EFFECT OF ADVANCE ORGANIZER'S STRATEGY ON ACADEMIC PERFORMANCE IN TEACHING BASIC SCIENCE AMONG JUNIOR SECONDARY SCHOOL STUDENTS IN BAUCHI METROPOLIS

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Abstract
The study investigated the effect of advance organizer's instructional strategy on academic performance in teaching Basic science among junior secondary school students in Bauchi Metropolis, two research objectives was stated as: to determine the difference in students mean performance scores between pre-test and post-test mean score of students in the experimental group and to examine the difference in the students post-test mean score of students taught using advanced organizer's instructional strategy and those taught using conventional method and two Research Questions as: What is the difference in the students mean performance scores between pre-test and post-test mean score of students in the experimental group? And what is the difference in the students' performance mean score of students taught using advance organizer's instructional strategy and those taught using conventional method? And two Research Hypotheses, Quasi-experimental research design was adopted, a population of 4,448 students was found as at 2024/2025 academic session, Simple random sampling technique was used to select the school and an intact class was chosen through balloting. An intact class of one hundred and nineteen students was found, sixty-seven (67) in the experimental group and fifty-two (52) students in control group. Mean and standard deviation was used to answer the research questions while independent sample t-test was used to analyze the research hypotheses. The results show that, the paired samples t-test revealed a statistically significant difference between the pretest and post-test mean scores of students in the experimental group at the 0.05 level of significance, the post-test mean score ($\bar{x}$ = 67.00) was substantially higher than the pretest mean score ($\bar{x}$ = 42.00), indicating a mean gain of 25.00 points. This result suggests that the Advance Organizer Strategy had a significant positive effect on students' academic performance in Basic Science. The study recommends incorporating advance organizers into teaching practices, providing equal opportunities for all students, conducting further research, developing inclusive learning materials, and providing professional development for educators. The findings have implications for teaching practices and

educational policy, highlighting the need for further research into the application of advance organizers in various educational contexts.

Keywords: Advance organizer, Advance organizer's instructional strategy, Academic Performance and Basic Science.

Introduction

Basic Science occupies a central position in the Nigerian basic education curriculum, particularly at the junior secondary school level, where it serves as a foundation for scientific literacy and future learning in science-related disciplines. The subject is designed to develop students' understanding of fundamental scientific concepts, promote inquiry skills, and foster positive attitudes toward science and technology (NERDC, 2013). Despite its importance, evidence from school assessments and public examinations indicates that students' academic performance in Basic Science at the junior secondary level has remained persistently low, raising concerns about the effectiveness of prevailing instructional strategies (Aina, 2020; Okeke, 2019).

One of the major factors identified as contributing to students' poor academic performance in Basic Science is the continued dominance of teacher-centered instructional methods, which often emphasize rote memorization rather than meaningful learning and conceptual understanding (Adesoji & Olatunbosun, 2018). Such approaches may fail to adequately activate students' prior knowledge or provide cognitive structures that support the integration of new scientific concepts, particularly for abstract and conceptually demanding topics commonly encountered in Basic Science (Ausubel, 1968).

In response to these challenges, educational researchers have advocated the use of learner-centered and cognitively oriented instructional strategies that enhance meaningful learning. One such strategy is the Advance Organizer Strategy, which is grounded in Ausubel's theory of meaningful verbal learning. Advance organizers are introductory materials presented prior to instruction to bridge the gap between learners' existing knowledge and new content, thereby facilitating comprehension, retention, and transfer of learning (Ausubel, 1968; in Mayer, 2018).

Advance organizers may take various forms, including concept maps, diagrams, outlines, analogies, and narrative overviews, all aimed at providing learners with an organizing framework for incoming information. Empirical studies have demonstrated that the use of advance organizers can significantly improve students' academic performance in science subjects by enhancing conceptual understanding and reducing cognitive overload (Mayer, 2018; Alabi, 2016). In the context of science education, advance organizers have been found to promote active engagement, improve recall, and support higher-order thinking skills among learners (Oloyede, 2016).

There is a noticeable paucity of empirical research focusing specifically on Basic Science at the junior secondary school level, especially within Bauchi metropolis. Given the unique socio-educational context of the area, including class size, instructional resources, and students' background knowledge, it is necessary to investigate whether the advance organizer strategy can effectively enhance students' academic performance in Basic Science.
Therefore, this study sought to examine the effect of Advance Organizer's Strategy on

academic performance in teaching Basic Science among junior secondary school students in Bauchi metropolis. The findings of this study are expected to contribute to science education research, inform instructional practices, and provide evidence-based guidance for teachers and curriculum planners on effective strategies for improving students' learning outcomes in Basic Science.

Statement of the Problem

The concern over students' poor academic performance in Basic Science at the junior secondary school level is supported by empirical and national assessment evidence. Reports from national examinations and continuous assessment records indicate that a significant proportion of junior secondary school students in Nigeria perform below average in Basic Science, particularly in concept-based and application-oriented questions (NERDC, 2013; Okeke, 2019). Similarly, national monitoring reports by education agencies have shown that over 50% of JSS students score below credit level in Basic Science related assessments, reflecting weak conceptual understanding rather than mere lack of exposure to content (UBEC, 2018).

Research evidence further attributes this trend to the dominance of traditional, teacher-centered instructional approaches. Adesoji and Olatunbosun (2018) reported that more than 65% of science teachers in Nigerian secondary schools rely primarily on lecture-based methods, which inadequately engage students cognitively. Similarly, Aina (2020) observed that students taught using conventional methods recorded significantly lower mean achievement scores compared to those exposed to cognitively-oriented instructional strategies. These findings suggest that ineffective instructional practices contribute substantially to students' poor academic performance in Basic Science.

Therefore, the present study is justified as it seeks to empirically determine the effect of Advance Organizer's Strategy on academic performance in teaching Basic Science among junior secondary school students in Bauchi metropolis.

Objectives of the Study

The following Objectives guided the study:

1) Determine the difference in students mean performance scores between pre-test and post-test mean score of students in the experimental group.
2) Examine the difference in the students' post-test mean score of students taught using advanced organizer's instructional strategy and those taught using conventional method.

Research Questions

The following Research Questions guided the study:

1) What is the difference in the students mean performance scores between pre-test and post-test mean score of students in the experimental group?
2) What is the difference in the students' performance mean score of students taught using advance organizer's instructional strategy and those taught using conventional method?

Research Hypotheses

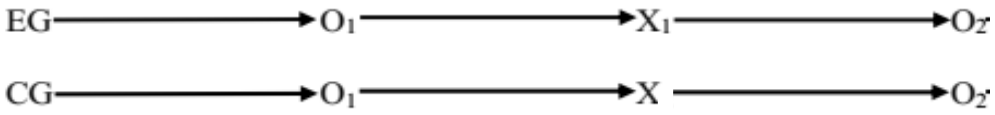
The following hypotheses guided the study:

H_{O1}: There is no significant difference between pre-test and post-mean score of students taught in the experimental group.

H_{O2}: There is no significant difference in the post-test mean score of students taught using advance organizers instructional strategies and those taught using conventional method.

Methodology

The research design adopted in this study was pretest-posttest, non-randomized group design. Due to constraints related to maintaining the organization of the school and the inability to exert complete control over the entire population, achieving complete randomization of subjects is often unfeasible. Consequently, the researcher opted for a quasi-experimental design. A population of 4,448 students was found as at 2024/2025 academic session, Simple random sampling technique was to select the school and an intact class was chosen through balloting. The sample of 119 students was fund into two groups: the control group and the experimental group. To conduct the research, Basic science Performance Test (BSPT) was developed. The pre-test scores was then be utilized to ensure that students with similar levels of prior knowledge was determine In the experimental group (X_1), instruction was provided using advanced organizer's instructional strategy while the control class (X_2) received their teaching using conventional method without any additional enhancements. Following three weeks, the same test was administered as a posttest. The study's design is illustrated in Figure 1.



Where:

EG Experimental Group
CG Control Group
O_1 Pre-test administration
X_1 teaching students using advanced organizer (treatment)
X teaching students using conventional lecture method (control)
O_2 Post-test administration

The instrument used for the research was the Basic Science Performance Test (BSPT), developed by the researcher using past question papers Basic Education Certificate Examination (BECE) from 2020 to 2024. The BSPT consists of 20 multiple-choice basic science test items with four options (A-D) from which the students would select the correct answers. The test items covered all topics taught in the duration of the study. The topics are the structure and functions of digestive organs, the process of digestion, absorption and assimilation of nutrients, the role of enzymes in digestion, regulation of digestive activities, common digestive disorders, and nutritional requirements for a healthy digestive system. The BSPT contained four options (A-D) with only one correct option.

The Basic Science Performance Test (BSPT) was validated by the experts from the Science Education Department of Abubakar Tafawa Balewa University, Bauchi, and two senior secondary school teachers. They asked to study the items and certify. To determine the reliability of the instrument, a test-retest method was employed. The first test was administered to students at a school that was not part of the study sample, after two-weeks interval, the second test was given to the same students; Pearson Product-Moment Coefficient (PPMC) was found to be r = 0.89. Using the reliability coefficient scale of 0-1, 0.89 is considered strong and reliable, and thus the instrument was deemed suitable for the study (Sambo, 2018). The Basic Science Performance Test (BSPT) was administered to the experimental group as a pre-test by the researcher. After six-weeks of instruction period, the BSPT was then administered to both groups as a post-test. The BSPT items were graded by the

researcher, and the scores was used to answer research questions using mean and standard while hypotheses were analyzed using independent sample t-test at a significance level of $P < 0.05$.

Results

Research Question one:

What is the difference in the students mean performance scores between pre-test and post-test mean score of students in the experimental group?

Table 1: students mean performance scores between pre-test and post-test mean score of students in the experimental group

Variables	N	Mean	SD	Df	MD
Pretest	67	42.00	7.85		
				66	25.00
Posttest	67	67.00	8.42		

In Table 1: the mean difference of 25.00 suggests a marked gain in students' academic performance after exposure to the Advance Organizer Strategy. Such a large positive mean gain indicates that the instructional strategy effectively enhanced students' conceptual understanding of Basic Science concepts. According to Ausubel (1968), meaningful learning occurs when new instructional materials are systematically linked to learners' existing cognitive structures, a condition strongly facilitated by advance organizers. Empirical studies have similarly reported significant mean gains in achievement when advance organizer strategies are employed in science classrooms (Ogbeba & Abakpa, 2015; Adeyemi, 2018).

Research Question two:

What is the difference in the students' performance mean score of students taught using advance organizer's instructional strategy and those taught using conventional method?

Table 2: students' performance mean score of students taught using advance organizer's instructional strategy and those taught using conventional method

Groups	N	Mean	SD	MD
Exp.	67	67.00	8.42	
				12.70
Cont.	52	54.30	7.96	

In Table 2 the observed mean difference of 12.70 indicates a substantial improvement in academic performance among students exposed to the Advance Organizer Strategy compared to those taught using the conventional method. This result suggests that the strategy effectively enhanced students' conceptual understanding of Basic Science. According to Ausubel (1968), instructional approaches that activate learners' prior knowledge facilitate meaningful learning and improve achievement outcomes. This finding is consistent with previous studies, which

reported significantly higher post-test mean scores for students taught using advance organizer strategies than those taught using traditional methods (Ogbeba & Abakpa, 2015; Adeyemi, 2018).

Research Hypotheses

Ho_1: There is no significant difference of students in the mean performance scores between the pre-test and post-test mean scores of students in the experimental group.

Table 3: Result of paired sample t-test on pre-test and post-test mean scores of students in the experimental group among junior secondary school students in Bauchi Metropolis

Variables	N	Df	t-cal	t-crit	Sig(P)	Decision
Pretest-Posttest	67	66	18.32	2.00	<0.05	Rejected H_O

In Table 3: the paired samples t-test revealed a statistically significant difference between the pretest and post-test mean scores of students in the experimental group at the 0.05 level of significance. The post-test mean score ($\bar{x}$ = 67.00) was substantially higher than the pretest mean score ($\bar{x}$ = 42.00), indicating a mean gain of 25.00 points. This result suggests that the Advance Organizer Strategy had a significant positive effect on students' academic performance in Basic Science.

This finding supports Ausubel's theory of meaningful learning, which emphasizes that instructional strategies that activate learners' prior knowledge enhance understanding and retention of new concepts (Ausubel, 1968). The result is consistent with previous studies that reported significant improvements in students' achievement following the use of advance organizer strategies in science instruction (Ogbeba & Abakpa, 2015; Adeyemi, 2018).

Ho_2: There is no significant difference in the post-test mean score of students taught using advance organizers instructional strategies and those taught using conventional method.

Table 4: Inodependent samples t-test of post-test mean score of students taught using advance organizers instructional strategies and those taught using conventional method

Variables	N	Df	t-cal	t-crit	Sig(P)	Decision
Exp.	67	117	8.41	1.98	<0.05	Reject H_0
Cont.	52					

In table 4 the independent samples t-test revealed a statistically significant difference in the post-test mean scores of students in the experimental and control groups at the 0.05 level of significance. Students taught using the Advance Organizer Strategy performed significantly better ($\bar{x}$ = 67.00, SD = 8.42) than those taught using the conventional method ($\bar{x}$ = 54.30, SD = 7.96). This indicates that the Advance Organizer Strategy had a significant positive effect on students' academic performance in Basic Science. This finding supports Ausubel's theory of

meaningful learning, which posits that instructional strategies that activate prior knowledge enhance comprehension and retention of new concepts (Ausubel, 1968). The result is consistent with earlier studies that reported statistically significant achievement gains in science among students taught using advance organizer strategies (Ogbeba & Abakpa, 2015; Adeyemi, 2018).

Discussion of Findings

The findings of this study revealed a statistically significant difference between the pretest and post-test mean scores of students taught Basic Science using the Advance Organizer Strategy. The post-test mean score of the experimental group was significantly higher than the pretest mean score, and the paired samples t-test result indicated that this difference was significant at the 0.05 level. This finding demonstrates that the Advance Organizer Strategy had a positive and significant effect on students' academic performance in Basic Science.

The significant improvement observed in students' post-test performance can be attributed to the instructional effectiveness of advance organizers in facilitating meaningful learning. Advance organizers help learners activate relevant prior knowledge and provide a conceptual framework that enables them to integrate new information more effectively (Ausubel, 1968). By presenting an overview of key concepts before instruction, students were better prepared to understand abstract and complex Basic Science concepts, which likely contributed to the substantial mean gain recorded in this study.

The moderate standard deviation observed in the post-test scores suggests that the Advance Organizer Strategy benefited students across different ability levels. This indicates that the strategy did not favor only high-achieving students but also supported average and low-achieving learners by reducing cognitive overload and improving conceptual clarity (Mayer, 2018). Such consistency in learning outcomes underscores the instructional value of advance organizers in junior secondary school science classrooms.

The findings of this study are consistent with previous empirical studies that reported significant improvements in students' academic performance when advance organizer strategies were employed in science teaching. For instance, Ogbeba and Abakpa (2015) found that students taught Integrated Science using advance organizers achieved significantly higher mean scores than those taught using conventional methods. Similarly, Adeyemi (2018) reported significant achievement gains in science subjects among students exposed to advance organizer-based instruction. The present study extends these findings by providing empirical evidence from Basic Science at the junior secondary school level in Bauchi metropolis.

Furthermore, the significant post-test performance supports Ausubel's theory of meaningful learning, which emphasizes the importance of linking new instructional content to learners' existing cognitive structures (Ausubel, 1968). The use of advance organizers in this study created an enabling learning environment where students could organize, interpret, and retain scientific concepts more effectively. This theoretical alignment strengthens the validity of the findings and highlights the relevance of cognitive-based instructional strategies in improving science learning outcomes.

Finally, the findings of this study suggest that the Advance Organizer Strategy is an effective instructional approach for enhancing students' academic performance

in Basic Science. Its successful application in this study indicates the need for Basic Science teachers to adopt innovative and learner-centered strategies that promote meaningful learning rather than rote memorization. The results also have implications for teacher training, curriculum implementation, and instructional planning in junior secondary schools, particularly within the context of Bauchi metropolis.

Conclusion

This study examined the effect of the Advance Organizer Strategy on the academic performance of junior secondary school students in Basic Science in Bauchi metropolis. The findings of the study revealed a significant improvement in students' academic performance following exposure to the Advance Organizer Strategy, as evidenced by the higher post-test mean scores compared to the pretest mean scores of the experimental group. The result of the paired samples t-test further confirmed that the observed difference was statistically significant at the 0.05 level of significance.

The significant learning gains recorded in this study underscore the effectiveness of the Advance Organizer Strategy in promoting meaningful learning by helping student's link new scientific concepts to their existing knowledge structures. By providing a conceptual framework prior to instruction, advance organizers enhanced students' comprehension, retention, and organization of Basic Science concepts, thereby reducing learning difficulties often associated with abstract topics.

The findings of this study lend empirical support to Ausubel's theory of meaningful learning and corroborate earlier studies that reported positive effects of advance organizers on students' academic achievement in science-related subjects. The success of the strategy across the experimental group suggests that it is a viable learner-centered instructional approach capable of addressing persistent challenges in Basic Science teaching at the junior secondary school level.

In conclusion, the Advance Organizer Strategy is an effective instructional strategy for improving students' academic performance in Basic Science. Its integration into classroom practice, teacher education programmes, and curriculum planning is therefore essential for enhancing the quality of science education in junior secondary schools, particularly within the context of Bauchi metropolis.

Recommendations

Based on the findings of this study, the following recommendations are made:

1 Adoption of Advance Organizer Strategy in Basic Science Teaching: Basic Science teachers at the junior secondary school level should adopt the Advance Organizer Strategy as a regular instructional approach, as it has been shown to significantly improve students' academic performance by enhancing meaningful learning and concept integration.

2 Teacher Training and Professional Development: Education stakeholders, including Ministries of Education and teacher training institutions, should organize workshops, seminars, and in-service training programmes to equip teachers with the skills required to design and effectively implement advance organizers in classroom instruction.

3 Integration into Teacher Education Programmes: Colleges of Education and Faculties of Education should integrate the use of advance organizer strategies into teacher education curricula to ensure that pre-service teachers are adequately

prepared to apply learner-centered and cognitively oriented instructional strategies in science teaching.

4 Curriculum and Instructional Planning: Curriculum developers and Basic Science textbook authors should incorporate advance organizers such as concept maps, outlines, diagrams, and introductory summaries into instructional materials to facilitate students' comprehension of complex scientific concepts.

5 Supportive Learning Environment: School administrators should encourage the use of innovative instructional strategies by providing supportive classroom environments, adequate instructional time, and relevant teaching aids that facilitate the effective use of advance organizers.

6 Extension to Other Science Subjects: The Advance Organizer Strategy should be extended beyond Basic Science to other science subjects such as Biology, Chemistry, and Physics, where students often experience difficulties with abstract concepts.

7 Further Research: Future researchers should replicate this study in other geographical locations and at different educational levels to enhance the generalizability of the findings. Additionally, studies could examine the effect of advance organizers on other learning outcomes such as students' interest, retention, self-efficacy, and critical thinking skills.

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