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III. BİLSEL

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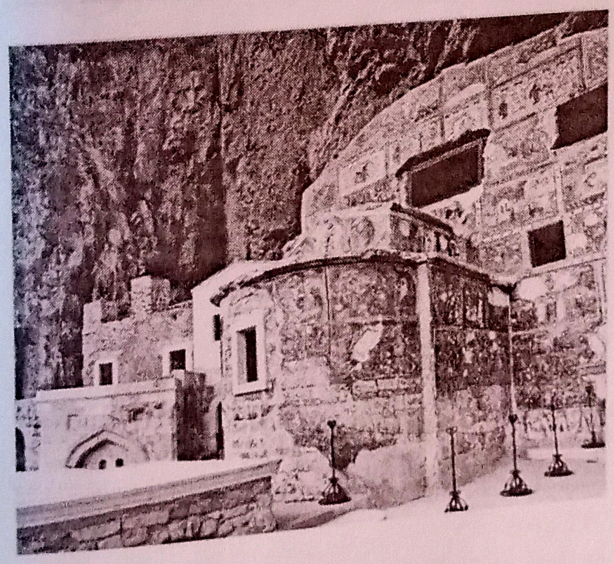

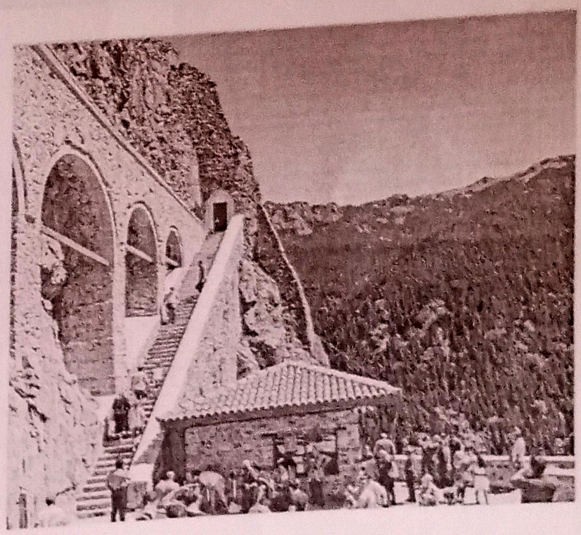

6-7 NİSAN 2024

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DATE and PLACE

06-07 APRIL 2024, TRABZON/TÜRKİYE

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İÇİNDEKİLER/CONTENTS

EFFECTS OF MOBILE – BASED AUGMENTED REALITY ON STUDENTS ACHIEVEMENT IN CHEMISTRY AMONG SECONDARY SCHOOLS IN SANGA LOCAL GOVERNMENT KADUNA STATE.

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Rabiu M. B.,
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ABSTRACT

This study was carried out to determine the Effects of Mobile – Based Augmented Reality on Students' Achievement and Motivation in Chemistry among Secondary Schools in Sanga local Government Kaduna State. The study adopted a quasi-experimental design using a target population of 284 SSS2 chemistry students. The sample of the study comprised 163 chemistry students randomly selected from the population guided by Research Sample Advisor using intact classes and randomly assigned to experimental and control groups. The research instruments used were adopted and confirmed reliable using Cronbach Alpha method of internal consistency with coefficient of 0.83 for questionnaire on motivation towards Mobile-Based Augmented Reality (QUMOBAR), and 0.75 for Organic Chemistry Achievement Test (OCAT). The collected data were analysed using mean, standard deviation, mean rank, sum of rank, z-test, ANCOVA. The findings of the study revealed that there was difference in the mean achievement score of chemistry students in the experimental and control groups though the difference was not statistically significant. It was recommended among others that Ministry of education, curriculum planner and professional bodies should encourage chemistry teachers to integrate Mobile – Based Augmented Reality (MOBAR) while teaching, so as to enable students learn and participate fully in the lesson.

Keywords: Mobile – Based Augmented Reality, Achievement, Chemistry

Background to the Study

Chemistry is considered to be a complicated and abstract science due the use of notions which are not objects of direct understanding. As a result, students have to create images of virtual objects exactly in their imaginations. However, not all students have the ability to create such objects or to create them in an appropriate way; hence teachers have to device a means of teaching to intensify visibility always. It has also been observed that many students taking chemistry have problem in learning and understanding molecular structures in organic chemistry (Samart, 2012). This may be attributed to the lack of visualization of the spatial structures of organic molecules which they are taught in a two dimensional representation on the blackboard or in textbooks. Understanding organic chemistry, therefore, depends on understanding the spatial structures of organic molecules.

The main problem with traditional teaching methods is maintaining the interest of the students into the learning process as classroom, information keeps flowing from the teachers to the students. Anthony and Paller, (2018), highlighted that the fundamental key for increasing information retention is by repetition of subject learning materials. MAR, however as an educational product, provides direct, interactive, and vivid visualization, which allows a better understanding (Shuxia Yang et al, 2018). Conventional teaching approach is viewed as a process of delivering required instruction to students without any opportunity for questioning. This means that the teacher has the monopoly of knowledge required to be imparted.

As a result students' achievement in the subject remains low in Nigeria. The aforementioned statement is attested to in the result of students in the West African Secondary School Certificate Examination (WASSCE) as reported in the Chief Examiner's report (2014/2015/2018). For students to learn more and better, learning has to be both experimental and interactive and should include the repetition of subject learning materials. We learn more from hands-on experiences and repetition of subject learning materials.

Teaching is the practice implemented by a teacher aimed at transmitting skills (knowledge, know-how, and interpersonal skills) to a learner, a student, or any other audience in the context of an educational institution (Manuel et al, 2012). It is therefore appropriate to say that teaching is a deliberate and conscious interactive attempt to help an individual acquire a meaningful change of attitude, knowledge, idea and skill. It is therefore a deliberate, conscious and systematic activity designed by a teacher or an instructor to make learning easier and to enable learners to achieve worthwhile knowledge, a change in behaviour, and acquire a skill. To address the shortfalls associated with conventional teaching approach, innovation and innovative tools will have to be used in teaching and learning. Therefore, this study seek to improve students' cognitive ability and interactivity, leveraging on the flexibility and visualization of the AR technology.

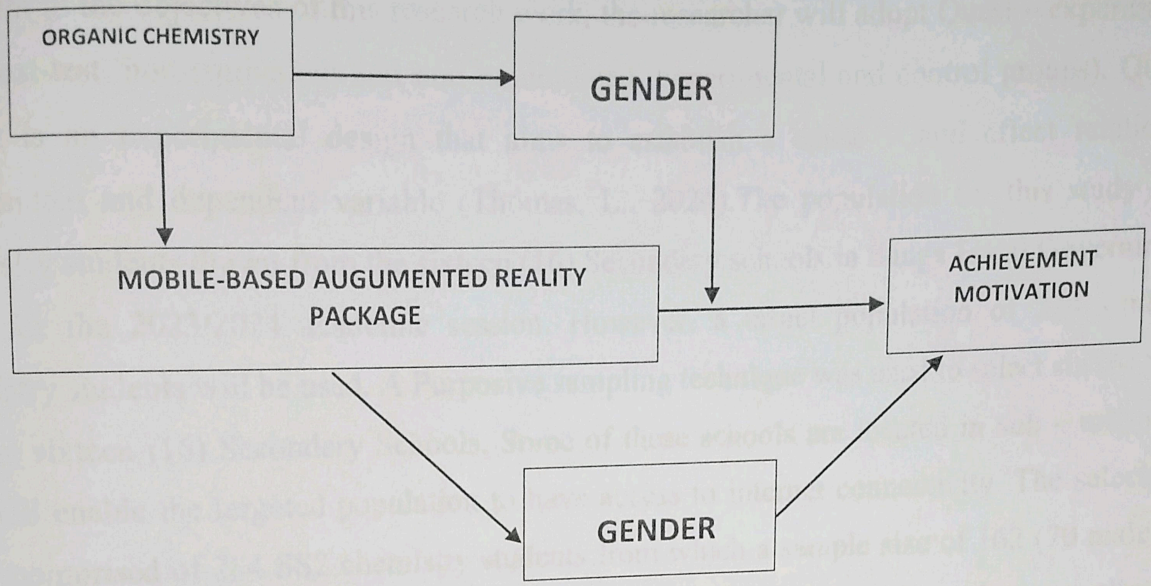

Figure 1.1: Conceptual Framework of the Study

It is on this background that this research work was carried out to determine the Effects of mobile – based augmented reality package on students' achievement and motivation in chemistry among secondary schools in Sanga local government Kaduna State.

Aims and Objectives of the Study

The aim of the study is to determine the effects of mobile – based augmented reality on students' achievement and motivation in chemistry among secondary schools in Sanga local government Kaduna State. Specifically, the objectives of the study were set to

1. determine the effects of Mobile Based Augmented Reality (MOBAR) on secondary schools chemistry students' academic achievement in Sanga local Government Area of Kaduna State.

2. determine the effects of Mobile – Based Augmented Reality (MOBAR) on secondary schools chemistry students' academic achievement in Sanga local Government Area of Kaduna State based on gender.

Research Questions

This study will be guided by the following research questions:

1. What is the difference between the achievement of students taught organic chemistry with Mobile Based Augmented Reality (MOBAR) and those taught with traditional method?

2. What is the difference between the achievement of male and female students taught organic chemistry with Mobile Based Augmented Reality (MOBAR) and those taught with traditional method?

Methodology

Pursuant to the objectives of this research work, the researcher will adopt Quasi – experimental research (pre-test, post-test, non-equivalent and non-randomized, experimental and control groups). Quasi – experimental design is an experimental design that aims to establish a cause – and effect relationship between an independent and dependent variable (Thomas, L., 2024).The population for this study will comprise 535 chemistry students drawn from the sixteen (16) Secondary schools in Sanga Local Government Area., Kaduna State for the 2023/2024 academic session. However, a target population of 284 students of the SSS2 chemistry students will be used. A Purposive sampling technique was used to select six (6) Secondary Schools out the sixteen (16) Secondary Schools. Some of these schools are located in sub – urban communities and this will enable the targeted population to have access to internet connectivity. The selected schools for the study comprised of 284 SS2 chemistry students from which a sample size of 162 (70 males and 92 females) students were selected, using Krejce and Morgan (1970) table, by simple random sampling and used for the study. For this study, two research instruments were employed by the researcher and used two for data collection and one for treatment. Organic chemistry Achievement Test (OCAT) and Questionnaire on Mobile-based Augmented Reality (QUMOBAR).

A pilot test was conducted to test the reliability of the instrument. A total of 30 Senior Secondary School Students from Government Secondary School Mayir, Sanga Local Government Area of Kaduna State who are not part of the sample selected for the study were used. The treatment instruments (OCAT and SOCHEMBAR) were administered to the students at a single administration using split-half method and the reliability coefficient was obtained using a Spearman Brown formula. The scores obtained from OCAT were divided into even and odd numbers and a reliability coefficient of **0.75.** The descriptive statistics (mean, standard deviation, mean rank and sum of rank) were used to answer research questions while inferential statistics Z- test and ANCOVA was used to test the research hypothesis at 0.05 level of significance, since the research was to assess relationships and differences between independent groups.

Analysis of Research Question

Research Questions One: What is the difference between the achievement of students taught organic chemistry with Mobile – Based Augmented Reality (MOBAR) and those taught with traditional method? Research question one was answered using mean and standard deviation and is presented in Table 1.1

Table 1.1: Mean and Standard Deviation (S.D) of Achievement Scores of chemistry Students taught with Mobile – Based Augmented Reality (MOBAR) and those taught with traditional method

		Pre-test		Post-test			
Groups	N	Mean	S. D.	Mean	S. D.	Adjusted Mean	Adj. Mean Diff
Experimental	96	25.89	7.101	30.32	8.828	4.43	2.46
Control	67	28.37	7.752	30.34	8.791	1.97	

Table 1.1 showed the Mean and S.D of Achievement Scores of chemistry Students taught with Mobile – Based Augmented Reality (MOBAR) and those taught with traditional method. The result indicated that, students exposed to Mobile – Based Augmented Reality (MOBAR) had a mean pre-achievement score of 25.89 with SD of 7.101, post-test mean achievement score of 30.32 with standard deviation of 8.828, the adjusted mean achievement was 4.43 while those exposed to traditional method had a mean pre-achievement score of 28.37 with SD of 7.752 and mean post-achievement score 30.34 with standard deviation of 8.791, the adjusted mean was 1.97. The different in the adjusted mean between the groups is 2.46 and this result indicates that Mobile – Based Augmented Reality (MOBAR) had increased achievement scores of students than traditional method did. The result shows that experimental group exposed to Mobile – Based Augmented Reality (MOBAR) performed better than control group that was exposed to traditional method. However, the responses of students in control group were closely related with S.D of 8.791.

Research Questions Two: What is the difference between the achievement of male and female students taught organic chemistry with Mobile – Based Augmented Reality (MOBAR) and those taught with traditional method? Research question two was answered using mean and standard deviation and is presented in Table 1.2

Table 1.2: Mean and Standard Deviation (S.D) of Achievement Scores of Male and Female chemistry Students taught with Mobile – Based Augmented Reality (MOBAR) and those taught with traditional method

		Pre-test		Post-test		
Groups	N	Mean	S.D.	Mean	S.D.	Adj. Mean
Male Experimental	42	26.21	6.628	29.19	9.701	2.98
Female Experimental	55	25.85	7.614	31.45	8.205	5.60
Male Control	28	28.50	9.624	31.82	7.252	3.30
Female Control	38	28.03	6.078	28.87	9.476	0.84

Table 1.2 showed the Mean and S.D of Achievement Scores of Male and Female chemistry Students taught with Mobile – Based Augmented Reality (MOBAR) and those taught with traditional method. The result indicated that, Male students exposed to Mobile – Based Augmented Reality (MOBAR) had a mean pre-achievement score of 26.21 with SD of 6.628 and posttest mean achievement of 29.19 with standard deviation of 9.701, the adjusted mean is 2.98. Female students exposed to Mobile – Based Augmented Reality (MOBAR) had a mean pre-achievement score of 25.85 with SD 7.614 and posttest mean achievement score of 31.45 with standard deviation of 8.205, the adjusted mean achievement is 5.60 while Male students exposed to traditional method had a mean pre-achievement score of 28.50 with SD of 7.252 and posttest mean achievement 31.82 with standard deviation of 7.252, the adjusted mean was 3.30 and female students exposed to traditional method had a mean pre-achievement score of 28.03 with SD of 6.078 and posttest mean achievement of 28.87 with standard deviation of 9.476, the adjusted mean was 0.84. The result indicates that female students in experimental group had higher adjusted mean achievement scores than male control, male experimental and female control. However, the responses of male students in control group were closely related with S.D of 7.252.

Discussions

The findings from this study revealed that there was difference in the mean achievement scores of students taught organic chemistry with Mobile-Based Augmented Reality (MOBAR) and those taught with traditional method though the difference was not statistically significant. The finding is in agreement with work carried out by Chiang et al, (2014), and Jamali (2019), who found out that the average learning achievement of the students taught using MAR was better than those that were exposed to traditional methods in natural science and structural equation modeling on mathematical concepts respectively. The finding is also congruent with

Midak et al (2022), who stated that students taught with lap book with augmented reality elements in a combination with the mobile application for study achieved better results in organic chemistry. The likely explanation for this outcome may be connected to the fact that the Mobile-Based Augmented Reality (MOBAR) provides the learner with a better way of understanding chemistry and an in-depth knowledge of the content area when compared to the traditional method.

There was no significant difference in the mean achievement scores of male and female students taught organic chemistry with Mobile-Based Augmented Reality (MOBAR). This result is in tandem with Pribeanu, (2018); Emin Ibili and Mark Billinghurst (2019), and Sebastian Habig (2020) who reported that the gender differences are not statistically significant as regards the observed scores, intrinsic load scores of both male and female students are below the average and gender has no effect on the intrinsic load and for science education in general and chemistry education in particular AR technology provides a promising approach to visualize complex concepts as this is supported by the consistently positive ratings of students respectively. This alignment, likely, may be connected to the fact that the Mobile-Based Augmented Reality (MOBAR) is gender friendly.

Conclusion

This study concluded that, though the differences in the mean achievement scores of students are not statistically significant, MOBAR has the potential to help students to access resources of knowledge, collaborate with each other, consult experts, share knowledge and solve problems, motivated behavior, which would lead to better academic achievement than the traditional method. There is no gender disparity in the achievement capacities of male and female students taught chemistry using the mobile – based augmented reality package which showed that package is gender friendly.

Based on the findings of this study, the researcher inferred thus: tools such as mobile – based augmented reality that integrate open educational resources in an organic and transversal way in face-to-face, online and blended educational contexts gain acceptability due to a flexibility, mobility, ease of use and understanding environment for online learning, a good alternative to the regular traditional method, and places emphasis on practice and mastery of information.

Recommendations

1. Ministry of education, curriculum planner and professional bodies should encourage chemistry teachers to integrate Mobile – Based Augmented Reality (MOBAR) while teaching, so as to enable students learn and participate fully in the lesson by allowing students to learn independently and become self-evaluated in order to improve students' academic achievement.

2. Government through ministry of education should organize workshops, seminars and conferences order to trained science teachers on the integration of Mobile – Based Augmented Reality (MOBA in the process of teaching and learning.

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