges from 3 phase model, 4E to 5E and 5E to most recent 7E learning cycle model by Eisenkraft (2003). No matter whatever the variation in the number of phases in each instructional model, the central goal of all is the same (Settlage, 2000). A number of researchers stated that the approaches underlying the instruction models help students to better understand the scientific concepts, develop ability to reason and to correct the misconceptions and misinterpretations related to science concepts (Alam M., 2017; Akar, 2005; Alsalhi, 2023; BalcÕ, ÇakÕro÷lu, & Tekkaya, 2006; Boddy, Watson, & Aubusson, 2003; Brown & Sandra, 2007; Ceylan, 2009; Kaynar, Tekkaya, & Cakiroglu, 2009; Mecit, 2006; Spencer & Guillaume, 2006).

In Pakistan, Science is a taught as compulsory subject for grade IV to VIII. The school children struggle to understand scientific concepts and the achievement in science remained low. Students of grade VIII scored average score 478 that was below mean (500) that showed the low achievement in science by grade VIII students in National Achievement Test, 2016 (NEAS, 2018). Achievement in science (NAT) remained 498 in public schools also below the mean (500). Moreover, the achievement of students of rural areas and public schools was also lower than those studying in private schools and belong to urban areas. Average score for urban area students was 44.5 percent as compared to 42.1 percent for rural area students. The mean score in Standardized Achievement Test (SAT) for class 8 was 25.9 percent average (out of 100), that indicates that performance is unsatisfactory (School Education & Literacy Department, 2017). The reports of the Punjab Examination Commission (PEC Research & Analysis Wing, 2015; PEC Research & Analysis Wing, 2016; PEC Research & Analysis Wing, 2017) show a trend of poor results in subject of science in Punjab province as compared to other subjects. Thus, achievement score in the subject of science at the elementary school level is low in Pakistan as reported in National Achievement Test, 2016 (NEAS, 2018). The traditional method of teaching science is simplistic and not aligned with the methods recommended in the National Curriculum for General Science, 2006 (Curriculum Wing, 2006). Consequently, many students do not develop the understanding of basic concepts of science and objectives of science curriculum are not achieved.

The work has been done over the time to develop the inquiry-based teaching and learning strategies. Eisenkraft (2003) amended the 5E instructional model to 7E learning model keeping in view that important components elicitation and extension of knowledge should not be omitted. The 7Es learning model consists of seven phases (Elicitation, engagement, exploration, explaining, elaboration, evaluation & extension) that emphasize deduction and building concepts on the basis of previous knowledge; provides the learners 'growth and success (Kazempour, 2013). The 7E instructional model help students in better understanding the scientific concepts by integrating knowledge gained in past and at present. It also helps students to extend their knowledge to new situations. The model helps to improve the achievement score in the science subject by transfer of learning in a better way. The study used the 7E learning cycle to investigate whether it is effective for teaching science to elementary students or not?

Literature Review

The instructional methods used affect learning and effective strategies improve the learning practices. According to Glynn, Yeany and Britton (1991) regarded learning as "an active and complex process of acquiring new knowledge which involves interaction of cognitive processes". Learning is a social process according to Bruner (1973) who stated that construction of new knowledge depends on the existing knowledge. In addition, learners should develop the questioning skills, planning investigations, collecting data and giving explanations reasonably and communicating the results of investigations effectively. The

emphasis of teaching and learning should be on meaningful learning experience (Slavin, Lake, Hanley, & Thurston, 2012). Meaningful learning is preferred to old learning methods (Saka & Akdeniz, 2006).

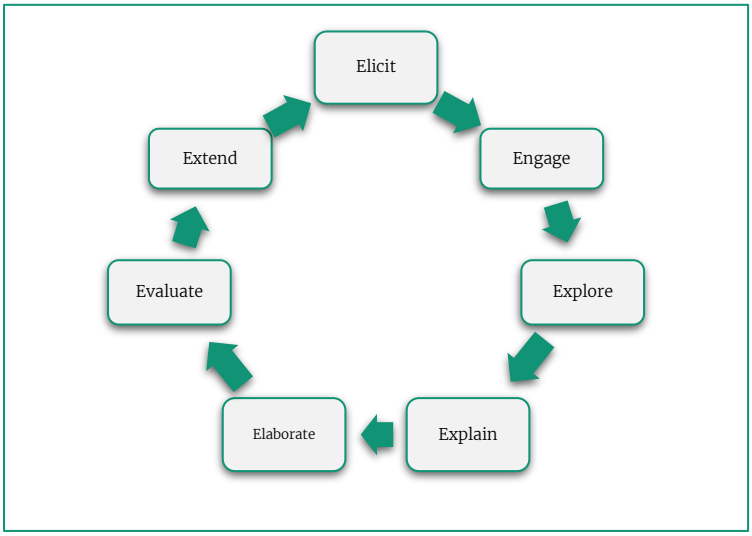
There exist two different approaches to teaching and learning. One is systematic approach and other is constructivism. The systematic approach emphasizes the transmission of knowledge from teacher to student because knowledge exists outside of individuals and can be transferred from teacher to learner. In this approach, objectives of instruction are precisely predefined. The instruction involves input, process and output (Fardanesh, 2006). While, the constructivism focuses on the active involvement of learner in the learning process and gaining knowledge through active exploration and creating meaning in his mind (Fardanesh, 1999). Moreover, knowledge emerges from meaningful experiences (Dewey, 1938). Constructivist theory has the influence of Piaget and Vygotsky school of thought. Piaget has given the concept of assimilation and accommodation i.e. adjusting knowledge in the existing cognitive structures and constructing new knowledge. Vygotsky stressed on the teacher and student relationship by introducing the terms, 'Zone of Proximal Development (ZPD)' and 'Scaffolding'. Through scaffolding learner reaches to higher level of thinking with the help of teacher.

The focus of constructivist approach is producing learning, questioning and use of inquiry strategies (Slavin, 1994). The researcher compared the inquiry based methods of teaching with the traditional teacher centered method found that learner centered methods are more effective in improving science achievement, developing scientific reasoning and science attitude (Abdi, 2014; Adesoji & Idika, 2015; Anderson, 2002; Minner, Levy, & Century, 2010). It is evident from the past researches that students' achievement is enhanced if they are provided the appropriate activities and taught through the teaching methods based on constructivist approach.

Based on the Constructivist Learning Theory (CLT) various leaning cycles have been developed. The learning cycle models emerge in various planned phases, ranging from 3 phases to 7E. Learning cycles provides the science teachers with a new approach to teaching. Learning cycle is much more effective for teaching the concrete concepts in science (Özmen, 2004). Similarly, Edmund (2008) supported the use of learning cycle as a best way to organize inquiry in science. Learning cycles have their significance as they are theory based and work effectively if adequately implemented (Sharma & Sankhian, 2018). The 7Es of learning model is a recommended method for teaching science curriculum and for teaching the today's science curriculum and the teachers should be motivated to use this model in classrooms (Balta & Sarac, 2016). Eisenkraft (2003) amended the 5E instructional model to 7E learning model keeping in view the demand of today's science curriculum at the school level. The 7E learning model is important as it emphasized the elicitation of previous knowledge and extending the learning into different situations. The model has the seven interconnected phases that involves the scientific investigation through exploration, drawing conclusions, building concepts and applying the learned concepts in new situation. Eisenkraft (2003) described the phases of the 7E learning cycle model as under:

Figure 1

7E learning cycle model phases



Elicitation of prior knowledge informs about the student's level of understanding and misconceptions and provides the learner an opportunity to express his knowledge about the concept that serves as the base for new knowledge. The teacher can use the cartoons; pose question and incomplete mind maps for eliciting the prior information about the concept. Elicitation helps in transferring the knowledge (Adesoji & Idika, 2015). It provides students chance to show their own ideas and creativity (Sharma & Sankhian, 2018). This 5E model does not have this phase.

In engagement phase the teacher try to develop students' interest towards a concept by showing small activities, videos and animations (Sharma & Sankhian, 2018). Students' brainstorm and think-pair-share technique can also be used to express ideas. This phase raises questions in students' mind. Students will ask themselves: What do I already know about this? What can I infer from this? And why this thing happened?

In exploration phase students get the chance to think freely and be active in activities. The teacher facilitates the students in building the new concepts. Probing questions and puzzles can be used in this phase. The students are involved in the activities like developing hypotheses, collecting evidence, recording data, creating graphs, interpreting the results and organizing the findings. Students can also discuss their findings with peers (Adesoji & Idika, 2015).

The educator and student both play vigorous role in explanation phase. The teacher role is central in at this stage (Adesoji & Idika, 2015). The students express their understanding. The students will explain the concept and teacher will ask for justification and clarification from students. After this, teacher will introduce the scientific terms and definitions of concepts. Students will explain possible alternatives. Students can also seek the clarification of other's explanations. They will also be given space to judge their understanding (Sharma & Sankhian, 2018).

In elaboration phase students develop deeper understanding by performing different activities. The focus of the phase is on practical skills. This stage provides the learners opportunity to apply their knowledge in new domains (Adesoji & Idika, 2015). The teacher helps students in thinking about alternative explanations of the concept. The students are involved in drawing conclusion from the evidence. The stage can also involve the solution of numerical problems. This phase directly relevant to the psychological construct called transfer of learning (Eisenkraft, 2003).

In evaluation students' understanding of the concept is assessed. Evaluation can be formative or summative as well as formal or informal (Adesoji & Idika, 2015). This can be done by asking open ended questions, mind maps, conceptual cartoon or know what learned (KWL) chart. Students will answer the questions; complete mind map and KWL chart (Sharma & Sankhian, 2018). In this stage, assessment is made about the achievement of objectives.

Extension phase is included in the 7E learning model for the transferability of learning. The good instruction helps learners in practicing the transfer of learning (Bransford, Brown, & Cocking, 2000). The concept learned should not be confined to the one situation but it must be applied in an unfamiliar or novice situation. This will help students in retaining the concept for a longer duration.

Science literacy is not essential only for few people but for everyone. It is not bound to the information, facts and figures presented in the text rather it is more than mere transmission of knowledge (Bentley, Ebert, & Ebert, 2007). Similarly, science literacy is not limited to reading and writing but has the specific concepts to explore. Use of constructivist approach is recommended by many researchers for teaching science (Balim, Turkoguz, Aydin, & Evrekli, 2012; Gök G., 2014; Gök, Vural, & Öztekin, 2014; Shaheen & Kayani, 2015). Apart from that U.S Department of Education and National Science Foundation also approved curriculum for science and mathematics based on constructivism (National Committee on Science Education Standards and Assessment, 1992). Balta and Sarac (2016) in their meta-analysis study, also concluded that use of 7E instructional model is positive in the teaching of science. In addition, it should be included in the science curriculum and considering the high effects of 7E model the teachers should be encouraged to implement this strategy in the classroom (ibid.). Apart from teaching, the 7E model was used to prepare instructional material that successfully enhanced the critical thinking skill of students at junior high school (Rahmayani, Jatmiko, & Susantini, 2016). Similarly, Turgut, Colak and Salar

(2016) in their study on high school physics students found that the course material prepared using the 7E model was effective in conceptual development and elimination of misconceptions. In the same way, physics course material developed using 7E model found to be useful in developing the problem-solving skill of students at high school (Erlina, Jatmiko, & Raharjo, 2016). Amini and Usmeldi (2020) also developed science learning material for fourth graders using 7E learning cycle and model syllabus, lesson plan, module, students' worksheet, and assessment designed were categorized as valid. It was concluded in a research study on the effects of 7E learning model on sixth grade students' conceptual understanding and science process skills that 7E model is effective in developing conceptual understanding and enhancing science process skills (Gok, 2014). In another study carried out by Indrawati, Suyatno and Yuanita (2017) 7E learning cycle implementation improved the concept mastery and critical thinking ability of students. An experimental study conducted on grade XI students concluded that 7E learning model with meta cognitive technique increased the achievement score, enhanced the integrated critical thinking and science process skills ability of students (Sornsakda, Sksringarm, & Singseewo, 2009). In another experimental study, Shaheen and Kayani (2015) found 7E model effective in enhancing the achievement level and science process skills of class 9 biology students as compared to traditional method of teaching. The use of 7E learning model was also found effective in developing positive attitude towards chemistry among secondary school students (Adesoji & Idika, 2015). Anisah, Sulastri and Syukri (2020) used 7E learning cycle to increase students' motivation and improvement in students' motivation was observed from initial level to final stage and was categorized as high using N gain score.

The literature showed that 7Es of learning model is much effective than traditional ways of teaching in enhancing the achievement level, science process skill, critical thinking and conceptual understanding. It also develops the positive attitude towards science. Hence, this instructional strategy is also usable in Pakistani context because it is an important intervention that can add to the volume of good researches conducted in Pakistan in the educational field. The current study aimed to examine the effect of 7E learning cycle model on science achievement of grade VIII students because elementary level is considered as the terminal stage for selecting the future field of study. The research is hoped to be a momentous contribution in the educational arena as well as in the nation's development.

Theoretical Background

The 7E learning cycle model relates back to constructivist learning designed to enhance the student's achievement through meaningful learning based on previous experience. Constructivist learning approach explains the process through which a person's mind realized learning and creates meaning (Fardanesh, 1999). Approach assumes that every person comes to the learning environment with some prior experience and constructs new knowledge on the basis of prior knowledge. According to Fardanesh (2006), constructivism is a learning approach that facilitates the learners make the knowledge significant and meaningful in their minds. The emphasis of approach is on learning environment that is conducive for the learners. The development of cognition and meaningful conceptual learning in constructivist approach depends on the environment provided to the learner. In learning through explorations, learners construct their knowledge on the basis of environment (Saab, Van Joolingen, & Van Hout-Wolters, 2005). The approach also helps learners in the acquisition of knowledge that is meaningful than that transferred by instructor (Güçlü, 1998). It requires the learners to be active during learning and also in classroom (Balta & Sarac, 2016). It also helps students in developing idiosyncratic method of learning by actively participating in the learning process (Özmen, 2004). Briefly, constructivism is about constructing new knowledge on the basis of knowledge gained in past by actively participating in the learning process (Çepni, Ayas, Ekiz, & Akyıldız, 2010; Richardson, 2003).

Statement of Problem

Learning outcomes show current performance of school and effectiveness of the administration and teachers. The achievement score in the subject of science at the elementary school level is low in Pakistan as reported in National Achievement Test, 2016 (NEAS, 2018). Students have a lot of difficulty in understanding scientific concepts. There are numerous models for effective teaching like 3 phases, 4E and 5E. Eisenkraft (2003) amended the 5E instructional model to 7E learning model keeping in view that important component elicitation and extension of knowledge should not be omitted. The Eisenkraft's 7E

(Elicit, Engage, Explore, Explain, Elaborate, Evaluate & Extend) learning model help students in improved understanding the scientific concepts by integrating knowledge gained in past and at present. It also helps students to extend their knowledge to new situations. The model helps to improve the achievement score in the science subject by transfer of learning in a better way. Current study aims to investigate the effect of instruction based on 7E learning cycle model on elementary school students' science achievement.

Research Objectives

The study was designed:

1. To compare the effectiveness of instruction based on the 7E instructional model and traditional instructional method on students' achievement in the subject of science of grade VIII
2. To compare science achievement levels of the control group and experimental group before the treatment
3. To compare science achievement levels of the experimental group in posttest and follow-up tests.

Research Hypotheses

The following hypotheses were tested:

H_0: There is no significant difference in the mean scores of students' science achievement based on the 7E instructional model and traditional instructional method

H_0: There are no significant differences in the science achievement of the experimental group and the control group before treatment

H_0: There is no significant difference in the science achievement of the experimental group in the posttest and follow-up tests.

Methodology

The research study was designed according to the positivist paradigm using deductive reasoning and an objective method of data collection (Remenyi et al., 1998). An experimental design (Static group pretest-posttest design) was used. The design is represented by Frankel et al. (2012) schematically as

O X O
O O

Where,
O = Observation
X = Treatment

Sample

All the grade VIII students in district Sargodha were included as the population of the study. Two grade VIII static groups at Govt. Girls High School 90/SB (district Sargodha) were selected. One group was considered as control group, and the other as the experimental group. There were 17 students in experimental and 19 in control group. According to Gall et al. (2003), in experimental and causal-comparative research, there should be a minimum of fifteen participants in each group in order to compare (p. 176).

Instrumentation

Multiple choice Science Achievement Test (SAT) was designed by researcher to measure the sample students before and after intervention. To make test items comprehensive for students both the tests (pretest & posttest measuring science achievement) were translated into Urdu language by the team of subject specialists. Test items were reviewed and revised as recommended by the subject experts. Initially 60 items were developed. The test was measuring the Knowledge, Comprehension & Application & higher order thinking, levels of Bloom' s cognitive domain.

Table 1

Table of specification

Unit/Objectives	Knowledge	Understanding	Application & HOT	Total Items
Acids, alkalis & salts	3	8	4	15
Force & Pressure	4	8	3	15
Measurement of physical quantities	4	7	4	15
Sources and effects of heat energy	4	7	4	15
Total Items	15	30	15	60
Weightage	25%	50%	25%	100%

After the approval of subject specialists and teachers, the final form of the test was administered to students.

The test after its construction was administered to 30 students of class 8. After item analysis, items were revised and deleted. The split-half method (odd-even) was used to measure the reliability of the Science Achievement Test (SAT) from the scores obtained by the participants of pilot testing. Spearman Brown Prophecy formula was used to calculate the coefficient of reliability and the value was .92. The items having acceptable level of reliability coefficient were included in the final form of science achievement test.

Intervention

Twenty lesson plans were prepared according to the phases of 7E learning cycle model. Four chapters from the textbook of science for grade VIII published by Punjab Curriculum and Textbook Board were selected according to the academic calendar.

Lesson plans were prepared for the following four chapters:

1. Acids, alkalis & salts
2. Force and pressure
3. Measurement of physical quantities
4. Sources and effects of heat energy

Treatment

Experiment continued for 12 weeks and pretest having 41 items was administered to calculate achievement level of the students of both Experimental and Control groups. A period of 40 minutes daily was used to teach the selected science syllabus to the students of experimental group using learning activities and lesson plans according to the 7E learning model.

After the treatment, a post test was administered to both experimental and control group. After the four months a follow-up test was given to experimental group to find the stability of achievement.

The score obtained by students in pretest, posttest and follow up tests was used for further analysis. Inferential statistics, independent samples and paired sample t-test were used.

Findings

For analyzing the collected data by administering a pretest and posttest to both the experimental and control groups, a t-test was used.

Table 2

Independent sample t-test to determine the level of science achievement

Pretest	Mean	SD	df	t-value	Sig(2-tailed)
Experimental Group	18.76	3.49	34	1.17	.250
Control Group	17.16	4.60			

Table 2 shows the mean difference in science achievement of experimental and control group. Independent sample t-test was applied to determine the level of science achievement level of grade VIII students. No significant difference in pretest achievement score of experimental group (M = 18.76, SD = 3.49) and control group (M = 17.15, SD = 4.59) was found, t (34) = 1.17, p > 0.05. So, the null hypothesis was rejected.

Table 3

Independent sample t-test to determine improvement in understanding ability of basic concepts of economics

Post Test	Mean	SD	df	t-value	Sig(2-tailed)
Experimental Group	31.65	5.11	34	8.811	.000
Control Group	18.00	4.18			

Table 3 shows the mean difference between post test score of experimental and control group. Independent sample t test was applied to calculate improvement in understanding ability of students about basic concepts. Significant difference in posttest achievement score of experimental group (M = 31.63, SD = 5.11) and control group (M = 18.00, SD = 4.17) was found, t (34) = 8.81, p < 0.05. Thus, the null hypothesis was rejected.

Table 4

Paired sample t-test to determine improvement in understanding ability of basic concepts of economics

Test	Mean	SD	df	t-value	Sig(2-tailed)
Post-Test	31.6471	5.11054	16	-3.246	.005
Follow up	32.7059	4.80579			

A Paired sample t test was applied to calculate improvement in understanding ability of students about basic concepts. Table 4 shows the mean difference between post test score (M=24.14, SD = 11.723) and follow up test score (M=78.71, SD = 17.802), at t (34) = -18.2=381, p < .05 is significant. There was significant improvement in understanding ability of students after learning through concept attainment model. Thus, the null hypothesis was rejected.

Conclusion and Discussion

The 7E learning model had a significant effect on learning outcomes. This is due to the reason that 7E learning cycle model requires students to construct their own knowledge through the active participation in learning process. Students are not treated as passive beings to memorize the information rather they are asked to understand the subject matter and apply the learned concepts in their daily lives. Based on the analysis of data and major findings it can be included that experimental group students' achievement in science significantly improved by teaching through 7E learning cycle model. Thus, science literacy can be improved by using7E learning cycle model in classroom instruction.

Various versions of inquiry models are available to make science education more easy, enjoyable and effective. Focus of all the models e.g. 4E, 5E, 7E, is on active participation of students and construction of new knowledge by connecting it to the previously learned information. Moreover, in inquiry models teacher is not mere transmitter of knowledge rather he is a facilitator. Teacher facilitates and guides students in learning the science concepts and apply them in novel situation. It was found that 7E learning cycle model led students to better attainment of science concepts than traditional method. The phases of model provided students an opportunity to use their prior knowledge, focus on lesson through active engagement in the process and construct new knowledge based on previously learned information, inquire and evaluate (Gok, 2014).

Learning cycles are considered an effective way to increase curiosity among students and train them to learn concepts by clarifying misconceptions (Fatimah & Anggrisia, 2019). Research studies also show that students phases of models help students to clarity their thoughts, provide them opportunities to convey learned concepts verbally, think, find and search examples of concepts in a real life (Shaheen & Kayani, 2015). It is also reported by Marfilinda et al. (2019) that learning cycles develop skills such inquiry and critical thinking and provides students an opportunity to explore scientific explanations of

phenomenon together, ask questions and seek answers. All the skills mastered during the phases of learning cycles help students to learn concepts efficiently and effectively and resultantly improve learning outcomes.

Testing of hypothesis revealed that achievement score of experimental group taught using 7E learning cycle model was significantly higher than that of control group. This is evident from the posttest mean score of experimental group i.e. 31.65 and control group i.e. 18.00. Acquisition of higher mean score by experimental group is consistent with the results of previous studies (Koksal & Demiral, 2017; Mecit, 2006; Salehi, 2011; Setyasih, Romadhon, Amirudin, Fatchan, & Utaya, 2016; Shaheen & Kayani, 2015). The model named as 7E learning cycle model is a learner-centered so students have the pivotal role in thinking, finding, exploring things. The model improves students' learning outcomes through the experiential learning and makes students active, creative and critical thinkers (Meldania, 2013).

Finally, 7E learning cycle model can improve learning outcomes of students because students are active participants of leaning process where they explore the concepts themselves. Organized phases of model make it easier for students to understand the concepts, improve their thinking power and enhance learning outcomes (Sole & Wilujeng, 2013). Students learn how to construct knowledge and make it meaningful to be used in future also. The 7E learning cycle model used in the current study for science teaching has positive effect on students' achievement. Phases of model helped teacher to create interactive learning environment, pleasant for learners. Students were provided the opportunity to think deeply about the concepts taught and resultantly they developed the better understanding of the content covered during the period of study.

Implications & Suggestions

Current study has contributed to existing research on 7E learning cycle model through its empirical evidence. This study has highlighted the importance of 7E learning cycle model for teaching of science. Past studies have examined implications of 7E learning cycle across various contexts but this study particularly evaluated application of this model in rural context. The 7E learning cycle model enhances students' achievement by increasing their cognitive capacities, critical thinking skills and analytical reasoning. Moreover, classroom environment is more conducive for learning as it makes learning fun for students. Based on empirical findings of study, it is yielded that suitable curriculum is need for application of inquiry-based models in classrooms and enhanced achievement level of students. The findings of the study are useful for teachers to use 7E learning cycle to improve classroom practices. Incorporation of 7E learning cycle model in science curriculum is necessary, so students can construct their knowledge themselves by actively participating in class and create ideas to solve everyday problems.

Recommendations

The current study found 7E learning cycle model effective for enhancing academic achievement of science students, so it is recommended that science teachers may use this model in classroom instruction. In addition, training sessions should be conducted for science teachers to enhance their proficiency in implementation of 7E learning cycle model. Moreover, required teaching aids and well-equipped science laboratories for 7E model implementation should be provided.

Suggestions for Further Studies

It is expected that researcher will use 7E learning cycle model not only to improve achievement score of students but also to develop science literacy skills.

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