

Original Article

IMPACT OF VISUAL ORGANIZER ASSISTED SCIENCE INSTRUCTION ON STUDENTS' ACADEMIC ACHIEVEMENT: A COMPARATIVE INVESTIGATION

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ABSTRACT

Profound educational change occurs when teaching methods move beyond traditional delivery and actively involve learners through structured, visual concept-focused approaches. This investigation looks at how visual organizers help secondary students improve academically in science. Based on constructivist theory, this method prioritizes clear concepts, connects prior and new knowledge, and promotes active participation in learning. Visual organizers, designed to match the curriculum, were used in an experimental group. A control group experienced standard teaching methods. The study used a pre-test and post-test design, measuring comprehension, retention, application, and overall performance through a standardized achievement test. The results showed significant improvement in post-test scores for students who used visual organizers, indicating that this method greatly enhances learning outcomes. The analysis showed positive academic growth for both boys and girls, proving it works effectively for all students. Besides increasing scores, the method also led to higher engagement, better organization of thoughts, and sustained interest in science. The study concludes that instruction using visual organizers has great teaching potential, offering a solid, meaningful path to academic success and a better experience in the classroom for secondary school students.

Keywords: Visual Organizer, Academic Achievement, Science Achievement Test

INTRODUCTION

Today's education system does not focus just on the content delivered; it prioritizes the learner receiving it. Modern teaching methods should align with students' mental levels, needs, interests, and learning abilities. Education becomes meaningful only when learners actively engage with concepts, establish connections, solve problems, and apply knowledge in real-life situations. Therefore, it is essential to use methods that not only transfer knowledge but also promote creativity, critical thinking, and independent learning.

As Vygotsky noted, "Learning is a socially mediated activity where knowledge is constructed through active participation."

Traditional teaching techniques, especially lectures, often limit students to passively receiving information. While they provide facts, they do not ensure meaningful understanding or the ability to apply knowledge in new situations. Constructivist teaching, on the other hand, asserts that learners build knowledge through active involvement. Bruner stated that "The purpose of education is not to impart knowledge but to facilitate thinking." This type of teaching encourages students to explore, discover, and relate new ideas to prior experiences.

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In this context, visual organizers have emerged as effective tools for teaching. They offer a structured way to represent concepts, allowing learners to see relationships among ideas, organize information meaningfully, and gain a deeper understanding. These tools foster meaningful learning by linking newly acquired knowledge with what students have already learned, which aids comprehension, retention, and application. Novak (1993) noted that learning becomes stronger when students can visualize and relate different pieces of knowledge. Visual organizers also promote active engagement, teamwork, and reflection, which are vital in modern education.

Thus, incorporating visual organizers into science teaching and other subjects is both pedagogically sound and psychologically valuable. They clarify understanding, improve memory, spark interest, and develop higher-order thinking skills. Ausubel pointed out that "The most important factor influencing learning is what the learner already knows; teaching must connect with it." Visual organizers effectively bridge this gap and are highly relevant in today's educational practices.

DEFINITIONS OF KEY TERMS

Visual Organizer

Novak & Gowin (1984): "A visual organizer is a structured diagram that shows concepts and their relationships, helping learners arrange knowledge meaningfully and connect new information with what they already understand."

Academic Achievement

The measurable learning outcomes of students, shown through test scores and performance indicators, reflecting their comprehension, retention, and ability to apply academic content.

Science Achievement Test

A standardized assessment tool designed to measure students' understanding, retention, application, and overall mastery of science concepts, providing a reliable measure of academic performance and learning effectiveness in science.

REVIEW OF RELATED LITERATURE

An examination of previous studies shows a consistent focus on how visual and physical organizers improve learning in science education. Ausubel, D. P. (1978). provided a theoretical basis, arguing that advance organizers help students learn meaningfully by connecting new information with prior knowledge. Adcock (2000) later noted that visually structuring content reduces cognitive load and improves processing efficiency. Research by Chang et al. (2002) found that concept mapping enhances comprehension and summarization skills, a result supported by classroom studies in science education Asan (2007). Chen (2007) reported that using advance organizers online helps learning and retention, while Akinbobola (2008) highlighted their positive effect on students' attitudes and success in science. At the secondary level, Adesola and Salako (2013) and Cheema and Mirza (2013) confirmed that visual organization strategies effectively improve academic performance. With technological integration, Aljaser (2017) and Amar (2019) emphasized the growing effectiveness of electronic and graphic visual organizers. Recent research from 2020 to 2024 further supports that digital and interactive visual organizers boost conceptual understanding, encourage student engagement, and improve long-term retention Hwang and Kim, (2020), Wu and Chen (2022), Kim (2023). In conclusion, the evidence clearly shows that visual organizers are crucial in organizing knowledge, simplifying complex scientific concepts, and promoting meaningful and enduring learning. Thus, they are an essential teaching tool in modern science education.

NEED AND SIGNIFICANCE OF THIS RESEARCH

From traditional science classrooms, we see that standard teaching methods focus on memorizing facts rather than meaningful understanding and practical application. Often, students struggle to apply their scientific knowledge in real-life situations, leading to misconceptions due to misinterpretation of scientific experiences. Recently, students have shown declining interest in studying science and lower academic achievement, highlighting the urgent need for innovative, learner-centered, and stimulating teaching methods.

So, we should question whether traditional methods produce the desired educational outcomes or whether we need more effective and dynamic approaches for teaching science. Visual organizers seem to be a powerful educational innovation, as they help students visualize relationships among ideas, build knowledge meaningfully, and actively engage in learning. Albert Einstein's words resonate: "Education is not the learning of facts, but the training of the mind to think." Similarly, David Paul Ausubel stressed the importance of relating new ideas to knowledge students already have. Therefore, this study aims to investigate how teaching science through visual organizers impacts students' academic achievement, exploring whether this method can make science learning more effective, engaging, and applicable to real-life scenarios.

OBJECTIVES OF THE RESEARCH

- 1) To examine the effectiveness of traditional teaching methods on the science achievement of Class IX students by comparing their pre-test and post-test scores.
- 2) To examine the effectiveness of visual organizers on the science achievement of female students in Class IX by comparing their pre-test and post-test scores.
- 3) To examine the effectiveness of visual organizers on the science achievement of male students in Class IX by comparing their pre-test and post-test scores.
- 4) To examine the effectiveness of visual organizers on the science achievement of Class IX students by comparing their pre-test and post-test scores.

HYPOTHESES OF THE RESEARCH

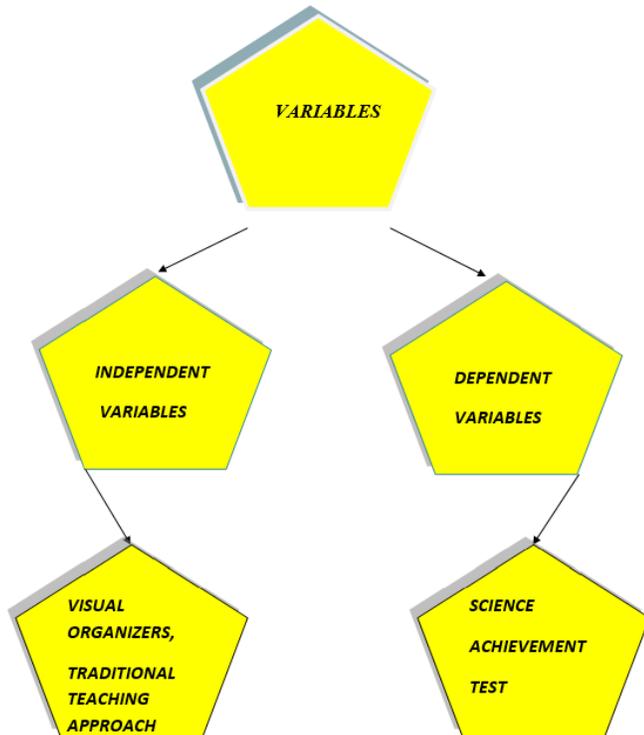
H0-1: There is no significant difference between the pre-test and post-test achievement scores of Class IX science students after being taught using traditional methods.

H0-2: There is no significant difference between the pre-test and post-test achievement scores of female Class IX science students after being taught using visual organizers.

H0-3: There is no significant difference between the pre-test and post-test achievement scores of male Class IX science students after being taught using visual organizers.

H0-4: There is no significant difference between the pre-test and post-test achievement scores of Class IX science students after being taught using visual organizers.

VARIABLES OF THE RESEARCH



SAMPLE OF THE RESEARCH

A sample refers to a group of participants selected from the larger population for research.

In this study, 80 students from the class IX science at AadharShila 'the School' in Chandpur, Bijnor district, were chosen. Students were selected using a purposive sampling technique, ensuring they were relevant and suitable for the research.

TOOLS OF THE RESEARCH

In this study, two main types of tools were used: structural tools and measuring tools. The structural tool includes visual organizers and a traditional lesson plan, which the researcher developed and used as a teaching strategy to improve concept clarity, knowledge organization, and meaningful learning for students. These visual organizers were specifically designed based on the Class IX NCERT Science curriculum and were consistently used during teaching sessions. The measuring tool, the Science Achievement Test, was also created by the researcher and assessed students' overall performance in science. Therefore, the study aims to determine how effective the visual organizers based on the NCERT Class IX Science content are at improving students' science achievement by examining the link between the teaching method and students' achievement outcomes.

Validity:

To maintain the academic quality of the study, we focused on ensuring the validity of the research tool. A test is valid when it accurately measures what it is supposed to. In this study, we confirmed the validity of the Science Achievement Test through content validity. Subject experts reviewed the test items to see if they truly represented the required content and teaching goals. Their judgment confirmed that the tool covered the essential areas of the curriculum, ensuring it accurately measures students' science achievement.

Reliability

Equally important was ensuring the reliability of the test so that the results remained consistent and dependable. Reliability refers to how stable and consistent the scores are when a test is given under similar conditions. In this research, we established reliability using the Split-Half Method. The test was divided into two equal parts, and the correlation between their scores was calculated. The reliability coefficient of 0.85 indicates a high level of internal consistency, suggesting that the test is trustworthy and sound for measuring students' performance.

Research Method

This research used an experimental approach to examine the effect of Visual Organization strategies compared to traditional teaching on the academic achievement of Class IX science students. The study aimed to provide strong evidence supporting innovative teaching practices to improve student learning outcomes.

RESEARCH DESIGN

The study employed a pre-test and post-test control group experimental design. One group learned through visual organizers, while the control group received traditional instruction. Pre-tests and post-tests were given to both groups to compare achievement levels, ensuring reliable, objective, and scientifically controlled evaluation of teaching effectiveness.

RESULTS OF STUDENTS SCORES BASED ON HYPOTHESES

H0-1: There is no significant difference between the pre-test and post-test achievement scores of Class IX science students after being taught using traditional methods.

GROUP	NUMBER (N)	MEAN (M)	STANDARD DEVIATION (S.D)	't' VALUE	0.05	0.01
SUDENTS PRE-TEST CONTROL GROUP	40	20.25	6.62	2.42	Rejected	Accepted
STUDENTS POST-TEST CONTROL GROUP	40	23.925	6.99		Significant Difference	Not significant Difference

The table above shows the mean scores of pre-test and post-test achievement tests for Class 9 Science students. In this research, the control group of students learned using the traditional method. The calculated t-value for the hypothesis in the table is 2.42. This t-value is greater than the critical t-value of 1.99 at the 0.05 level for 78 degrees of freedom and less than the critical t-value of 2.64 at the 0.01 level. Therefore, we reject the hypothesis at the 0.05 level of significance and accept it at the 0.01 level.

In conclusion, teaching Class 9 Science using the traditional method improved students' post-test achievement only at the 0.05 level of significance.

H0-2: There is no significant difference between the pre-test and post-test achievement scores of female Class IX science students after being taught using visual organizers.

GROUP	NUMBER (N)	MEAN (M)	STANDARD DEVIATION (S.D)	't' VALUE	SIGNIFICANCE LEVEL	
					0.05	0.01
FEMALE PRE-TEST EXPERIMENTAL GROUP	20	21	6.91	5.9	Rejected	Rejected
FEMALE POST-TEST EXPERIMENTAL GROUP	20	31.65	4.17		Significant Difference	

The table above shows the mean scores of pre-test and post-test achievement tests for Class 9 Science students. In this study, the experimental group of students learned with a visual organizer. The calculated t-value for the hypothesis in the table is 5.90. This t-value exceeds the critical t-values of 2.02 and 2.71 at the 0.05 and 0.01 levels for 38 degrees of freedom. Therefore, we reject the hypothesis at both the 0.05 and 0.01 levels of significance.

H0-3: There is no significant difference between the pre-test and post-test achievement scores of male Class IX science students after being taught using visual organizers.

GROUP	NUMBER (N)	MEAN (M)	STANDARD DEVIATION (S.D)	't' VALUE	SIGNIFICANCE LEVEL	
					0.05	0.01
MALE PRE-TEST EXPERIMENTAL GROUP	20	20	6	6.96	Rejected	Rejected
MALE POST-TEST EXPERIMENTAL GROUP	20	31.35	4.17		Significant Difference	

The table above shows the mean scores of pre-test and post-test achievement tests for Class 9 Science students. In this study, the experimental group of students learned with a visual organizer. The calculated t-value for the hypothesis in the table is 6.96. This t-value exceeds the critical t-values of 2.02 and 2.71 at the 0.05 and 0.01 levels for 38 degrees of freedom. Therefore, we reject the hypothesis at both the 0.05 and 0.01 levels of significance.

H0-4: There is no significant difference between the pre-test and post-test achievement scores of Class IX science students after being taught using visual organizers.

GROUP	NUMBER (N)	MEAN (M)	STANDARD DEVIATION (S.D)	't' VALUE	SIGNIFICANCE LEVEL	
					0.05	0.01
STUDENTS PRE-TEST EXPERIMENTAL GROUP	40	20.5	6.4	9.14	Rejected	Rejected
STUDENTS POST-TEST EXPERIMENTAL GROUP	40	31.5	4.12		Significant Difference	

The table above shows the mean scores of pre-test and post-test achievement tests for Class 9 Science students. In this study, the experimental group of students learned with a visual organizer. The calculated t-value for the hypothesis in the table is 9.14. This t-value exceeds the critical t-values of 1.99 and 2.64 at the 0.05 and 0.01 levels for 78 degrees of freedom. Therefore, we reject the hypothesis at both the 0.05 and 0.01 levels of significance.

In conclusion, teaching Class 9 Science content through visual organizers improved students' post-test academic achievement at both the 0.05 and 0.01 levels. This study shows a significant difference in the mean scores of their academic achievement due to the use of visual organizers.

CONCLUSION

Finally, based on the results of the hypotheses in this study, we can say that the increase in academic achievement in the group taught with the traditional method was limited. In contrast, groups taught with visual organizers showed higher academic achievement. Therefore, using visual organizers can help improve children's academic performance. This study highlights the importance of visual organizers.

This study concludes that using visual organizers for science instruction is a more effective teaching approach than traditional methods in secondary schools. By improving conceptual clarity, organizing knowledge, and engaging learners, visual organizers greatly enhance students' academic performance in science.

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