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EFFECTIVENESS OF CONSTRUCTIVIST APPROACH ON THE ACHIEVEMENT IN SCIENCE OF THE STUDENTS OF GRADE IX.

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ABSTRACT: Science is a cumulative and endless series of empirical observations which result in the formation of concepts and theories. The aims of science education are to enable the learners to acquire the theoretical knowledge, practical skills, nurture the natural curiosity, problem solving and creative abilities in science. From the research it is found that the existing mode of teaching science in schools has not fulfilled the needs of the larger community of students. Most of the teacher follow traditional method of teaching. If the learner could not understand these concepts and theories clearly, it will affect their achievement. So, the researcher has decided to find out how much the constructivist approach that is 5E's model is effective on students' achievement in science.

Keywords: Constructivist approach, Traditional approach, Multiple intelligence, Collaborative learning, Quantitative analysis.

RATIONALE OF THE STUDY

Science is an important force in the contemporary world. It generates solutions for everyday life and gives idea to work faster. It brings thinking and psychological changes in human mind. It fulfils all the needs of human and improves the quality of life. It gives new life to the society and civilization. It has made possible on which modern civilization depends like large sources of energy, modern agriculture elaborate machinery, rapid transportation and so on. The progress, welfare and security of a country depends upon science. It affects the social, economic and technological of development of a country. In other words, science is the one of the most important channels of knowledge. It has a specific role, as well as a variety of functions for the benefit of our society: creating new knowledge, improving education and increasing the quality of our lives. So, every nation provides science education for its progress, security and welfare.

Science education occupies a very prominent place in Indian school curriculum. The government is taking many steps from time to time to improve science education like development of infrastructure, providing advanced science laboratory, recruitment of teacher etc. Different education commission has given importance to science education. The Kothari commission recommended that upgrading school curriculum by research in curriculum development, the revision of textbook and teaching learning material. Its emphasis that science education should start right from primary stage and should become a part of all courses at the university stage.

The nature of science is complex due to its various facts, concepts, principles, theories and hypotheses. If the learners could not understand these concepts and principles, it will affect their achievement in life or attitude towards science during later life. So, a question arises why the students fail to learn and understand the scientific concepts and theories. From the research it is found that students get confused due to complexity of concepts in science which is not properly explained.

It is our common experience that most of teachers follow traditional method of teaching. Traditionally science teaching refers the transfer of information from teacher to uninformed students which fails to promote logical thinking, divergent thinking, scientific skills and attitude among students. In traditional mode of teaching the students are simply the passive listeners. One proposed solution to above problem is to adopt a student centric method using a constructivist approach, which has been well emphasised in NCF,2005.

The NCF,2005 has well emphasised and introduced a concept under the title of 'construction of knowledge'. It is thought that the constructivist approach may be a good alternative to the traditional approach for the realisation of learning objectives. In this approach the learners find their voices, nurture their curiosity to do things, to ask questions and to integrate their experiences with school knowledge rather than rote memorisation. In class room situations, the teacher as a facilitator has many techniques to promote inquiry, logically thinking, collaborative learning and multiple intelligence. Learning actives in constructivist setting are characterized by active engagement, inquiry, problem solving and collaboration with others. The teacher encourages the students to question, challenge, and formulate their own ideas. The constructivist approach to teach science facilitates learning by doing and deeper understanding. So, the researcher has decided to find out how much the constructivist approach that is 5E's model is effective on students' achievement in science.

OBJECTIVES: The objectives of the study are as follows:

- To find out the instructional effect of traditional approach in terms of achievement of the sample students in science.
- To find out the instructional effect of 5E's model in terms of achievement of the sample students in science.
- To compare the effectiveness of constructivist approach (i.e., 5E's model) and traditional method.

HYPOTHESES: The hypotheses formulated in the light of the above stated objectives are as follows:

1. The constructivist approach (i.e., 5E's model) has a positive effect on the achievement of students of grade IX in science.
2. The students of grade IX taught through 5E's approach will gain significantly higher score as compared to their counterparts in the control group on the achievement in science.

METHOD OF THE STUDY:

- **Method:** The pre-test and post-test quasi experimental design was used to conduct the study.
- **Sample:** Using purposive sampling method a sample of 80 students of grade IX were divided into two equal groups based on their marks in science secured in periodic test examination. As many as 40 students were included in experimental group and also equally 40 students were included in control group. The sample students were selected from OAV Karapalli, Karapalli, Ganjam District.
- **Tools and Techniques used:** The following tools were used to collect relevant data:
  1. Development of Lesson plan in the light of 5E's model.
  2. Achievement test in science for the students of grade IX (i.e., both pre-test and post-test, developed by the Investigator).

COLLECTION OF DATA: Necessary data was collected in two phases. i.e., pre-experimental phase and post-experimental phase.

DATA TREATMENT: The generated data were subject to quantitative analysis. To find out the instructional effect of traditional method and 5E'S model of teaching science, percentage analysis was undertaken. The statistical technique of t-test was used to compare the performance.

DATA ANALYSIS: On the basis of analysis of data, findings obtained in this study are summarised and reported below under three heads:

- **Instructional effect of traditional approach on learners' achievement in science:**

The first objective of the study was to find out the instructional effect of traditional approach in terms of achievement of sample students in science. For the purpose of percentage analysis was undertaken.

- About 70% of sample students achieved above 50% scores.
- Only 2.5% of student achieved full score and 10% of students achieved 90% score.
- Traditional Approach was effective in generating learning achievement in science.

- **Instructional effect of 5E's model on learners' achievement in science:** The second objective of the study was to find out the instructional effect of 5E'S approach in terms of achievement of sample students in science. For the purpose of percentage analysis was undertaken.

- About 82.5% of sample students achieved above 50% scores.
- 7.5% of students scored full and 15% students scored 90%.
- The 5E's model as a constructivist approach was found to be very effective in generating learning achievement in science.

- **Effectiveness of Constructivist approach (i.e.,5E's model) and Traditional method- A Comparative analysis:**

The last objective of the study was to compare the 5E's model with that of traditional method. The effectiveness of constructivist approach (i.e.,5E's model) on the achievement in science of the students of grade IX was studied in pre-test and post-test experimental design using the achievement test in science. The pre-test in science with 10 items and carrying a total mark of 10 was administered on both the control and experimental groups. To determine the effectiveness of 5E's model on the learners' achievement in science, the data were analysed by considering the overall achievement test scores of the sample students. The pre-test mean, SD and t-value for both groups are given in Table 1.

Table-1

Pre-test Mean, SD and t-value.

Group	N	Mean	SD	t-value
Experimental	40	5.22	2.14	1.337
Control	40	4.57	2.21	

Table 1 displays that the t-value of 1.337 with df 78 is not significant even at 0.05 level. Thus, it can be concluded that the sample students in experimental group did not differ significantly in their mean achievement in science in comparison to their counterparts in the control group. So, the groups were found to be almost similar as far as their pre-test achievement in science is concerned.

To be sure of the intervention effect, i.e., the effectiveness of 5E's model as a constructivist approach on the achievement in science of the sample students, the post-test result on science scores (i.e., such scores were generated through the administration of post-test) for both the groups were examined. In Table 2 the post-test mean, SD and t-test of scores on achievement in science for both the groups are presented.

Table-2

Post -test Mean, SD and t-value

Group	N	Mean	SD	t-value
Experimental	40	6.62	2.08	2.06*
Control	40	5.67	2.15	

*p<.05

From Table 2 it is apparent that the t-value of 2.06 with df=78 is significant at 0.05 level. Thus, a significant difference has been observed in the post-test mean achievement scores in science of the students of experimental and control groups. From the mean value it is evident that the students of experimental group had significantly higher achievement scores(M=6.62) than their counterparts in the control group(M=5.67). Science the experimental group had significantly gained more scores in the achievement of science. Thus, it can be concluded that the constructivist approach (i.e., 5E's model) has proved very much fruitful in enhancing achievement scores of the experimental group. Hence the hypothesis stating that the students of grade IX taught through 5E' model (i.e., constructivist approach) will gain significantly higher score as compared to their counterparts in the control group on the achievement in science was retained.

EDUCATIONAL IMPLICATION:

The implications based on the findings of the study are given below:

- The learners can be encouraged to construct knowledge instead of rote memorization. Rote memorization inhibits creativeness of learner.
- The class-room environment should be learner-friendly, activity oriented, active engagement and democratic so that the learner feels free to construct their knowledge.
- Emphasis should be given to discover, ask questions, connect their previous experiences etc. which promotes construction of knowledge among learners.

  In specific, the implications of the study can be elaborated under the following heads:
- **Learner:** Learners are the central point of teaching-learning process. He should participate actively in this process for knowledge construction. The role of the learner in constructivist approach is to engage and interact with the world around them, with peers, with authorities, and with educational materials. Through active engagement the learner constructs knowledge

and meaning, observing how objects and ideas interact, creating a cognitive framework for making sense of it all. materials. As a constructivist approach, 5E's model provides more scope to construct their own knowledge. Basically, learners use their previous knowledge as a foundation and build on it with new things that they learn. They start analysing the concepts, thus develop thinking creatively which in turn improves their level of achievement in science.

- **Teacher:** During the teaching-learning process, teacher plays a very important role. The teacher should encourage the learners to participate actively, to relate concept with their everyday life, to discuss with their friends about the problem and to construct knowledge by their own understanding and experiences. Constructivist teacher develop skills and abilities and provides democratic learning environment to empower students and to make them feel competent and significant.
- **Teacher education:** Constructivism promotes social and communication skills by creating a classroom environment that emphasizes collaboration and exchange of ideas. Students must learn how to articulate their ideas clearly as well as to collaborate on tasks effectively by sharing in group projects. The trainees of pre-service teacher education programme should be acquainted with constructivist approach, so that they can apply in their teaching-learning process. They may be encouraged to undertake minor research projects, may be in the form of action research, to experiment the effectiveness of the 5E's model in the teaching different subject.
- **School administration:** School atmosphere plays important role in managing the teaching-learning process. The school administration should be encouraged the teacher to adopt 5E's model in teaching different subjects in general and science in particular. Similarly, the students should be encouraged to take part in different activities to construct their own knowledge. The school administration should provide all resource support for the successful implementation of this method.

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