



THE IMPACT OF CONSTRUCTIVIST LEARNING ON SCHOLASTIC MOTIVATION AND PROBLEM- SOLVING SKILLS AMONG 8TH-GRADE SCIENCE STUDENTS

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Abstract

The present study examined the impact of constructivist learning on scholastic motivation and problem-solving skills among 8th-grade science students. Constructivism has emerged as one of the most influential approaches in modern education because it promotes active participation, meaningful learning, and learner-centered classroom experiences. The study employed a quasi-experimental pre-test and post-test design involving two groups: an experimental group taught through constructivist teaching modules based on the 5E's Model and a control group taught through traditional lecture methods. The sample consisted of 100 students selected from Vaish Arya Kanya Senior Secondary School, Jhajjar District, Haryana. Standardized tools such as the Scholastic Motivation Scale and Problem-Solving Ability Test were used for data collection.

The findings revealed no significant differences between the groups before the intervention, indicating comparability between the experimental and control groups. However, after the treatment, students exposed to constructivist teaching demonstrated significantly higher scholastic motivation and improved problem-solving skills compared to students taught through conventional methods. The study also revealed that constructivist learning created a positive classroom environment where learners actively participated, collaborated, questioned, and reflected on their understanding. The findings support the argument that constructivism not only improves academic performance but also strengthens higher-order thinking, critical inquiry, intrinsic motivation, and independent learning. The study concludes that constructivist teaching strategies should be integrated into school curricula and teacher training programs to improve the quality of science education at the secondary level.

Keywords: Constructivism, Scholastic Motivation, Problem-Solving Skills, Science Education, 5E's Model, Student-Centered Learning.

1. Introduction

Education in the twenty-first century has shifted from teacher-centered instruction to learner-centered approaches that encourage active participation and critical thinking. Traditional teaching methods often emphasize rote memorization, passive listening, and



examination-oriented learning. Such practices may help students reproduce information temporarily, but they frequently fail to develop deep understanding, creativity, independent learning, and problem-solving abilities. In contrast, constructivism emphasizes that learners actively construct knowledge through interaction with their environment, experiences, and social engagement.

Constructivism emerged as a major theoretical development in cognitive psychology during the twentieth century. The approach is largely influenced by the works of Jean Piaget, Lev Vygotsky, and John Dewey. Piaget believed that learners construct knowledge by connecting new experiences with prior understanding. According to him, learning occurs when students face cognitive conflict and attempt to resolve inconsistencies in their understanding. Vygotsky introduced the concept of the Zone of Proximal Development (ZPD), emphasizing the role of social interaction and guidance in learning. Dewey advocated experiential learning and believed that students learn best through inquiry, exploration, and real-life experiences.

In science education, constructivism has become particularly important because science learning requires inquiry, observation, experimentation, reasoning, and interpretation. Science is not merely a collection of facts; it is a process of discovering, questioning, and understanding the natural world. Therefore, science classrooms must encourage students to investigate concepts actively rather than memorize information mechanically.

The National Curriculum Framework (NCF-2005) in India strongly advocates constructivist learning by emphasizing activity-based teaching, learner autonomy, collaborative learning, and reflective thinking. Despite these recommendations, many classrooms still rely heavily on conventional lecture methods that restrict student participation and creativity.

The present study focuses on two significant psychological and educational variables: scholastic motivation and problem-solving skills. Scholastic motivation refers to the internal drive that encourages students to participate in academic activities and strive for educational success. Motivated students tend to show greater interest, persistence, and curiosity in learning tasks. Problem-solving skills refer to the ability to analyze situations, identify possible solutions, and apply reasoning effectively. Both variables are essential for meaningful science learning.

Constructivist learning environments are believed to enhance these qualities by encouraging students to participate actively, work collaboratively, engage in inquiry-based activities, and reflect on their understanding. Therefore, the present study attempts to examine the effectiveness of constructivist teaching on enhancing scholastic motivation and problem-solving skills among 8th-grade science students.



2.Review of Literature

A comprehensive review of related literature provides the theoretical and empirical foundation for the present study. Research conducted at both international and national levels highlights the effectiveness of constructivist learning in improving academic achievement, motivation, attitudes, and higher-order thinking skills.

2.1 International Perspective

International research consistently supports constructivist approaches in education. Gemayel (2010) found that constructivist instruction was more effective than traditional methods in developing scientific thinking among biology students. Similarly, Saadi (2010) demonstrated that students taught through constructivist approaches achieved significantly higher scores in biology achievement tests.

Research conducted by Yavuz and Cakici (2010) revealed that constructivist science teaching improved students' conceptual understanding and reduced misconceptions. Galia (2016) also reported that students taught through constructivist methods performed better in mathematics and demonstrated more positive attitudes toward learning.

Shieh (2010) emphasized that social constructivism supports collaborative learning, self-direction, and active engagement among adult learners. Studies in history, language learning, and mathematics have similarly shown that constructivist approaches improve learner participation, confidence, and understanding.

However, some studies have also identified challenges in implementing constructivism. Altun and Yücel-Toy (2015) observed that overcrowded classrooms, limited teaching resources, and examination pressure can create obstacles for effective constructivist teaching.

2.2 National Perspective

In India, several researchers have highlighted the effectiveness of constructivist learning. Bhattacharjee and Mehera (2014) found that constructivist approaches improved academic achievement in science significantly more than traditional lecture methods. Dev (2016) demonstrated the positive impact of constructivism on mathematics achievement at the elementary level.

Adak (2017) conducted a study using the 7E's constructivist model and found that students taught through constructivist strategies outperformed conventionally taught students, especially in higher-order cognitive tasks such as application, analysis, and problem-solving.

Pandey and Ameta (2017) highlighted that constructivist learning not only benefits students but also positively changes teachers' attitudes toward instructional methods. Chandi (2020) concluded that constructivism naturally motivates learners and improves reasoning, flexibility of thinking, and problem-solving abilities.



The National Curriculum Framework (NCF-2005) strongly recommends learner-centered and activity-based education. NCERT textbooks have also been designed on constructivist principles. Despite these efforts, the implementation of constructivist practices in Indian classrooms remains limited.

2.3 Research Gap

The review of literature indicates that while several studies have investigated constructivist learning and academic achievement, limited research has focused specifically on scholastic motivation and problem-solving skills among 8th-grade science students in Haryana. Furthermore, there is a need to investigate the practical effectiveness of constructivist teaching in real classroom settings at the secondary school level.

The present study attempts to fill this gap by examining the impact of constructivist learning on scholastic motivation and problem-solving abilities among 8th-grade students studying science.

3. Objectives of the Study

The study was conducted with the following objectives:

1. To study the effect of constructivist teaching on scholastic motivation among 8th-grade science students.
2. To examine the effect of constructivist teaching on problem-solving skills among 8th-grade science students.
3. To compare the scholastic motivation of students taught through constructivist and traditional teaching methods.
4. To compare the problem-solving skills of students taught through constructivist and traditional teaching methods.
5. To examine the difference between pre-test and post-test scores of the experimental group.

4. Hypotheses of the Study

The following null hypotheses were formulated:

1. There is no significant difference between the scholastic motivation scores of the experimental and control groups before treatment.
2. There is no significant difference between the scholastic motivation scores of the experimental and control groups after treatment.
3. There is no significant difference between the problem-solving skills of the experimental and control groups before treatment.
4. There is no significant difference between the problem-solving skills of the experimental and control groups after treatment.
5. There is no significant difference between the pre-test and post-test scores of the experimental group.



5. Methodology

The methodology of the present study was designed carefully to examine the effectiveness of constructivist teaching on scholastic motivation and problem-solving skills among 8th-grade science students. A systematic and scientific procedure was followed to ensure reliability, validity, and accuracy of the findings.

5.1 Research Design

The study adopted a quasi-experimental pre-test and post-test two-group design. This design was selected because it allowed the researcher to compare the outcomes of two different instructional methods under controlled classroom conditions.

The two groups involved in the study were:

Experimental Group: Students taught through constructivist teaching strategies based on the 5E's instructional model.

Control Group: Students taught through conventional lecture-based teaching methods.

Both groups were administered pre-tests before the intervention and post-tests after the intervention. The comparison of scores helped in determining the effectiveness of the constructivist approach.

The design of the study can be represented as:

Group	Pre-test	Treatment	Post-test
Experimental Group	O ₁	Constructivist Teaching (X)	O ₂
Control Group	O ₃	Traditional Teaching (C)	O ₄

Where O₁ and O₃ represent the pre-test observations of the experimental and control groups respectively, while O₂ and O₄ represent the corresponding post-test observations. X denotes the constructivist teaching intervention and C denotes the traditional teaching method.

This design helped the researcher measure the actual change caused by the intervention while controlling the influence of external variables.

5.2 Population of the Study

The population of the study consisted of all students studying in Class VIII at Vaish Arya Kanya Senior Secondary School, Jhajjar District, Haryana. The school was selected because it provided suitable classroom conditions and accessibility for conducting the experimental study.

5.3 Sample and Sampling Technique

A sample of 100 students was selected from Class VIII through a simple random sampling technique. The students were divided equally into two groups:

Experimental Group = 50 students

Control Group = 50 students



Care was taken to ensure that both groups were comparable in terms of age, educational background, classroom environment, syllabus, and teacher support.

The students in both groups belonged to similar socio-economic and educational backgrounds, which minimized the possibility of bias in the findings.

5.4 Variables of the Study

Independent Variables

1. Constructivist teaching method
2. Conventional teaching method

Dependent Variables

1. Scholastic motivation
2. Problem-solving skills

Controlled Variables

The following variables were controlled during the experiment:

School environment

Class level

Subject matter taught

Duration of teaching

Teacher handling the classes

Teaching schedule and classroom timing

Controlling these variables ensured that the observed changes were due mainly to the teaching method used.

5.5 Tools Used for Data Collection

The researcher used standardized and self-developed tools for collecting data.

1. Scholastic Motivation Scale

The Scholastic Motivation Scale was used to measure students' interest, enthusiasm, participation, confidence, and willingness toward academic learning in science. The scale helped identify whether students were intrinsically motivated after receiving constructivist instruction.

2. Problem-Solving Ability Test

The Problem-Solving Ability Test measured students' analytical thinking, reasoning ability, application of scientific concepts, and capability to solve unfamiliar scientific situations.

3. Constructivist Teaching Modules

Constructivist teaching modules were specially prepared by the researcher based on the 5E's instructional model. The modules included:

Activity-based learning

Group discussions

Demonstrations



Brainstorming sessions

Inquiry-based questioning

Problem-solving activities

Real-life examples related to science concepts

The lessons were designed in a student-centered manner to encourage active participation and independent thinking.

5.6 The 5E's Instructional Model

The experimental group was taught through the 5E's Constructivist Model, which included the following stages:

Engage

At this stage, students' prior knowledge was activated by asking questions, presenting demonstrations, or discussing real-life situations related to science concepts. The purpose was to stimulate curiosity and identify misconceptions.

Explore

Students actively participated in hands-on activities, experiments, and group investigations. They observed, collected information, discussed ideas, and attempted to discover concepts independently.

Explain

Students explained their observations and conclusions in their own words. The teacher acted as a facilitator and clarified scientific concepts wherever necessary.

Elaborate

Students applied their newly learned concepts to different situations and problem-solving activities. This stage strengthened conceptual understanding and promoted critical thinking.

Evaluate

Students' understanding was evaluated continuously through classroom interaction, worksheets, discussions, and achievement tests. Students were also encouraged to reflect on their own learning.

5.7 Procedure of the Study

The study was conducted systematically in three phases.

Phase I: Pre-testing

Before the intervention, both the experimental and control groups were administered the Scholastic Motivation Scale and Problem-Solving Ability Test. The purpose of pre-testing was to determine the initial level of students and ensure that the two groups were equivalent before treatment.

The pre-test scores revealed no significant difference between the groups, confirming comparability.



Phase II: Experimental Treatment

The intervention continued for approximately one month during regular classroom teaching hours.

The experimental group received instruction through constructivist teaching modules based on the 5E's Model.

The control group received instruction through conventional lecture and textbook methods.

The same science topics were taught to both groups to maintain uniformity in content coverage.

During the treatment period, the experimental group actively participated in:

Hands-on experiments

Cooperative learning activities

Group discussions

Brainstorming sessions

Scientific inquiry and exploration

Problem-solving exercises

Reflective learning activities

The teacher guided students as a facilitator instead of directly providing answers.

The control group, however, followed traditional classroom practices involving explanation, memorization, note-taking, and question-answer methods.

Phase III: Post-testing

After completion of the intervention, both groups were again administered the Scholastic Motivation Scale and Problem-Solving Ability Test.

The post-test scores were compared with the pre-test scores to measure the effectiveness of constructivist teaching.

5.8 Statistical Technique Used

The collected data were analyzed using the t-test statistical technique.

The t-test was used to:

1. Compare pre-test scores of experimental and control groups.
2. Compare post-test scores of experimental and control groups.
3. Compare pre-test and post-test scores within the experimental group.

The statistical analysis helped determine whether the observed differences were significant or occurred by chance.

5.9 Delimitations of the Study

The study was limited to:

One school in Jhajjar District, Haryana

Class VIII students only

Science subject only



A sample of 100 students

Scholastic motivation and problem-solving skills as dependent variables

Despite these delimitations, the study provides meaningful insights into the effectiveness of constructivist teaching in science education.

6. Results and Findings

The collected data were analyzed using the t-test statistical technique.

6.1 Pre-test Analysis

The pre-test analysis showed no significant difference between the experimental and control groups regarding scholastic motivation and problem-solving skills. This confirmed that both groups were comparable before the intervention.

The absence of significant differences established the internal validity of the experiment and ensured that any changes observed in the post-test could be attributed to the instructional intervention.

6.2 Post-test Analysis

The post-test results revealed highly significant differences between the experimental and control groups.

Scholastic Motivation

Students taught through constructivist methods demonstrated significantly higher scholastic motivation than those taught through traditional methods. The experimental group showed increased curiosity, participation, confidence, and interest in science learning.

Problem-Solving Skills

The experimental group also achieved significantly higher scores in problem-solving tasks. Students were better able to analyze situations, formulate hypotheses, apply scientific principles, and solve unfamiliar problems.

These findings indicate that constructivist teaching effectively promotes higher-order cognitive skills and intrinsic motivation.

6.3 Within-Group Analysis

A comparison of pre-test and post-test scores within the experimental group showed remarkable improvement in both scholastic motivation and problem-solving abilities.

Students became more independent learners and demonstrated greater willingness to participate in classroom discussions, group work, and inquiry-based activities.

7. Discussion

The findings of the study strongly support the effectiveness of constructivist learning in science education. The significant improvement in scholastic motivation among students in the experimental group indicates that constructivist classrooms create a more engaging and supportive learning environment.



Traditional teaching methods often place students in passive roles where they memorize information without meaningful understanding. In contrast, constructivist teaching transforms learners into active participants who explore, question, investigate, and collaborate.

The increase in problem-solving skills can be attributed to the inquiry-based and activity-oriented nature of constructivist instruction. Students in the experimental group actively participated in experiments, discussions, brainstorming, and group investigations. Such activities encouraged critical thinking, analytical reasoning, and the practical application of scientific concepts.

The study also confirms the theoretical perspectives of Piaget and Vygotsky. Piaget's concept of active knowledge construction was reflected in the students' ability to develop understanding through exploration and experimentation. Similarly, Vygotsky's emphasis on social interaction was evident in collaborative classroom activities where students learned through discussion and peer support.

The findings are consistent with previous research studies conducted by Adak (2017), Bhattacharjee and Mehera (2014), Dev (2016), and Chandi (2020), which reported positive effects of constructivist learning on academic achievement, motivation, and higher-order thinking.

The constructivist approach not only improved students' academic functioning but also contributed to the development of confidence, communication skills, and independent learning habits. The democratic classroom atmosphere encouraged learners to express ideas freely and develop scientific attitudes.

8. Educational Implications

The findings of the study have important implications for teachers, curriculum developers, learners, and educational policymakers.

8.1 Implications for Teachers

Teachers should adopt learner-centered instructional strategies that promote inquiry, collaboration, and active participation. They should act as facilitators and guides rather than mere transmitters of information.

Teacher training programs should include practical training in constructivist teaching techniques such as brainstorming, scaffolding, cooperative learning, project-based learning, and reflective evaluation.

8.2 Implications for Curriculum Developers

School curricula should be redesigned to include more activity-based and problem-solving-oriented content. Science textbooks should encourage inquiry, experimentation, and real-life applications of concepts.

Constructivist learning experiences should be integrated into classroom activities, assignments, and assessments.



8.3 Implications for Learners

Students should be encouraged to participate actively in discussions, projects, experiments, and group learning activities. Opportunities for self-evaluation and reflection should be provided to help students become independent learners.

8.4 Implications for Educational Policy

Educational authorities should support constructivist practices by reducing overemphasis on rote learning and examinations. Schools should be provided with adequate resources and infrastructure to facilitate activity-based and experiential learning.

9. Conclusion

The present study confirms that constructivist learning significantly enhances scholastic motivation and problem-solving skills among 8th-grade science students. Students taught through constructivist methods demonstrated greater enthusiasm for learning, improved reasoning abilities, and stronger problem-solving capabilities than students taught through traditional methods.

Constructivist teaching encourages active participation, inquiry, collaboration, and meaningful learning. It transforms the classroom into a democratic and interactive environment where learners actively construct knowledge instead of passively receiving information.

The findings suggest that constructivism is not merely a theoretical perspective but a practical and highly effective teaching approach capable of improving educational outcomes in science education. Therefore, schools, teachers, and policymakers should promote the use of constructivist teaching methods at the secondary level.

The study also opens avenues for future research. Further studies may investigate the effectiveness of constructivism in other subjects, educational levels, and psychological variables such as creativity, critical thinking, self-concept, and learning styles.

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