Exploring The Use And Impact Of Graphic Organiser In Science Learning Environment Of University Students In Ikere Ekiti, Nigeria

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Accepted:	reviewed:	Published:
10 August 2025	5 September, 2025	20 November 2025

Abstract: This study investigated the impacts of graphic organizer on University students' learning in Ikere Ekiti, Nigeria. Literatures relevant to the topic were reviewed and three research questions and hypotheses were raised to guide the study. Also, the influence of gender on the performance of students exposed to graphic organizer was examined. The research was a quasi-experimental design. The population of the study comprises of all Science Education students in the University. The samples used for the study consisted of 100 respondents who were purposively selected from second year students in the department. The students pre-test and post test scores were subjected to Student t- test. The findings of the study showed that the performance of students exposed to graphic organizer were better than their counterparts exposed to the conventional classroom instruction. However, no significant difference existed in the performance of male and female students exposed to graphic organizer. Based on the research findings recommendations were made on the need to develop relevant graphic organizer packages for teaching science education programs in Nigerian universities.

Keyword: Learning, Gender, Performance, Undergraduates Graphic Organiser

Introduction

It is generally assumed that physics, chemistry and biology have many theoretical concepts that are difficult to be understood by students, and have misconceptions about. It is also known that students do not or rarely link the knowledge gained from those scientific concepts to their daily life (Ozmen, Ibrahimoglu and Ayas, 2017). The students' conceptions, which may not be defined as scientific are named as "misconception", "alternative conception", "naive theories", and "children science" in the literature Simpson and Arnold (2014) stated that in education and learning process, inadequate traditional education system and the existing educational materials are neither helping the solution of the existing problems nor assisting in the development of conceptual learning.

Learning how to think is not as complicated as some people have believed. Once learnt, thinking skills can be readily applied to lessons in all curriculum areas and further to enhance students' life-long learning. While our knowledge about courses can change, fade, or become obsolete, our ability to think effectively remains constant. Effective thinking strategies allow students to acquire the necessary knowledge and apply it appropriately. (Nworgu 2019)

Various activity-based teaching strategies have been employed for the purpose of improving

the teaching and learning of Science. These strategies include inquiry method, demonstration method, process approach, cooperate learning, laboratory activity method among others (Usman, 2017). Some of the problems encountered in teaching and learning of Sciences can be attributed to so many factors such as poor classroom management, lecturers' attitude toward the teaching of Science and poor instructional methods and strategies used in teaching and learning. Also, another factor is students" lack of interest in learning science (Okeyefi & Nzewi, 2015). With all these problems, the need arises to use a strategy such as Graphic-Advance-Organizer to see whether it may enhance meaningful teaching/learning, develop students" interest and understanding of the concepts taught.

Advance organizers are links that have capacity to introduce and also organize the new learning material and learners" experience. According to Kurniaman (2018), when appropriate instructional learning materials are chosen and incorporated into each lesson, students' performance may improve. Furthermore, studies support the claim that relevant and appropriate instructional learning materials do improve students' performances because they directly support the presenting and gathering of facts, principles, and concepts in class (Kaku & Arthur, 2020; Taculod & Arcilla, Jr., 2020). In addition, with the use of suitable instructional learning materials, students become more engaged and motivated to learn, according to Nasir, Prastowo, and Riwayani (2018). As a result, in order to have the greatest impact, such materials must be carefully planned, selected, organized, refined, and used in a course (Garzon-Diaz, 2021).

The spatial arrangements of graphic organizers allow the students to identify the missing information or absent connections in one's strategic thinking (Ellis, 2017). According to Condidorio (2016), graphic organizers facilitate student comprehension of science content by showing the interrelatedness of ideas; providing visual cues to help students process the information; and allowing students to direct their own learning by keeping graphic organizers open to interpretation and independent thinking. In fact, dozens of empirical studies were conducted to verify the efficacy of such organizers, and some of these studies asserted their viability for teaching science subjects.

In constructivist learning, students engage in active cognitive processing, such as paying attention to relevant incoming information, mentally organizing incoming information into a coherent representation, and mentally integrating incoming information with existing knowledge (Mayer, 2016).

The idea of Graphic Organizers is based on Ausubel"s assimilation theory of cognitive learning (Ausubel, Novak & Hanesian, 1978). Students' interest could also be considered as the feelings of an individual towards a particular object or an activity. Meaning that the child could develop interest on any object or activity that is found to be attractive or stimulating to him. Therefore, in a classroom situation, the learner could be attentive only when the instruction handed over is of interest to him/her. The curiosity and interest of the students according to Aychin and Coskun (2019) manifest in the performance of the students. The authors reiterate that students whose interests have not been developed do not attend class regularly and such students neither listen to the lesson carefully nor do their homework.

Another variable considered in this study is gender. Sex alludes to state of being male or female. For a long time, sexual orientation was recorded by analysts as one of the variables that affected the scholastic accomplishment of the child (Gupta, Sharma & Gupta, 2016; Abubakar &

Oguguo, 2015). Thus, there have been parcels of talk about whether sexual orientation truly influences scholastic execution. A few analysts accepted that boys frequently out-perform their young ladies partners in most subject zones, whereas a few conclude the other way (Maliki, Ngban & Ibu, 2009; Jabor, Machtmes, Kungu, Buntat, & Nordin, 2016). But current patterns appear that the hole that once existed between sexes is quick closing (Abubakar & Bada, 2017). This recommends that ladies are getting more uncovered to instructive exercises more than ever. This may give prove for each sex bunches perform superior when instructed science utilizing graphic organizer. Male and female understudies may hold more or less or may hold similarly when instructed science utilizing these guidelines models. From the fore going, the analyst is attempting to explore the use and impact of graphic organizer in science learning environment of university students in Ikere Ekiti, Nigeria.

Methods

The target population involved all science education students in Bamidele Olumilua University of Education, Science and Technology, Ikere Ekiti , Nigeria. One hundred (100) students in the 200Level participated in the study.

The sampling technique that was adopted for the student in each group was random sampling method. The sampling procedure for students was done by assigning numbers randomly to students and dividing numbers randomly to represent the experimental and control group. The research instrument for data collection consists of 25 objective-multiple choice test items extracted from the curriculum. The test was administered with the assistance of an instructor from the department of Educational Technology and the researcher and marked for data analysis.

Pre-test was administered to each of the groups to test the student's previous knowledge about the topic and to establish that the students are of relatively same cognitive standard as far as the topic is concerned. Both the experimental group and the control group were being taught using lecture demonstration method. Thereafter, the experimental group (group A), were taught using graphic organizer.

The graphic organizer used for the teaching is on Mendelian inheritance pattern and breeding. It consists of a printed manual containing instructions to be followed by students and teachers to use the method. The questions were to test the result of the process, it is not meant for data analysis. After the graphic organizer procedure the same post test was administered to the two groups in order to access their academic performance after the teaching.

The test instrument was drawn from standardize past questions that focused on genetics and was scrutinized by experts and lecturers of biological sciences. The instrument used to access the graphic organizer procedure has been used for study of effectiveness of graphic organizer by various researchers and result found encouraging. Test-retest method was used to test the reliability and reliability coefficient of 0.72 was obtained.

Data collected was interpreted using the frequency distribution table and analyzed using various measures of central tendencies like mean, variance and standard deviation. The hypothesis 1, 2 and 3 were tested using the Students t- test with an alpha level of 0.05 level of significance.

Result And Discussion

Result

Hypothesis 1: There is no significant difference between the academic performance of students taught with graphic organizer and that of students taught with lecture method.

Table 1: Showing the t-test analysis for the post-test of experimental group and control group.

Groups	**N**	**X**	**S.D**	**d.f.**	**Alpha level**	**Critical t-value**	**Calculated t-value**
A	50	73.8	12.81				
B	50			98	0.05	1.980	38.97

As seen in table 1 above, the difference between the post-test score of the experimental group (A) and the control group (B) was found to be significant at 0.05 alpha levels since the calculated t-value (38.97) is greater than the critical or table value (1.980). We therefore reject the null hypothesis 1 stated above and restate the hypothesis as below

There is a significant difference between the academic performance of students taught with graphic organizer and that of students taught with lecture method.

Hypothesis 2- There is no significant difference between the academic performance of male students taught with graphic organizer and that of female students taught with graphic organizer

Table 2: Showing the t-test analysis for the post-test of Males and Females experimental group

Gender	**N**	**X**	**S.D**	**d.f.**	**Alpha level**	**Critical t-value**	**Calculated t-value**
Males	20	74.8	12.81				
Females	30	72.8		48	0-05	2.02	1.97

As seen in table 2 above, the difference between the post-test score of the males and the females experimental group was found not to be significant at **0.05** alpha levels since the calculated t-value (**1.97**) is less than the critical / table value **(2.02**). We therefore accept the null hypothesis 1 stated above.

Hypothesis 3- there is no significant effect of the use of graphic organizer on the students' academic performance. To determine whether there is any significant effect of the use of graphic organizer on the academic performance of the students, the pre and post–test of the experimental group has been subjected to t-test analysis. The result of the test is shown in table 3.

Table 3: Showing the t-test analysis of the pre and post-test of the experimental group.

Test	**N**	**X**	**S.D**	**d.f.**	**Alpha level**	**Critical t-value**	**Calculated t-value**
Pre	50	48.08	17.51				
Post	50	73.8	12.81	49	0-05	2.02	32.72

As seen in table 6 above, the difference between the pre-test score and the post-test score of the experimental group was found to be significant at **0.05** alpha levels since the calculated t-value (**32.72**) is greater than the critical or table value (**2.02**) at (49, 0.05). We therefore reject the null hypothesis 3 stated above and restate the hypothesis as below;
There is a significant effect of the use of graphic organizer on the students' academic performance

Discussion

This study has shown that graphic organizer has assisted in increasing the level of understanding of the concepts of genetics. The results of the final performance tests have shown that student's performance increased and found to be meaningful (at 0.05 alpha levels). Based on the responses provided to the test questions, the students have shown meaningful differences in the academic performance, when taught using graphic organizer and when taught using the traditional lecture method on. This indicates that the use of graphic organizer classes has a positive effect on the students' academic performance. It is supported by Sharrock (2018) that that graphic organizers helped the students keep to the topic by having their ideas in front of them as they were writing. The graphic environments provide a platform to apply the knowledge in a given situation, and their interactions results in the discovery of new knowledge that will help cognitive domain development and the accumulation of knowledge.

In addition, Cavanaugh, (2017) claimed that by using graphic organizers, students are encouraged to actively engage with the material instead of just passively taking it in. When they create or analyze these visual tools, they synthesize information and link new knowledge to what they already know. This hands-on approach fosters deeper cognitive engagement and enhances learning. Tobias, (2021) supported that Visual learning strategies, such as graphic organizers, can significantly boost memory retention. Our brains are wired to remember images and spatial arrangements more easily than text alone. Research indicates that students who incorporate graphic organizers into their learning process tend to recall information more effectively, as the visual format reinforces the material. Tobias, 2021.

The influence of gender on the academic performance of students in when taught with graphic organizer was examined using hypotheses two. The result of the analysis of t-test showed no significant gender difference for learners exposed to graphic organizer package. These findings showed that gender had no influence on the performance of students if they were taught with graphic organizer packages. These findings on gender agree with the earlier viewpoint of Majzub and Rais (2020) who stated that boys and girls performance do not correlate with the strategies used. A meta-analysis of 169 undergraduate biology and chemistry courses conducted by Sara & Halle (2021) found no overall gender gap in performance. However, factors like class size, assessment type, and teaching methods were identified as moderators influencing performance disparities. Larger classes, reliance on exams, and traditional lecture formats were associated with lower grades for women. Also, in the study of Isaac & Afua (2024) involving 290 students across three colleges of education in Ghana revealed no statistically significant gender differences in academic performance in integrated science and assessment courses. Both male and female students achieved similar mean scores, suggesting that gender-sensitive educational interventions can promote equity. This study provides the opportunity of finding out which of the groups, males or females, will do better when different types of graphic organizer are used.

Conclusion

It could be concluded that the use of graphic organizer in teaching concepts stimulate creativity, curiosity, critical thinking, promotes students engagement with scientific method, encourage active learning and promotes socio-academic interaction among learners and their teachers in teaching and learning of science subjects. The researcher therefore concluded that the usage stimulates creativity, curiosity and promotes socio-academic interaction among learners and their lecturers.

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