



Effectiveness of Constructive lesson plan in Science on Achievement level of IX Standard Students

Dr. Mumtak Ering^{1*}, Dr. Boa Reena Tok^{2**}, Dr. Omini Ering^{3***}

¹Assistant Professor (Guest), Department of Education, Government Model Degree College, Daporijo, Arunachal Pradesh, India

²Professor, Department of Education, Rajiv Gandhi University, Rono Hills, Doimukh, Arunachal Pradesh, India

³Assistant Professor (Guest), Department of Education, Arunachal Pradesh University, Arunachal Pradesh, India

Abstract

The present study examines the effectiveness of a constructivist lesson plan in enhancing science achievement among Class IX students. The study adopted a quasi-experimental design and involved a sample of 60 students, equally divided into an experimental group and a control group. The experimental group received instruction through the 5E constructivist model comprising the stages Engage, Explore, Explain, Elaborate and Evaluate, while the control group was taught through conventional classroom methods. To assess academic achievement, researcher-developed achievement test was administered to both groups before and after the intervention. The analysis of pre-test scores showed no significant difference between the two groups, indicating that students had comparable levels of prior knowledge in science. However, the post-test scores revealed a significant difference in favour of the experimental group. Additionally, the experimental group demonstrated substantial improvement in academic achievement from pre-test to post-test. These findings indicate that constructivist teaching methods can foster active student engagement, critical thinking and improved academic performance in science education.

Keywords: *Constructivist lesson plan, Constructivist 5E model, Experimental group, Control group, Academic achievement.*

Introduction

Constructivism is a widely recognized educational theory based on the belief that learners actively create their own understanding of the world through personal experiences and reflection (Allen, 2022). Instead of simply absorbing information, they interact with their surroundings and use those interactions to develop and adjust their internal understanding. This approach emphasizes critical thinking, analysis, evaluation, and creativity, fostering a deeper connection with the learning material. It encourages students to view challenges from multiple perspectives, reflect on their learning processes, and identify areas for further growth based on their individual needs.

The term “construct” comes from the Latin word *construere*, meaning to arrange or build. In the context of education, constructivism is about organizing, restructuring, and creating meaning through ongoing mental processes. Knowledge construction occurs both individually and collectively, with students often beginning by constructing their own ideas and later engaging in social interactions that refine and expand their understanding (Vygotsky, 1978; Piaget, 1973).

Constructivist learning is a dynamic process, which is shaped by various forms of knowledge construction:

1. Physical Construction of Knowledge: Learning through active engagement and hands-on experiences.
2. Symbolic Construction of Knowledge: Representing and interpreting actions through personal expression and symbols.
3. Social Construction of Knowledge: Collaborative learning and meaning-making within a social context.
4. Theoretical Construction of Knowledge: Developing deeper understanding by explaining ideas and concepts in one's own words.

In the classroom, constructivism shifts the focus from rote memorization to active, inquiry-based learning. Teachers become facilitators who understand students' pre-existing ideas and guide them through problem-solving, experimentation, and critical questioning (Gautam & Agarwal, 2024). Rather than merely delivering facts, educators encourage students to question, analyse, and assess their understanding, fostering a culture of active knowledge construction. In this environment, students evolve into expert learners, discovering knowledge through engagement rather than memorization. In the constructivist perspective, learners are regarded as active agents in constructing their own knowledge and understanding. Teaching with this approach focuses on encouraging students to analyse, explore, collaborate, share, build, and generate new ideas based on their existing knowledge, rather than simply memorizing facts, skills, or processes. The emphasis is on fostering deeper engagement and critical thinking rather than rote learning.

ICT has opened up exciting possibilities for creating engaging learning environments where students can learn in interactive, collaborative, and meaningful ways. As more and more young people are using digital technology in their daily lives, it makes sense to tap into this trend to enhance education (Chaudhary, 2018). Today, new teaching methods are gradually changing the traditional classroom approach, making learning

more student-centred. One such approach that has gained a lot of attention is the constructivist method, which focuses on learning through experience and active participation. Keeping this in mind, the present study was taken up to examine the “Effectiveness of Constructive lesson plan of science on Achievement level of IX standard students.”

Objectives of the Study

1. To examine the difference in science pre-test scores between the Experimental and Control groups.
2. To analyse the difference in science post-test scores between the Experimental and Control groups
3. To determine the effectiveness of constructivist teaching in enhancing Science achievement among students in the Experimental group.

Hypotheses of the study

Ho1: There is no significant difference in the Pre-test Achievement scores in Science between the Experimental group and Control group.

Ho2: There is no significant difference in the post-test achievement scores in Science between the Experimental group and Control group.

Ho3: There is no significant difference between the pre-test and post-test science achievement scores of students in the Experimental group.

Sample of the study

The students studying in government secondary school Mirku in IX standard were selected for the sample. The two sections were randomly selected: one was taken as Experimental group and other was taken as Control group. Thus, the sample comprises of 60 students including both experimental (30) and control group (30). The sample included 27 boys and 33 girls in total.

Table 1.1 Details of distribution of the sample

Group(sample)	Boys	Girls	Total
Experimental Group	13	17	30
Control Group	14	16	30
Total	27	33	60

Research design

A quasi-experimental design was implemented in this study to assess whether there was a difference in the achievement levels of students.

Variables of the study

Independent Variable: In this study, constructivist teaching and traditional teaching were considered as the independent variable.

Dependent Variable: The achievement test scores of students were taken as the dependent variable in this study.

Tools used in the test

1. Lesson plan based on Constructivist Approach: 5E model (Engage, Explore, Explain, Elaborate, and Evaluate) developed by the researcher.
2. Achievement test in science of IX standard developed by the researcher.

Procedure details of the study

In the initial phase of the study, the researcher prepared lesson plans using the constructivist approach, along with an achievement test in science. To understand the students' starting level, both the experimental and control groups were given a pre-test. Following this, the experimental group was taught using the constructivist method, while the control group continued learning through the usual traditional approach. After the teaching sessions were completed, a post-test was administered to both groups to assess any improvement or changes in their academic performance.

Analysis and Interpretation

Objective1: To examine the difference in science pre-test scores between the Experimental and Control groups.

Ho1: There is no significant difference in the Pre-test Achievement scores in Science between the Experimental group and Control group.

Table 1.2: Mean, SD and 't' value of experimental and control group on pre-test scores of achievements in science.

Group	Mean of pre-test	N	SD	SEM	SE _D	t value (computed)	t value at 0.05 (tabulated)	Remarks
Experimental group	13.1	30	2.84	0.51	0.74	0.27	2.00	Not significant
Control group	13.3	30	2.96	0.54				

Interpretation: Table 1.2 indicates that the calculated t-value of 0.27 is less than the critical t-value of 2.00 at the 0.05 level of significance with 58 degrees of freedom. This means that the difference in mean scores is not statistically significant at the 0.05 level. Therefore, the null hypothesis stating that “*There is no significant difference in the pre-test achievement scores in Science between the Experimental group and the Control group*” is accepted. Based on this result, it can be concluded that the pre-test scores of the experimental and control groups do not differ significantly.

Objective 2: To analyse the difference in science post-test scores between the Experimental group and Control group.

Ho2: There is no significant difference in the post-test achievement scores in Science between the Experimental group and Control group.

Table 1.3: Mean, SD and ‘t’ value of experimental and control group on post-test scores on achievements in science.

Group	Mean of pre-test	N	SD	SEM	SE _D	t value (computed)	t value at 0.05 (tabulated)	Remarks
Experimental group	29.1	30	4.1	0.75	1.17	3.64	2.00	Significant
Control group	24.1	30	4.9	0.90				

Interpretation: Table 1.3 shows that the computed ‘t’ value of 3.64 is greater than the critical t-value of 2.00 at the 0.05 significance level, with 58 degrees of freedom. This indicates that the mean difference is statistically significant at the 0.05 level. As a result, the hypothesis stating “*There is no significant difference in the post-test achievement scores in Science between the Experimental group and Control group*” is rejected. It can be concluded that there is a significant difference in the post-test science achievement scores between the experimental and control groups. The experimental group, with a mean score of 29.16, performed better than the control group, which had a mean score of 24.1. This suggests that the experimental group achieved better results in science.

Objective 3: To determine the effectiveness of constructivist teaching in enhancing Science achievement among students in the Experimental group.

H₀₃: There is no significant difference between the pre-test and post-test science achievement scores of students in the Experimental group.

Table 1.4: Mean, SD and ‘t’ value of pre-test and post-test scores of experimental groups.

Experimental Group	Mean of pre-test	N	SD	SEM	SE _D	t value (computed)	t value at 0.05 (tabulated)	Remarks
Pre-Test	13.1	30	4.1	0.51	1.53	10.45	2.00	Significant
Post- Test	29.1	30	4.1	0.75				

Interpretation: Table 1.4 shows that the computed ‘t’ value of 10.45 is greater than the critical t-value of 2.00 at the 0.05 significance level, with 58 degrees of freedom. This indicates that the mean difference is statistically significant at the 0.05 level. As a result, the hypothesis, “*There is no significant difference between the pre-test and post-test science achievement scores of students in the Experimental group*” is rejected. It can be concluded that there is a significant difference in the pre-test and post-test scores for the experimental group in science. The mean score of the experimental group before the treatment was 13.1, and after the treatment, it rose to 29.16. The increase in the post-test mean score highlights the effectiveness of the Constructivist Approach.

Findings of the study

1. The study’s findings revealed that there was no significant difference in the performance of the control and experimental groups. Both groups performed similarly on the pre-test.
2. Additionally, the study found a significant difference in the post-test performance between the experimental and control groups. Students taught using the constructivist approach outperformed those taught with the traditional approach, suggesting that the constructivist method was more effective for learning science.
3. The study also concluded that there was a significant difference in the achievement scores of the experimental group between the pre-test and post-test. This indicates that the instructional materials used in the treatment were effective in improving the students' performance in science.

Education implications of the study:

The present research emphasizes the need for a learner-centred atmosphere in science classrooms, where students are given the freedom to explore and discover independently, with teachers acting as facilitators and guides. The constructivist teaching approach is shown to be more effective than traditional methods, fostering understanding through meaning-making rather than rote memorization. It encourages group work and peer learning, emphasizing both individual and collaborative construction of knowledge. The approach enhances students’ perception of the nature of science, linking it to improved achievement, science process skills, and meta-cognitive development. Students develop essential skills such as reasoning, classifying, and experimenting when provided with hands-on learning opportunities. To ensure effective

implementation, training programs on the constructivist approach should be organized for both pre-service and in-service teachers.

Conclusion:

The study's findings suggest that the constructivist approach is more effective than the traditional approach in teaching science. Constructivism is a theory rooted in observation and scientific research on how people learn and develop new ideas. This paper discusses various aspects of constructivist learning, including the 5E model of constructivism, the roles of teachers and learners in constructivist learning, and the implications of this approach. The constructivist approach emphasizes the active construction of knowledge rather than passive reproduction, helping students develop both skills and attitudes. The study involved two groups: the experimental group, which was taught using the constructivist approach by the researcher, and the control group, which was taught by a regular teacher using traditional methods. The results showed that the 5E constructivist approach significantly improved science achievement in IX standard students compared to the traditional teaching method. Practical and real-life examples, along with innovative activities, made the constructivist approach more engaging and effective.

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