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EFFECTS OF EXPERIENTIAL LEARNING STRATEGY AND GENDER ON SECONDARY SCHOOL STUDENTS' ACADEMIC PERFORMANCE IN BASIC SCIENCE

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Abstract

This study investigated the effects of experiential learning strategy and gender on secondary school students' academic performance in Basic Science. The purpose of the study was to investigate the effects of experiential learning strategy and the influence of science students' gender on their academic performance. The study adopted pre-test and post-test control group quasi- experimental research design of the survey type. The sample for this study was 30 junior secondary school II Basic Science students in Ekiti State and they were selected through multistage sampling procedure. The research instrument used was Basic Science Performance Test (BSPT) which was given as pre-test and post-test to the respondents. Face and content validity of the instrument were ascertained by experts in Science Education, and Test, Measurement and Evaluation. Test-retest method was used to establish the reliability of BSPT as administered to 20 students outside the normal sample with interval of two weeks and co-efficient correlation value of 0.75 was obtained. Data collected were analyzed using t-test for the hypotheses at 0.05 level of significance. The result showed that science students' performance through experiential learning strategy at post-test was found to be significantly better than that of the control group. The findings also revealed that experiential learning strategy was not gender sensitive. Based on the findings of the study, it was concluded that experiential learning strategy improved students' performance in science subjects. It was therefore recommended that this new instructional strategy should be introduced to the teaching of science subjects at all levels.

Keywords; Science subjects, Basic Science, experiential learning strategy, academic performance, and gender

Introduction

Science and Technology are essential factors for country's growth and development. Science is an integral body of knowledge that aids the acquisition of skills and provision of immediate solution to the societal problems. Science is defined by Omiko (2015) as a quest for meaning or an investigation of natural phenomena. The importance of science in the 21st century cannot be underestimated as it forms the bedrock for any substantial growth economically and technologically in any country of the world.

Science and technology give direction to the modern way of working, communication, connect and transact of businesses. Since technical and scientific

revolution underpin economic advancements, as well as development in all areas of national development; health system, education, infrastructure and commerce.

Science as being developed from the grass root from the foundational level of education to the level of converting it to be a workable knowledge acquired. And so, teaching of Science subjects at the primary or secondary schools should not be viewed down or jettison in as much that such nation or country is aspiring to towards the national development. This could be part of the main reasons why developed countries of the world such as US and Japan achieved their eminence in which they are the leading countries in the production of electronics and automobiles due to the attachment of importance to the teaching of science subjects (Cambell, 2000).

Science teachers are crucial to the teaching of science subjects, because they are the ones to organize and implement curriculum of science subjects from the primary to the University level and science needs to be taught in practical way to avoid students considering its concepts as been abstract. One of the important science subjects is Basic Science.

In Nigeria, Basic Science was formally known as Integrated science which was formally to develop students from ages 6 to 13 years to observe carefully and thoroughly, report completely what is observed organise information acquired, generalizing on the basis of the acquired information and predicting as a result of the generalization, National Policy on Education (FRN, 2014). This subject had been on in both primary and secondary schools.

This science subject was changed both in content by broadened it and the name changed to Basic Science due to the recent educational reforms in Nigeria (FRN, 2007). The subject's curriculum was equipped to equip students with more needed skills than that of integrated science.

Basic Science was designed for Nigerian secondary schools as a panacea to the problems bedeviling science education especially at the junior secondary school level (Oniya, 2018). The programme as stated in national policy on education emphasizes acquisition of skills and development of the spirit of enquiry as opposed to rote learning. It is also to develop acquisition of scientific attitudes rather than accepting scientific facts as a dogma (Adenike & Busayo, 2013).

Basic science could be refers to as the gateway to the teaching and learning of science which is fundamental to the learning of specialized scientific discipline such as Physic, Chemistry, Agricultural Science and Biology (Afuwape, 2013), and these subjects of disciplines form the conceptual science. Therefore Basic Science is the interface between these conceptual science subjects which rebuild Basic Science as the study of science which comprises of biological, physical and chemical sciences in a holistic approach.

National Policy on Education (NPE, 2014) specifies that Basic Science is focused at enabling students to acquire skills of sing models to explain phenomena where appropriate, continuing the process of inquiry when new data do not conform to predictions among other. It is stated clearly that the subject supposed to be presented by the teachers according to the National Policy on Education (NPE, 2007) in a way for the students to be able to gains the concept of the fundamental unity of science (Physics, Chemistry and Biology), gains the commonality of approach of problem of a scientific nature and gain an understanding of the role and function of science in everyday life and the world in which he or she lives.

Despite the utilitarian value of Basic Science and other science subjects to the development of a student towards specialized or conceptual science subjects, national development and human capacity in order to find solution to immediate societal problem so as for a child to be self-reliance to a certain level. The subjects are faced with students' performance that is not encouraging; Lawal, (2018) on his study identified that the performance of students in science subject was alarming going by WAEC results of previous years.

It has also been observed by Omebe and Omiko (2015) that the suggested methods of teaching science subjects have been utilized for several years by the Science teachers and yet the results of the students in both external and internal examinations have not been encouraging.

Furthermore, Omwuakpa & Nwcke (2000) observed that adequate teaching and learning with appropriate use of effective instructional strategy is not taking place very well as far as Science and Technology are concerned in Nigerian schools. The level of performance of science students in both external and internal examinations is not encouraging and this eventually led to low enrollment of students into science courses, Oniya (2018).

Finding solutions to the above existing problems over the years, the effects of new teaching strategies have been investigated; Flipped Instructional Strategies, Abiola and Titilope (2018); Guided Inquiry Oyeniyi, (2019); Activity-Based Approach, Laboratory Instructional Strategies, Puzzle- based Learning Strategies, Generative Instructional Strategy among others, but not so much have been done on experiential Learning Strategy especially to science subjects such as Basic Science which is the subject that serves as interface or treats science holistically.

Experiential Learning Strategies is often referred to as the hands-on or problem-based teaching method. There is a common adage attached to experiential learning, "Tell me and I will forget, show me and I may remember, involve me and I will understand," (Confucius).

Experiential Learning Strategy is an approach to teach a concept with the process of mapping it to the experienced of the learning. Teaching with Experiential Learning Strategy offers the learners the opportunity to acquire skills and

knowledge through first hand experiences, reflect upon those experiences and convert it to functional experiences in daily life situations. The classroom or laboratory can serve as a venue for experiential learning through embedded activities, problem based studies, guided inquiry simulation, experiments or art projects (Wurdinger and Carlson, 2010).

Experiential learning approach encourages different activities where students can reflect, develop skills, knowledge and apply what they have learnt to a new condition in their daily life. It is about learning which depends on the basic skills and accomplishing or acting on more complicated skills in the future. The teaching-learning time can be extended to include off school learning activities and experiences which eventually are being reflected in the transfer of learning tasks into products and performances that constitute the constructed knowledge and skills out of these activities and experiences.

There are some examples that could vividly explain Experiential learning strategy such as going to the zoo to learn about animals through observation, instead of reading about them. Learning in the school farm to learn about photosynthesis instead of demonstration by the teacher in the class or in the laboratory. Hoping on a bicycle to try and learn to ride, instead of listening to your parent explain the concept.

Besides, the effects learning strategy adopted for the teaching of science, learner's characteristics such as gender might also affect students' achievement in basic science practical skills, especially in Nigeria where the traditional attitude of parents to the education of their children is to invest more in the education of boys (Onocha, Okpala and Offorma, 2000).

The critical belief of biological theorists is that gender differences are natural and therefore unalterable (Olubunmi, 2011). It would be right and proper to treat boys and girls in schools differently because their natural inclinations are different roles. Thus, theories were advanced that female excelled in language based subject because of their greater and reasoning abilities yet underperformance in science because of their lower level of innate ability of shape and form factors (Baniface, 2008). Some researchers pointed out that gender plays no significant role in students' academic performance in science subjects while others hold a contrary opinion. The general belief that males achieve better than females in science subjects could be regarded as a myth.

It is in view of this, that the researchers investigated the effects of experiential learning strategy on secondary school students' academic performance in science subjects. Also to determine the effect that gender would have on secondary school students' academic performance in science subjects.

Statement of the Problem

There has being a trend of poor performance of students in Science subjects in both external and internal

examinations despite the efforts being made by towards achieving high level of performance. This could be attributed among others to adoption of inappropriate instructional strategy by science subject teachers and that the conventional teaching strategy seem not meeting the expected outcome in students' performance. As a result of this, Science educators are continually seeking instructional strategies among others that will improve students' performance in Basic Science. There is the need to look at the effect of using novel learner centered methods of instruction in Science subjects. Studies have shown that Computer Simulation Strategy could be used successfully to enhance better performance in Science subjects. It is also empirically cleared that gender could effectively influence the academic performance of students in science subjects.

This study is faced with the problem of verifying the effects of experiential learning strategy on Secondary School Students' Academic Performance in Basic Science. The researcher is also interested to find the effect of gender on academic performance of students in science subjects.

Delimitation of the Study

The study is delimited to the effects of experiential learning strategy and gender on secondary school students' academic performance in Basic Science. It is also delimited to Junior Secondary School II students in Ekiti State and the study is conceptually delimited to Heat Energy and Habitat.

Research Hypotheses

The following null hypotheses were formulated in the course of the study

1. There is no significant different in the post-test mean score of students exposed to experiential learning strategy and conventional method among secondary school students in Basic Science
2. There is no significant difference in the post test mean score of students exposed to experiential learning strategy by gender among secondary school students in Basic Science

Significance of the Study

It is hope that the result of the findings would be significant as the findings will be of benefit to learners, teachers, parents, curriculum planners and the body of knowledge. It will enable the learners to observe the concept in a realistic situation in the classroom by using the model of the concept during teaching. It would be useful to science teachers in all science subjects and at all levels to have the knowledge of empirical frame work for the use of experiential learning strategy which will cater for the gender balancing. It would be an eye opener for the curriculum planner to provide enabling strategies that is gender insensitive for teaching and learning that will enhance scientific attitude in learners which will enable them to contribute to the development of the nation. It would be of benefit to the

parents as the study would be able to achieve the purpose of financing the education of their children.

Methodology

The study design was pre-test and post-test control group quasi- experimental research. The design provided an opportunity for determining how the independent variables combined to influence the dependent variables in the study, hence determined the effectiveness of the treatment. The design permitted the determination of all experimental variables to be generalizable across all levels of the control variables. The population of the study consisted of 1,276 Junior Secondary School II in Ekiti State, they were considered relevant because they were not involved in any external Certificate Examination and therefore they were readily available for the study. The sample for this study was 30 JSS II Basic Science students in Ekiti State and they were selected through multistage sampling procedure. Stage one involved the selection of two Local Government in Ekiti State which were; Ikere and Ado Ekiti Local Government Areas using simple random sampling technique. The second stage involved the selection of one secondary school in each of the Local Government selected using purposive sampling technique putting into consideration the schools that are gender mixed and have University graduate as Basic Science teacher. The third stage involved the use of simple random sampling technique to select 15 students in each of the school selected making 30 respondents. The research instrument used was Basic Science Performance Test (BSPT) which was given as pre-test and post-test to the respondents. Face and content validity of the instrument were ascertained by experts in Science Education, and Test, Measurement and Evaluation. Corrections made were properly incorporated into the instrument to make the final and corrected version. Test-retest method was used to establish the reliability of BSPT as administered to 20 students outside the normal sample with interval of two weeks and co-efficient correlation value of 0.75 was obtained. Data collected were analyzed using t-test for the hypotheses at 0.05 level of significance

Hypotheses Testing

Hypotheses 1

There is no significant different in the post-test mean score of students exposed to experiential learning strategy and conventional method among secondary school students in Basic Science

Table 1: *t-test analysis of the* post-test mean score of students exposed to experiential learning strategy and conventional teaching strategy in Basic Science

Group	N	Mean	Std. Deviation	df	t_{cal}	t_{tab}
Control Group	30	28.97	4.87			

Conventional Group	30	23.07	8.54	58	3.27	1.68

Table 1 revealed that tcal was greater than t-tab. This implies that there was a significant difference between the performance of students exposed to experiential learning strategy and that of conventional method at post-test. Hence, the null hypothesis was not accepted.

Hypotheses 2

There is no significant difference in the post test mean score of students exposed to experiential learning strategy by gender among secondary school students in Basic Science

Table 2: t-test analysis of the post-test mean score of students exposed to experiential learning strategy by gender in Basic Science

Group	N	Mean	Std. Deviation	Df	t_{cal}	t_{tab}
Male	15	24.80	2.46	28	0.59	1.71
Female	15	24.33	1.80			

Table 2 revealed that t-cal is less than t-table. This implies that there was no significant difference between the post-test mean score of students exposed to experiential learning strategy by gender. Hence, the null hypothesis was accepted.

Discussion

The findings revealed that there was a significant difference between the performance of students exposed to experiential learning strategy and that of conventional method at post-test of students in Basic Science. The students exposed to experiential learning strategy performed significantly better than those exposed to conventional method at post-test. This is supported by Wigfield & Eccles, (2019) that experiential learning strategy is motivating and improves students' performance in science subject. This is also in agreement with the claim of Olalekan and Shamila and Yoon, (2017) who ascertain that experiential learning strategy improves academic performance of undergraduates in science courses.

The findings also shown that there was no significant difference in the post test means score of students exposed to experiential learning strategy by gender among junior secondary school Basic Science students. This shows that experiential learning strategy is also gender insensitive. This finding is in support of Gambari et. al. (2012) who stated that if both male and female students are exposed to the same

treatment and given equal opportunity, they will achieve equally academically. This is opposed to Okoro (2011) who claimed that boys can perform significantly better than girls in science subjects.

Conclusion

From the findings of this study, it is concluded that students' exposure to experiential learning strategy resulted to a significant increase in academic performance of students in science also that the strategy is gender insensitive.

Recommendations

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

1. Experiential learning strategy should be adopted to teach science concepts.
2. Pre-service science teachers should be trained on how to make use of the strategy for better performance of their students.
3. Curriculum developers and educational technology specialists should intensify efforts aimed at developing interactive experiential learning strategy
4. It is also recommended that experts in science education should incorporate design features into experiential learning so that science students would be fully immersed in the experiential learning.

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IDENTIFICATION OF DIFFICULT TOPICS IN CHEMISTRY CURRICULUM AS PERCEIVED BY SECONDARY SCHOOL STUDENTS IN ADO EKITI

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Abstract

The study identified concepts perceived by secondary school chemistry students as difficult in the chemistry curriculum in Ado Ekiti. The study examined the reasons for the students' perceived difficulty and created awareness of the difficult concepts. The research design adopted for this study was a descriptive research of survey type where a sample of one hundred and fifty (150) secondary school chemistry students was selected for the study. Data collected were analyzed using inferential statistics and mean ranking correlation. It was revealed that carbonyl compounds, polymerization, esterification and thermodynamics are the top 5 difficult concepts in the chemistry curriculum. Based on the findings of this study, it could be concluded that students find the chemistry curriculum difficult and the factors that caused the difficulty included methods of teaching used by the teacher, lack of well-equipped laboratory and misconception of principles and concepts. It was recommended that chemistry teachers should concentrate more on the quality than the quantity of concepts covered during the course and chemistry teachers in secondary schools should re-examine and evaluate their teaching strategies and results to modern and effective strategies. Such teachers should develop not only a set of attitudes, but also new professional skills.

Keywords: concepts, difficult concept, chemistry curriculum, perception

Introduction

A curriculum is a set of experiences planned to influence learners toward the goals of an organization. However, Howson & Kingsbury (2021) defined curriculum as a set of engagements of a person to be educated with other persons and with things (all bearers of information, processes, techniques and values) in a certain arrangement of time and space.

On the other hand, Annala, & Mäkinen. (2017) see curriculum as the cumulative tradition of organized knowledge, modes of thought, a planned learning environment, cognitive and affective content and process, an instructional plan, instructional outcomes and a technological system of production. Therefore, the content of the curriculum and the method employed to present the content have to be determined by the nature of the society, discipline and the capability of the learner. Olugbuyi, Ayeni, Famuwagun, & Odunyemi, (2020) opined that the chemistry curriculum should be closely related to everyday life. However, chemistry is expected to provide basic literacy in chemistry for functional living in the society. It should also provide its learners with basic concepts and principles

for the preparation for further studies and it should stimulate creativity.

Chemistry as a course is one of the three main branches of pure science, the other two being physics and biology. Chemistry is the aspect of science that deals with the study of compositions and properties of matter. It also attempts to explain the chemical phenomena of everyday life. Azeez, Oyedeji, Adebisi, Adejumo, & Tijani (2017) defined chemistry as the scientific study of the characteristics and composition of substances. Azeez, et al. (2017) noted that chemistry is divided into fields of organic, physical, inorganic, analytical, biophysical, organometallic, medicinal, agricultural, electro-organic, theoretical and solid-state chemistry. It is the basis for modern technology due to its wide applications in several fields including agriculture, medicine, engineering and pharmaceutical.

The teaching and learning of chemistry are of great importance to the nation, individuals and society at large. Chemistry researchers are deepening the understanding and this leads to new discoveries that will help the nation in solving many future problems, including sustainable energy and food production, managing our environment, providing safe drinking water and promoting human and environmental health. However, it has been observed by the researcher that students in chemistry find some concepts difficult which could be attributed to the fact that some terms in chemistry cannot be observed or be related to physical activities; the teaching and learning of some topics in chemistry involves mathematical expression and critical thinking, Jegede, Olatunbosun, Ajayi, & Olugbuyi (2017).

Many chemistry principles and concepts require laboratory experience which will provide students with opportunities for team building, inquiry-based learning, hands-on activities, and exposure to standard laboratory equipment and technology. Although, an excellent laboratory experience will certainly require hours of behind-the-scenes work on the part of the teacher. However, Chemistry is a laboratory science and cannot be effectively taught and learned without robust laboratory experiences.

There is a lack of competent teachers to handle chemistry in our various secondary schools and this is one of the major problems affecting the interest of students and the effectiveness of teaching and learning processes of chemistry in schools. Many of the teachers handling chemistry are not well grounded in the method that can facilitate effective teaching and learning in order to improve achievement in chemistry.

Additionally, the difficulty in understanding of chemistry curriculum is probably why many students resort to memorizing or even cramming the laws, principles, hypotheses, chemical equations and formulae in chemistry, hence, they forget easily and will not be able to apply the knowledge when needed. Here, the issue of language is responsible for the observed lack of understanding of chemical terms,

Concepts such as dissolution, particulate nature of matter, and chemical bonding are fundamental to learning chemistry (Azeez, et al. 2017 and Jegede et al. 2017). Unless these fundamentals are understood, topics including reaction rate, acids and bases, electrochemistry, chemical equilibrium, and solution chemistry become arduous, Therefore, inquiring into student's conceptions of the fundamental concepts in chemistry has been a research focus of several researchers in many countries for the last two decades, Tümay (2016). Concepts develop as new ideas are linked together and the learner does not always correctly make such links which may lead to misconception.

Winarni, & Syahrial, (2023) observed that what may appear difficult to somebody may be easy to another person because the concepts of easiness or difficulty as perceived by somebody are dynamic. Whatever the case, concept difficulty invariably affects students' achievement in such a subject.

Also, Wieman, & Gilbert, (2015) and Olugbuyi, Hammed, & Adaramoye, (2021) stated that the understanding of the student in a subject depends on the quality of the teaching method provided by the subject teacher, hence, the teaching methods used by the teacher should be well understood by the teacher and used at the appropriate time. A good knowledge of these teaching methods would help chemistry teachers to know the best method to employ in a particular topic in the classroom.

Inadequate time to teach is another factor that constitutes poor performance of students in chemistry; teachers thereby rush through the scheme of work. This is due to the voluminous nature of secondary school chemistry. Therefore, in order to achieve quality education, the fundamental important knowledge domain should be the focus of the class Olugbuyi, Oginni, Ayeni, & Fatoba, (2018).

Students and teachers also maintained that the topics are difficult because the instructional materials necessary for teaching and learning the topics are inadequate in supply as a result of underfunding by the government and the available ones are not properly used.

The researcher observed the poor academic achievement of chemistry students in Ekiti state secondary schools could be related to their perception of the subject as difficult. Hence, the identification of areas of difficulty in the chemistry curriculum is important as the study is out to identify the perceived difficult topics that pose some problems to or are difficult for students in the senior secondary school chemistry curriculum using Ado Ekiti as a case study.

Statement of the Problem:

The researcher observed that the poor academic performance of students in recent years in chemistry has been attributed to the inability of students to understand the concepts. This then calls for investigation of the issues related to the understanding of the concepts.

There is the low enrolment of students in chemistry in the senior secondary school certificate examination and this is as a result of students' perception of the chemistry curriculum as being difficult, they show little or zero interest in the study of chemistry.

Purpose of the study

The general purpose of this study is to identify the difficult topics in secondary school chemistry curriculum based on Ado- Ekiti student's perception. The study is also found to discuss various learning methods in order of its appropriateness by discussing its features.as well as the factors that affects students' learning in Ekiti State.

Research Questions

The following research questions were raised to guide the study:

1. What are the difficult topics in chemistry curriculum as perceived by secondary school students?
2. What are the learning methods engaged in chemistry classroom as perceived by secondary school chemistry students?
3. What are the prevalent challenges facing the learning of chemistry concepts in Ekiti State secondary school as perceived by chemistry students?

Methodology

The descriptive research survey type was adopted in this study. This design was considered appropriate because it carefully observed and recorded information as it naturally occurs in any research. The purpose of descriptive design is primarily to describe one or more times in the situation of interest. The resulting data is often used to explain and predict phenomena. The target population for the study is Secondary School Students who are offering chemistry in Ado Ekiti Local Government area. The study identified difficult topics in the senior secondary chemistry curriculum. The population of the study covered a total of one hundred and fifty (150) students while thirty (30) students were selected from each school.

The instrument used for this study is a questionnaire. The questionnaire was designed by the researcher and titled Identification of Difficult Teaching and Learning Topics in Senior Secondary Chemistry Curriculum in Ado Ekiti Local Government Area. Statements were drafted for subscales, A, B, C, D and E. Section A consists of relevant personal information regarding bio-data such as gender, age, and class levels. Other sections [B, C, D and E] allowed the collection of qualitative and quantitative data. Section B; is set to identify concepts that the students perceived as difficult.

Section C seeks to identify the likely methods used in learning Chemistry in the classroom. This section generated a total of four statements for subscale C. Section D elucidated information on conceptually difficult and the students' interest in the study of chemistry. This section sought for the respondents' interest in the study of chemistry. The primary purpose of this is to look at the students' views with regard to their motivations and anxieties in the

study of chemistry. Section E contains a set of questions to evaluate the challenges that are dominant in secondary schools based on the perception of the students

Results

Research Question One: What are the difficult topics in the chemistry curriculum as perceived by secondary school chemistry students?

Table 1 Mean and Rank Order Analysis of the difficult topics in chemistry curriculum as expressed by secondary school chemistry students

S/N	Difficult topics in secondary school chemistry curriculum as perceived by students	Mean	Rank Order
1.	Carbonyl compound	3.30	1st
2.	Polymerization	2.94	2nd
3.	Esterification	2.91	3rd
4.	Thermodynamics	2.89	4th
5.	Enthalpy	2.83	5th
6.	Chemical kinetics	2.80	6th
7.	Hydrophobic	2.76	7th
8.	Ionization	2.72	8th
9.	Electronegativity	2.71	9th
10.	Isomerism	2.69	10th
11.	The mole concept	2.69	10th
12.	Redox reaction	2.66	12th
13.	Electron Affinity	2.66	12th
14.	Stoichiometry	2.66	12th
15.	Enantiomer	2.66	12th
16.	Dipole moments	2.64	16th
17.	Radioactivity	2.64	16th
18.	Polarization	2.60	18th
19.	Atomicity	2.57	19th
20.	Quantum Number	2.55	20th

Table *1* reveals some of the difficult topics in chemistry as expressed by chemistry students in secondary schools. Carbonyl compound with a mean score of 3.30 was ranked 1st, and polymerization with a mean score of 2.94 was ranked 2nd. Esterification with a mean score of 2.91 was ranked 3rd. Thermodynamics with a mean score of 2.89 was ranked 4th. Enthalpy with a mean score of 2.83 was ranked 5th, chemical kinetics with a mean score of 2.80 was ranked 6th, and hydrophobic with a mean score of 2.76 was ranked 7th. Ionization with a mean score of 2.72 was ranked 8th, Electronegativity with a mean score of 2.71 was ranked 9th, Isomerism and mole concept with mean score 2.69 each were ranked 10th. Redox reaction, electron affinity, stoichiometry and enantiomer with a mean score of 2.66 each were ranked 12th, dipole moments and radioactivity with a mean score of 2.64 were ranked 16th, polarization with a mean score of 2.60 was ranked 18th, atomicity with a mean score of 2.57 was ranked 19th, quantum number with a mean score of 2.55 was ranked last (20th).

This result further revealed that all twenty (20) had mean scores above the cut-off point (2.50). Therefore, it can be deduced that chemistry is perceived as difficult as expressed by secondary school chemistry students in Ado Ekiti.

Research Question Two: What are the learning methods engaged in chemistry classrooms as perceived by secondary school chemistry students?

Table 2 Mean and Rank Order Analysis of learning method frequently used in chemistry classroom as expressed by secondary school chemistry students

S/N	Learning strategies for learning secondary school chemistry	Mean	Rank Order
1.	Observation	3.17	1st
2.	Memorization	3.06	2nd
3.	Demonstration	3.00	3rd
4.	Application of scientific formulas and laws to solve problems	2.97	4th
5.	Experimentation	2.94	5th
6.	Investigation	2.93	6th
7.	Group Work/Discussion	2.89	7th
8.	The use of ICT	2.83	8th
9.	The use of model	2.79	9th
10.	The use of textbooks and other resource books	2.76	10th
11.	Quiz/Questions and answer	2.72	11th
12.	Field trip	2.64	12th

Table *2* shows some of the learning method frequently used in chemistry as expressed by chemistry students in secondary schools. Observation with a mean score of 3.17 was ranked 1st,

Memorisation with a mean score of 3.06 was ranked 2nd, demonstration with a mean score of 3.00 was ranked 3rd, application of scientific formulars and laws to solve problems with a mean score of 2.97 was ranked 4nd. experimentation with a mean score of 2.94 was ranked 5th, investigation with a mean score of 2.93 was ranked 6th, group work/discussion with a mean score of 2.89 was ranked 7th.

The use of ICT with a mean score of 2.83 was ranked 8th, the use of model with a mean score of 2.79 was ranked 9th. The use of textbooks and other resource books with a mean score of 2.76 was ranked 10th, Quiz/Questions and answer with a mean score of 2.72 was ranked 11th while field trip with a mean score of 2.64 was ranked last (12th).

This result further reveals that six (6) items out of twelve (12) had mean scores above the cut-off point (2.9). Therefore, it can be deduced that the learning method frequently adopted in chemistry classroom as perceived by secondary schools' chemistry students in Ado Ekiti are: Observation, experimentation, demonstration, application of scientific formula and laws to solve problems, memorization and investigation.

Research Question Three: What are the prevalent challenges facing the learning of chemistry concepts in Ekiti State secondary school as perceived by chemistry students?

Table 3 Mean and Rank Order Analysis of challenges affecting the teaching and learning in chemistry classroom as expressed by secondary school chemistry students

S/N	Factors affecting the teaching and learning as perceived by the students	Mean	Rank Order
1.	Poor method of teaching	3.41	1st
2.	Lack of adequate laboratory	3.36	2nd
3.	Inadequate Library	3.30	3rd
4.	Lack of motivation from Teachers	3.17	4th
5.	Less experienced Laboratory attendant	3.14	5th
6.	Less experienced Chemistry Teachers	3.13	6th
7	Misconceptions of Chemistry concepts	3.11	7th

Table *3* showed the ranking of challenges facing the learning of chemistry concepts as perceived by the secondary school chemistry students in Ekiti State. Teaching method had been identified as the most prevalent challenge facing the learning of chemistry. Inadequate laboratory also was seen as prevalent. Others are inadequate library followed by the lack of motivation from teachers and inexperienced personnel in teaching chemistry in the laboratory and the classroom.

Conclusion

Based on the findings of this study, it could be concluded that secondary school chemistry students perceive the chemistry curriculum difficult. Also, the majority perceive observation and memorization as their easiest way of learning the chemistry concepts. While poor teaching methods, such as adopting discussion method in lieu of demonstration and hands on strategy, inadequate laboratories and inadequate libraries were prevalent in the challenges facing the learning of chemistry concepts.

Recommendations

Based on the findings of this study, the following recommendations were made.

i. Chemistry teachers should concentrate more on the quality than the number of concepts covered during the course, exposure to many concepts at a time promotes memorizing and enhances algorithmic skills instead of conceptual learning.
ii. Chemistry teachers in secondary schools should re-examine and evaluate their teaching strategies and results to modern and effective strategies. Such teachers should develop not only a set of attitudes, but also new professional skills.
iii. Authors of chemistry textbooks and other materials should consider the level of cognition of the students at the different levels and come up with indigenous textbooks commensurate with the secondary level of chemistry education. This will make it possible for local examples to be identified and incorporated into the textbooks.
iv. Students who opt for chemistry should be counseled right. They need to know that a lot is expected from them in terms of hard work and dedication.
v. Government and proprietors should increase teacher's salaries and also incentives should be given especially to science teachers inform of science allowance and reducing the burden on the teachers.
vi. Government should provide functional laboratories and other relevant instructional materials for the teaching and learning of Chemistry in our secondary schools.
vii. More qualified chemistry teachers who are practical-oriented should be posted to secondary schools to demystify the seemingly abstract concepts and topics in chemistry.
viii. Curriculum planners should look into the curriculum, and make provisions for more practical works and illustrations of different concepts.

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EFFECTIVENESS OF STANDARD AND IMPROVISED INSTRUCTIONAL MATERIALS ON STUDENTS' PERFORMANCE IN MATHEMATICS

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Abstract

The study examined effectiveness of standard and improvised instructional materials on students' performance in Mathematics. The study adopted quasi- experimental design with a sample of 74 students selected for the study. Mathematical Achievement Test (MAT) was used to collect data after the validation. Reliability coefficients of 0.68 was obtained. Data collected were analyzed descriptively and inferentially for the research question raised and the hypotheses formulated and tested at 0.05 level of significance. The findings of the study showed that there is a significant difference in the performance of mathematics students taught using standard and improvised instructional materials compared with the conventional method. Also, male students performed better than their female counterparts in this study. Based on the findings of the study, it was recommended that standard and improvised materials should be effectively used in teaching of Mathematics in secondary schools.

Keywords: *Standard, improvised, instructional materials, students' performance*

Introduction

Mathematics is the science of reasoning and computations. It is the science of numbers, quantities, shapes, spaces and their relationship. It deals with generalizations, abstractions and application of ideas to situations in the real life. Mathematics has become a language that helps man to describe ideas and drawn conclusion from his environment, which enables him to make scientific predictions, thereby transforming the invisible to the visible, through intuitive, logical and critical thinking for solving problems that would have been impossible in other subjects. As a result, mathematics teachers present mathematics knowledge to their students as a necessity right from pre-primary, primary, post-primary to tertiary level. Mathematics is a vital beckon for societal reality and personality development of a learner. Kolawole and Oginni, (2009) described Mathematics as compulsory subject for all primary and secondary school students, that must be passed before admission could be offered into any tertiary institution in Nigeria.

Activities of Mathematics teachers over the years has shown their excessive use of words to convey ideas, knowledge or facts in the

teaching-learning process. This in turn has resulted into abysmal performance of students in the subject. Several strategies are being put in place to ameliorate the problem by researchers but have not yielded the expected results. Akanmu and Fajemidagba (2016) laid emphasis on helpful strategies that can contribute positively to learners' ability to extract a simple figure from a complex one. This would be effective, more interactive and eventually make the teaching-learning of mathematics an interesting and activity – based for the students.

Instructional materials are the tools that facilitate teaching learning process. These materials compliment teachers' efforts in concretizing and practicalizing instructions and eventually promote students understanding of concepts. Any serious teacher who has the interest of the students at heart expected to look for improvised materials if it is impossible to get standard materials during teaching and learning process. The act of teaching Mathematics without using any instructional device can never erase the abstract impression that the majority of the students have towards Mathematics. Since the subject is practical in nature, every teacher needs tool in educational lessons, which could make learning more permanent. Instructional Materials are the collection of materials including living and non living resources that a teacher may use in teaching and learning situations to help achieve her objectives. This includes power point presentations, books, articles, manipulative and visual aids. Instructional materials make learning more exciting, interesting and interactive.

Instructional materials constitute alternati ve channels of communication, which a te acher can use while explaining more vividly instructional information to learners. (Amadioha, 2009). Instructional materials can be in different forms such as textual and non-textual, the visual, the auditory and audio-visual. Instructional materials refer to the facilities that can be used to ease, encourage, improved and promote teaching and learning activities.

Type of instructional materials

Classroom experiences help teachers to become conversant with the right type of materials to be used in teaching/ learning situations. Types of instructional materials outlined by Amadioha (2009) are graphic materials, three- dimensional materials, still pictures, still projected pictures, motion pictures and Audio materials. Nowadays, knowledge dynamism helps teacher to teach with devices that promotes graphics, animation on computer. Akanmu and Fajemidagba (2014) advocated interactive and dynamic classroom experience as a panacea to knowledge driven mathematical understanding that can sustain learners' interest in the subject. Dynamic teaching could employ the use of graphic materials that are used to compress information, to focus and captivate attention, to vary stimuli presented and as an aid to recall.
Other instructional materials in mathematics and its pedagogical uses are stated below:

Grid board: - for the teaching of perimeter and area of plane figures, coordinate system, graphing functions

Modified geoboard :- for the teaching of plane figures, similarity, coordination, counting, right angles, pattern, classification, scaling, position, congruence, area, perimeter

Fraction slider:- for the teaching of addition and subtraction of fraction

Number slider:- for the teaching of addition and subtraction of integers

Algebra Tiles: - for the teaching of number slider, modelling expression, solving quadratic equation, simplifying trinomials and polynomials

Fraction pie: - for the teaching of fraction, circumference of a circle, area of a circle, area of a circle, perimeter of a parallelogram

Perimeter and Area: - for the teaching of distance, polygons, perimeters of polygons, area of polygons

Platonic solid: This refers to regular polyhedral such as tetrahedron, hexahedron or cube, octahedron, dodecahedron, Icosahedron, sphere

Archimedean Solid: for the teaching of volume, surface area, tessellation, polygons

Number line: - for the teaching of counting, measurement, addition and subtraction, decimal and fraction

Standard instructional materials looks fascinating and more inviting. This could be in form of graphic materials, information Technology (IT) and other devices that are 21st century compliance. Nufus and Zubainur (2020) emphasized the use of standard materials that could enhance students' mathematical understanding ability. By using model, diagram, and symbols to present a concept; changing a representational to concrete. Graphics communicate facts and ideas clearly through combination of drawings, words and pictures. Oginni (2021) reiterated that graphic organizers help students to solve knotty issues as well as enhance test scores through effective and consistent problem-solving process in Mathematics.

Improvisation is the alternative material at our disposal that can be used in place of the standard materials, which are not available or expensive, delicate or sophisticated. In a situation where a readymade materials are not in place, it is expected of any professional mathematics teacher to demystify abstraction in the teaching of the subject. According to Onasanya and Omosewo (2011) creative minds are curious in expanding their academic horizon through the provision of alternative teaching tools. Improvisation is the make-shift of a learning material. Ikwuka & Chukwuemeka (2016) emphasized that improvisation of instructional materials has become a better substitute that promote comprehension and assimilation of facts.

Statement of the Problem

Many teachers are complaining of not providing them with sophisticated equipment to teach their students without

exploring locally available materials at their disposal, as an alternative impetus for the grossly unavailable standard materials in our schools. It appears that the environmental necessity in checking unavailability of teaching aids has not been priotised by Mathematics teachers, thereby leaving their students to theoretical knowledge transfer. It has been noticed that many students do not intentionally hate mathematics, but as a result of the abstract symbolism attached to most concepts by some teachers. Also, the researchers noticed poor performance of students in internal examination, hence the need for investigating into the effectiveness of different materials in the teaching of the subject.

Purpose of the Study

The purpose of the study is to investigate the effectiveness of standard and improvised instructional materials on the academic performance of students in Mathematics: Specifically, the study would:

-find out the instructional materials that can enhance mathematics learning

-investigate the gender difference and instructional materials effectiveness

Research Question

A research question was raised to guide the study.

1. What is the effect of standard and improvised material on student performance in Mathematics?

Research Hypotheses

The following hypotheses were generated for the study:

1. There is no significant difference in the pretest mean scores of students before their exposure to standard materials, improvised materials and conventional strategies.
2. There is no significant difference in the posttest mean scores of students exposed to standard materials, improvised materials and conventional strategies.
3. There is no significant difference in the performance mean scores of male and female students exposed to standard materials , improvised materials and conventional strategies before and after the treatment

Methodology

The research design employed for this study was pretest, posttest and control group quasi experimental design.

G_1:- O_1 X_1 O_2

G_2:- O_3 X_2 O_4

G_3:- O_5 C O_6

Where G_1 = Experimental group 1,

G_2 = Experimental group 2 and

G_3 = conventional group

O_1, O_3, O_5 are the pretest observations and O_2, O_4, O_6 are the posttest observations

X_1 - Treatment for group 1 (Standard instructional materials)

X_2 - Treatment for group 2 (Improvised instructional materials)

C -- Control group (conventional method)

The population for this study consisted of all Senior Secondary School I (SS1) in three schools in Ondo state. The sample for this study comprised 74 Mathematics students selected using multistage sampling procedure. Firstly, 3 schools were randomly selected from a local government in the state. Secondly, Art classes were purposively selected from each of the schools, this is because of their phobia for Mathematics and to test the efficacy of the experiment. The last stage involved the use of intact class of a single arm of SS1 from each of the selected schools. Mathematical Achievement Test (MAT) was the instrument used to collect data for the study. Some of the topics consider were Geometry, Measuration and Algebra while standard and improvised materials were provided for *Modified geoboard*, *Fraction slider, Algebra Tiles and Number line.* The face and content validity of the instrument was carried out through four experts in Mathematics education, with inter-rater rating of 0.88. The reliability coefficients of 0.79 was obtained when test re-test method was used to ascertain the reliability of the instrument. Mathematics Achievement Test consists of section A and B, section A consist of bio-data of the respondents which include the name of the school, students' identification number, and sex. Section B consist of 30 objectives items. The same items were used for both pre-test and post-test for data collection. MAT used for pre-test was reshuffled for the post-test in order to prevent carry-over effect. Data collected were analyzed descriptively and inferentially using mean, standard deviation, Analysis of Variance (ANOVA), Analysis of Covariance (ANCOVA), Scheffe posthoc, Multiple Classification Analysis (MCA) for the research question raised and the hypotheses formulated and tested at 0.05 level of significance

Results

Research Question

1. What is the effect of standard and improvised material on student performance in Mathematics?

Table 1:- Frequency counts and mean performance of students in Mathematics

Group	N	Pretest mean	SD	N	Posttest mean	SD	Mean Diff.
Standard	24	6.83	2.01	24	27.38	5.79	20.55
Improvised	20	6.45	1.76	20	44.65	5.12	38.20
Conventional	30	6.70	2.25	30	17.70	3.53	11.00

Table 1 showed the mean differences of the three groups, where the 20.55, 38.20 and 11.20 were recorded for the standard, improvised and the conventional group respectively. It appears as if the students taught using improvised instructional

materials perform better than their counterparts that were taught with standard instructional materials and the conventional group.

Hypothesis 1: There is no significant difference in the pretest mean scores of students in standard, improvised and conventional strategies.

Table 2:- ANOVA summary of students mean scores in standard, improvised and conventional groups before treatment

SOURCE	SS	Df	MS	F	P
Between groups	1.633	2	0.816	0.194	0.824
Within groups	298.583	71	4.205		
Total	300.216	73			

Table 2 showed that Fcal = 0.194, P value > 0.05 was not significant. The null hypothesis is not rejected, this implies that there is no significant difference in the pretest mean score of the students before their exposure to standard, improvised and conventional strategies. This indicated a homogeneity in their performance, and hence any changes thereafter could be as a result of the treatment.

Hypothesis 2: There is no significant difference in the posttest mean scores of students exposed to standard, improvised and conventional strategies.

Table 3:- ANOVA summary of students mean scores in standard, improvised and conventional groups after treatment

SOURCE	SS	Df	MS	F	P
Between groups	8735.43	2	4367.72	190.20	0.000
Within groups	1630.48	71	22.964		
Total	10365.91	73			

Table 3 showed that Fcal = 190.20, P value < 0.05 was significant. The null hypothesis is rejected, this implies that there was significant difference in the posttest mean score of the students exposed to standard, improvised and conventional teaching. In order to locate the sources of pairwise significant difference among the groups, Scheffe Posthoc test was carried out. The result is presented in Table 4.

Table 4:- Scheffe Posthoc analysis of students *in standard, improvised and conventional groups after treatment*

Groups	1	2	3	N	Mean

Standard (1)	*	*	24	27.38
Improvised (2)		*	20	44.65
Conventional (3)			30	17.70

Table 4 showed that there was significant difference between the performance of students taught using standard and improvised materials. Similarly, the mean difference between the performance of students taught with improvised materials is more significant than that of standard. The reason adduced to the improvement in the performance of students taught using improvised strategy over their counterpart in standard strategy could be as a result of locally invented materials that students are familiar with, which they participated in its build up during the experiment. Which gives opportunity for the students to search for familiar tools within their domains for continuous practices on how to use improvised items during and after class.

Hypothesis 3:- There is no significant difference in the performance mean scores of male and female students exposed to standard, improvised and conventional strategies before and after the treatment

Table 5:- *2x3 ANCOVA summary of gender difference performance in Mathematics when taught using standard, improvised and conventional*

Source	SS	df	MS	F	P
Corrected Model	9067.47*	6	1511.24	77.980	.000
Covariate (Pretest)	122.30	1	122.30	6.311	.014
Sex	108.71	1	108.71	5.609*	.021
Group	8696.92	2	4348.46	224.382*	.000
Sex*Group	176.02	2	88.01	4.541*	.014
Error	1298.440	67	19.38		
Total	68887.00	74			
Corrected Total	10365.916	73			

Table 5 showed that F_{cal} = 4.541, P value = 0.014 < 0.05 was significant. The null hypothesis is rejected, which implies that there was a significant difference in the performance mean scores of male and female students exposed to standard, improvised and conventional strategy before and after treatment. Similarly, the main effect of gender ($F_{1, 67}$ = 5.609, P < 0.05) and treatment ($F_{2, 67}$ = 224.382, P < 0.05) on the students' performance in Mathematics is statistically significant at 0.05 level of significance in each case. In order to determine the effectiveness of the treatment at enhancing students performance in Mathematics based on gender, multiple classification was used. The result is presented in Table 6.

Table 6:- Multiple classification Analysis *of students' performance in Mathematics when taught using standard, improvised and conventional based on gender*

Variable+ category	N	Unadjusted Devn'	Eta^2	Adjusted for Independent + Covariate	Beta
Standard					
Male	14	2.19		2.19	
Female	10	-3.08		-3.08	
Improvised					
Male	11	1.35		1.25	
Female	9	-1.65	0.72	-1.54	0.06
Conventional					
Male	14	-0.34		-0.75	
Female	16	0.30		0.66	
	Multiple R	Multiple R^2		Grand Mean	
Standard	0.002	0.000		27.38	
Improvised	0.328	0.107		44.65	
Conventional	0.398	0.158		17.70	

Table 6 revealed that male students exposed to standard instructional materials and improvised instructional materials had the higher mean scores in Mathematics than their counterparts that are exposed to conventional method. In standard instructional materials, the mean score for the male is 29.57 while the female mean score is 24.30. In improvised instructional materials, the mean score for the male is 45.90 while the female mean score is 43.11. However, in the conventional instructional strategy, the mean score for the male is 16.95 while the female mean score is 18.30. The treatment and gender explained about 72% (Eta^2 = 0.72) of the observed variance in students' performance in Mathematics.

The findings of the study showed that there is a significant difference in the performance of mathematics students taught using standard, improvised and the conventional strategies. This supported the study of Amadioha (2009) that instructional materials definitely make learning more real and meaningful to the learner. The findings also revealed that the students taught using improvised strategy performed better than those taught with the standard strategy. This could be due to the extra efforts made by the students to fetch for the materials in their local environment. The finding is in consonant with the earlier work of Owolabi and Oginni (2012) that there were significant difference in the performance of those students that were in the improvised classes and non-improvised classes. The findings is in line with the work of Olatunbosun et.al (2020) that the interest of the learner is captured and held during the process of improvisation and so will cause them to be able to create and improve on their own ideas.

The findings also revealed that male students taught using standard materials and improvised instructional materials performed better than their female counterparts except in conventional class where the female perform better than their male counterparts. The findings contradicted the work of Ikwuka, (2016) that there is no significant difference in the academic achievement of SS2 male students with mean score of 24.00 and female students with mean scores of 23.67 who were taught Mathematics with improvised instructional materials. Ikwuka (2016) reiterated that gender has no effect on the experimental group who were taught Mathematics with improvised instructional materials.

Conclusion and Recommendations

Conclusively, instructional materials make learning more real and meaningful to the learner. The materials should not be substituted for learning but must contribute to the learning process itself. It is not out of place to popularize the use of local materials in the teaching of Mathematics, even tasking the students in building some of these local materials could as well facilitate better learning outcome in Mathematics. Instructional materials should be useable and not so complex to use them. Instructional materials to be used must make learning more real and meaningful to the learner.

Based on the findings of the study, the following recommendations were made: Mathematics teachers should try to improvise instructional materials in the teaching and learning of Mathematics in secondary schools and Government should try to provide funds to secondary school Mathematics teachers to enable them improvise instructional materials for teaching Mathematics.

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EFFECTS OF THE USE OF METAPHOR ON SENIOR SECONDARY SCHOOL STUDENTS' ACHIEVEMENT IN CELL STRUCTURE IN ILORIN, NIGERIA

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Abstract

This study examined the effects of the use of metaphor on senior secondary school students' achievement in cell structure in Ilorin, Nigeria. The study adopted the quasi-experimental design of the pre-test, post-test, non-randomized, control group. The 380 students that participated in the study were drawn from eight intact classes of two purposively selected co-educational senior secondary schools in Ilorin, Kwara State, Nigeria. The response instruments were Field-dependent/Field-independent Biology Figure Sorting Test and Cell Achievement Test with reliability indexes of 0.87 and 0.82 respectively. The research questions were answered using mean while the three corresponding null hypotheses were tested using t-test statistics. The findings revealed that Metaphor significantly improved students' achievement in cell structure. However, no significant difference was found in the achievement of male and female student taught cell structure using metaphor. A significant difference was observed in the achievement of students based on their cognitive styles in favour of the field independent students. The researchers recommend that biology teachers should employ metaphor in the teaching of cell structure and other concepts considered difficult to understand by the students.

Keywords: Metaphor, cell structure, achievement, gender, cognitive styles.

Introduction

Biology is a natural science subject that deals with the study of living organisms and life, including their structure, distribution, growth, function, taxonomy and evolution (Gorgeous, 2013). As a field of study, biology has remained a fundamental science subject taught at the senior secondary school level of education in Nigeria (Federal Republic of Nigeria, 2013). The importance of biology cannot be over-emphasized, because it constitute a core requirement in many fields of study such as medicines, pharmacy, nursing, agriculture, biotechnology, nanotech-nology, forestry, and many other areas that has contributed immensely to the scientific and technological growth of many nations (Ahmed & Abimbola, 2011).

Moreover, biology is undoubtedly an essential discipline because it does not stop at looking for solutions to the different environmental issues but also significant for the successful existence of

human on earth (Adeoye & Abimbola, 2016). The knowledge of biology has also aided the acquisition of problem-solving and decision-making skills that had enhanced the development of inquiry and critical thinking abilities of several individuals as reflected in the positive responses of several people to the widespread and radical changes in all ramification of life.

Nevertheless, biology education has faced lots of challenges for decades and this is evident in the West African Examinations Council Chief Examiners' Report (2015) which indicated that students' achievement has shown little improvement over the years despite the high level of enrollment relative to other science subjects such as chemistry and physics. The various factors and causable variables adduced for the unremarkable achievement of students in biology included learning barriers, students study habits and non-usage of appropriate and innovative instructional strategies by biology teachers (Adeoye & Abimbola, 2016; Ebele & Olofu, 2017; Tanner, 2013).

Adesoji and Olatunbosun (2008) specifically observed that, oftentimes, most science teachers in Nigeria senior secondary schools employ the lecture method over learner-centred and innovative instructional strategy. Piaget (1977) had earlier affirmed that the construction of knowledge by students and the overall mastery of subject matter is based on the adoption or adaptation of suitable instructional strategies that marches learners mental and chronological ages. This is because the success of classroom instruction begins and end with the deployment of appropriate instructional strategies by teachers. Meanwhile, the results of research studies on the level of awareness and trends of deployment of innovative instructional strategies during classroom activities have indicated a poor level of teachers awareness and utilisation of innovative instructional strategies such as choral response, field trip, models, study aids and metaphor (Achor, Samba & Ogbeba, 2010; Oyelekan, Igbokwe & Olorundare, 2018).

Metaphor is a figure of speech in which words or phrases that should ordinarily describe one thing are used to describe other things, and as such makes comparison more explicit (Your Dictionary, 2016). The use of metaphor is prevalent in everyday life including in thoughts and actions, and it goes beyond being a literary device used only in languages, as it is used by all categories of people including scientists, in explaining research findings to members of the scientific world (Lakoff & Johnson, 1980). Therefore, metaphors can be used to describe objects by creating mental images shared in common by such objects (Fredriksson & Pelger, 2016).

Pramling (2011) observed that the use of metaphor could enhance science teaching and learning; promote higher-level thinking; and yield new tools for interpreting science education researches. This is because metaphor provides detailed explanation of concepts, ideas or

events in an ordinary style of expression understood by students (Wikipedia, 2017). Several researchers in the field of science education have established the effectiveness of metaphor in the teaching and learning of different biology concepts.

For instance, Awofodu (2016) discovered that metaphor instructional strategy enhanced students' cognitive achievement and practical skills in ecology after a study on the differential effect of metaphors and problem-solving strategies on senior school students' achievement in ecology. In addition, findings from the study of Gregory and Campbell (2001) revealed that metaphor instructional strategy enhanced students' metacognition in chemistry. In contrast, the present study investigated the effects of the use of metaphor on senior school students' achievement in cell structure.

Cell structures are components adapted and/or specialized in carrying out specific functions necessary for normal cellular activities. The cell constitutes the basic unit of structure, physiology, and organization in living organisms. However, there are varieties of differentiated internal structures known as organelles that performs the functions of maintaining the cell. These organelles include Mitochondria, Cytoplasm, Cell membrane, Endoplasmic reticulum, Nucleus, Golgi bodies, Ribosomes, Vacuoles and many more (Wikipedia, 2017). As a topical content in the senior secondary school biology curriculum, cell structure, falls under the theme organization of life (Federal Ministry of Education, 2009). The content scope of the present study – cell structures, is borne out of the observed difficulty of cell structures and related biology topics by the West African Examinations Council Chief Examiners' Report (2016, 2018).

The influence of gender on the teaching and learning of biology has been of interest to researchers in the field of science education. This is partly due to the fact that there seem to be no consensus in the views of researchers on the achievement of male and female students in biology. In fact, there are studies (Badmus, Bello, Hamzat, & Sulaiman, 2019; Ibrahim, 2020; Kingdom-Aaron, Etokeren, & Okwelle, 2019) that have established that gender is not a significant factor in determining students' achievement in biology while others believed that gender greatly influences how well, or poorly students perform in biology (Anchor, Kurumeh & Orokpo, 2012; Otor, 2013). Since there is no agreement on the influence of gender on students' achievement in biology, the present researchers deem it an important independent variable to investigate in other to affirm the gaps emanating from previous studies.

Cognitive styles of learners as field dependent and field independent individuals is another variable whose influence on learners' achievements has been investigated in several studies. Cognitive style relates to the way each learner processes information (Williamson & Watson, 2006; Witkin, Oltman, Raskin & Karp, 2002). Studies have indicated that

cognitive style significantly influences students' achievement in different subject areas (Ashiru & Sadiq, 2016; Idika, 2017). Conversely, Okoye (2016) posited that cognitive style was not a significant factor in relation to the achievement of field-dependent and field-independent students in biology. In the present study, the field-dependent and field-independent categorization of learners was also adopted as obtained in many existing studies, however, it was based on students' achievement in cell structure.

Purpose of the Study

The main purpose of this study was to investigate the effects of the use of metaphor on senior secondary school biology students' achievement in cell structure in Ilorin, Nigeria. Specifically, the study determined the:

1. difference in the achievement of senior secondary school students taught cell structure using metaphor instructional strategy and those taught without metaphor instructional strategy.
2. influence of gender on biology students' achievement when taught cell structure using metaphor instructional strategy.
3. influence of cognitive style on biology students' achievement when taught cell structure using metaphor instructional strategy.

Research Hypotheses

The following hypotheses were generated from the research questions and tested in this study:

H_{01}: There is no significant difference in the achievement of senior secondary school students taught cell structure using metaphor instructional strategy and those taught without metaphor instructional strategy.

H_{02}: There is no significant difference in the achievement of male and female students when taught cell structure using metaphor instructional strategy.

H_{03}: There is no significant difference in the achievement of students based on their cognitive styles when taught cell structure using metaphor instructional strategy.

Methods

This study adopted the quasi-experimental research design. Particularly, the pre-test, post-test, control group, non-equivalent and non-randomized design was adopted for the study. The population consisted of all senior secondary school students offering biology in Ilorin, Kwara State Nigeria. However, the target population comprised of eight intact classes of senior secondary school biology students in first year in Ilorin, Nigeria. Two co-educational senior schools in Ilorin were randomly selected for the study while the sample consisted of 380 Senior Secondary School one students (SSS 1). The response instruments used for data collection were Field dependent/Field independent Biology Figure Sorting Test (FDIBFST) and Cell Achievement Test (CAT). The CAT comprised of 20 questions on cell structure while the FDIBFST (used to categories students into the Field

dependent and Field independent groups) was adapted from Witkin, Oltman, Raskin, and Karp (2002), and Adamu (2010).

The content, construct and face validity of the instruments were determined by two senior secondary school biology teachers, two biology education experts and a plant Biologist from the University of Ilorin. A reliability index of 0.87 and 0.84 were obtained for the FDIBFST and CAT, respectively using the test-retest method and Pearson product-moment correlation statistical tool. At the commencement of treatment administration, the researchers sought the consent of the students' and their biology teachers (who were trained and involved as research Assistants) through informed consent forms. The study lasted for five weeks out of which the pre and posttest were administered in the first and fifth weeks while treatment administration took place in second, third and fourth weeks. The research questions were answered using descriptive statistics of the mean and standard deviation, while the hypotheses were tested using *t*-test statistics at 0.05 level of significance.

Results

Hypothesis One: There is no significant difference in the achievement of senior school students taught cell structure using metaphor instructional strategy and those taught without metaphor instructional strategy.

Table 1: *Mean gain difference for the Experimental and Control group*

Groups	*N*	Pre-test (*M*)	Pre-test SD	Post-test (*M*)	Post-test SD	Mean gain
Experimental	193	29.14	15.10	43.18	14.21	14.04
Control	187	40.00	10.87	42.46	12.02	2.46

Table 1 revealed that students in the experimental group exposed to metaphor instructional strategy had a higher mean gain score (14.04) than students in the control group (2.46). This was deduced from the pre-test and post-test mean scores of (29.14 and 43.18) and (40.00 and 42.46) obtained for the experimental and control groups, respectively. This shows that the mean gain score of the experimental group was higher than that of the control group with a difference of 11.58, in favour of the experimental group exposed to metaphor instructional strategy.

Table 2: *t-test Analysis of the Control and Experimental Groups*

Group	N	*M*	SD	*df*	*t*	Sig.
Experimental	193	43.18	14.21			
				382	0.50	.00
Control	187	42.46	12.02			

p < 0.05

Table 2 indicated that when $t_{(382)} = .50$, $p < .05$. Hence, hypothesis 1 was rejected since $p < .05$. This implies that there was a significant difference in the achievement of senior school students taught cell structure using metaphor instructional strategy and those taught without metaphor instructional strategy.

Hypothesis Two: There is no significant difference in the achievement of male and female students when taught cell structure using metaphor instructional strategy

Table 3: *Mean and Standard Deviation Distribution of Students Achievement Based on Gender*

Gender	*N*	*M*	SD	Mean Difference
Male	106	42.22	11.11	0.94
Female	87	43.16	13.97	

Table 3 showed that the mean score of the male ($M = 42.22$) and female ($M = 24.16$) students taught cell structure using metaphor instructional strategy was homogeneous. This suggest that there was no disparity in biology students' achievement taught cell structure using metaphor instructional strategy based on gender.

Table 4: *t-test showing the Achievement of Students Base on Gender*

Gender	*N*	*M*	SD	*df*	*t*	Sig.	Decision
Male	106	42.22	11.11				
				191	0.89	.38	NS
Female	87	43.18	13.97				

p > 0.05

Table 4 revealed that the calculated *t*-value was not significant at 0.05 alpha level of significance ($t_{(191)}$ = .89, p = .38). This indicates that there was no significant difference in the achievements of male and female students taught cell structure using metaphor instructional strategy. Hence, hypothesis two was not rejected.

Hypothesis Three: There is no significant difference in the achievement of students based on their cognitive styles when taught cell structure using metaphor instructional strategy

Table 5: *Mean and Standard Deviation Distribution of Students Achievement Based on Cognitive Styles*

Cognitive styles	*N*	*M*	SD	Mean Difference
Field Dependent	100	36.13	9.50	26.81
Field Independent	93	62.94	9.80	

Table 5 indicated that the mean score of the field-dependent (M = 36.13) students taught cell structure using metaphor instructional strategy was less than those of the field-independent (M = 62.94) students. This result suggests that metaphor instructional strategy favoured the field-independent students more than the field-dependent students.

Table 6: *t-test showing the Achievement of Students Base on Cognitive Style*

Cognitive styles	*N*	*M*	SD	*df*	*t*	Sig.	Decision
Field Dependent	100	36.13	9.50				
				191	-19.72	.00	S
Field Independent	93	62.94	9.80				

p < 0.05

Table 6 revealed that there was a significant difference in the achievement of field-dependent and field-independent students taught cell structure using metaphor instructional strategy in favour of the field independent students ($t_{(191)}$ = -19.72; p < .05). Hence, hypothesis 3 was rejected.

Discussion

The first finding of this study revealed that a significant difference existed in the achievement of students in the experimental and control groups in favour of students in the experimental group that were exposed to metaphor instructional strategy. Although, the pre-test score of the control group was higher (due to their pre-exposure to the content before the research), the mean gain score, however, indicated a low rate of achievement. The experimental group, on the other hand, had not been taught the content before the period of the study. Hence, they had a low pre-test achievement but a significantly high post-test mean score after exposure to metaphor instructional strategy. The implication of this is that the exposure of students to instruction using metaphor instructional strategy assisted them to learn cell structure meaningfully and thus, resulting in a better achievement. This finding is in agreement with those of Pramling (2011), Awofodu (2016) and Aboyeji (2019) who concluded in their various study that metaphor is an effective tool for facilitating and enhancing students' achievement.

The second finding of this study indicated that there is no significant difference in the achievement of male and female students' taught cell structure using metaphor instructional strategy. This finding may be attributed to the active involvement of both male and female students in the class sessions without any form of discrimination from the research assistants. The result implies that metaphor is gender friendly; thus, it can be used in coeducational institutions or mixed-gender classroom. This result tallies with the findings of Badmus, Bello, Hamzat, and Sulaiman, (2019); and Ibrahim, (2020) that students' achievement in biology is not affected by students' gender. However, the finding is contrary to those of Anchor, Kurumeh and Orokpo (2012); and Otor (2013) who identified gender as a significant factor affecting students' achievement in biology.

The third finding of this study revealed that there was a significant difference in the achievement of field-dependent and field-independent students taught cell structure using metaphor instructional strategy in favour of the field independent students. This finding may be due to the ease in information processing skills of the field-independent students which might have enhanced their achievement over the field-dependent students. This finding implies that metaphor instructional strategy alone cannot facilitate the achievement of field-dependent learners. This finding is in consonance with the findings of Ashiru and Sadiq (2016); and Idika (2017) but contrary to Okoye (2016) who identified cognitive style as a non-significant factor in determining students' achievement in biology.

Conclusion

The study concluded that metaphor enhanced students' achievement in cell structure. In addition, there was improvement in students' achievement irrespective of their gender when taught cell structure using metaphor instructional strategy. Furthermore, a significant difference was observed in the

achievement of students based on cognitive styles in favour of students belonging to field-independent cognitive style. Thus, metaphor can be used to facilitate students' achievement and understanding of cell structure and by extension other biology concepts.

Recommendations

The following recommendations are put forward based on the findings of the study:

i. Biology teachers should employ the use of metaphor in the teaching of cell structure and other hard to teach or difficult to learn biology concepts.
ii. Metaphor should be used in presenting instructions to students' irrespective of their gender because it is gender friendly.
iii. Metaphor instructional strategy alone cannot facilitate the achievement of field-dependent learners. Thus, other innovative teaching and learning strategies should be used in conjunction with metaphor to cater effectively for the field-dependent learners.

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AVAILABILITY AND EFFECTIVENESS OF E-LEARNING FACILITIES FOR TEACHING AND LEARNING DURING COVID-19 PANDEMIC IN EKITI STATE UNIVERSITY

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Abstract

This study examines the availability and effectiveness of e-Learning faciliteies for teaching and learning during the emergent covid-19 era in Ekiti State University. Specifically, the study determined the available e-learning facilities and its effectiveness in Ekiti State University. Four research questions were raised to guide the study. The study adopted survey design as the mode of enquiry. The population comprises of twelve thousand and eight hundred (12,800) students from two faculties in Ekiti State University. A total number of one hundred and sixty (160) students were randomly selected from the two faculties using stratified random sampling procedure. The data collected were analyzed using Mean, Standard Deviation (SD) and Ranking. The findings revealed that limited e-learning facilities are available and effective for teaching and learning in Ekiti State University. It was therefore suggested that educational institutions in Ekiti State should be adequately equipped with e-learning facilities for effective delivery of teaching and learning during emergency situation and for 21st century compliance.

Keyword: E-learning; teaching and learning; covid-19; University education; availability; effectiveness.

Introduction

The term "e-learning" has only been in existence since 1999 when the word was first utilized at a Computer Based Test (CBT) systems seminar. Other words also began to spring up in search of an accurate description such as "online learning" and "virtual learning". However, the principles behind e-learning have been well documented throughout history, and there is even evidence which suggests that early forms of e-learning existed as far back as the 19th century.

In some definitions e-Learning encompasses more than just the offering of wholly on-line courses. For instance, Oblinger and Hawkins (2005) noted that e-Learning has transformed from a fully-online course to using technology to deliver part or all of a course independent

of permanent time and place. E-learning also refers to the use of information and communication technologies to enable the access to online learning and teaching resources. In its broadest sense, Abbad, Morris and de Nahlik (2009), defined E-learning to mean any learning that is enabled electronically. They however narrowed this definition down to mean learning that is empowered by the use of digital technologies. Long before the internet was launched, distance courses were being offered to provide students with education on particular course or skills. In the 1840's Isaac Pitman taught his pupils shorthand via correspondence. This form of symbolic writing was designed to improve writing speed and was popular amongst secretaries, journalists, and other individuals who did a great deal of note taking or writing. Pitman, who was a qualified teacher, was sent completed assignments by mail and he would then send his students more work to be finished using the same system. Technology has broadly improved E-learning facilities in the present 21st century and can be classified into two categories, including the hardware and the software. The hardware facilities include PCs, tablets, digital camera, printer, digital videos, scanner, overhead projector, OHP, and OHP screen, USB drive and CD-ROM, while the software among others include operating systems, cloud technologies, applications, writing, editing, MS office and CD textbooks that fall in the category of courseware, OERS and e-contents.

These facilities has helped to move teaching and learning from the traditional chalk and board method to ICT-based customized, adaptable and synergistic learning that involves learners, instructors, facilitators and specialist (Eze, Chinedu-Eze, & Bello, 2018)

Types of E-Learning

There are diverse ways of classifying the types of e-learning. Zeitoun (2008) classified this by the extent of such features use in education, mixed or blended mode, assistant mode, and completely online mode. The assistant mode supplements the traditional method as needed. Mixed or blended mode offers a short-term degree for a partly traditional method. The completely online mode, which is the most complete improvement, involves the exclusive use of the network for learning (Zeitoun, 2008).

Algahtani (2011) described the completely online mode as "synchronous" or "asynchronous" by the application of applying optional timing of interaction. The synchronous timing comprises alternate on-line access between teachers or instructors and learners, or between leaners, and the asynchronous, to him allows all participants to post communications to any other participant over the internet (Algahtani, 2011; Almosa and Almubarak, 2005). The synchronous type allows learners to discuss with the instructors and also among themselves via the internet at the same time with the use of tools such as the videoconference and chat rooms. This type according to Almosa and Almubarak (2005) offers the advantage of instantaneous feedback. The asynchronous mode also allows learners to

discuss with the instructors or teachers as well as among themselves over the internet at different times. It is therefore not interaction at the same moment but later, with the use of tools such as thread discussion and emails (Almosa and Almubarak, 2005; Algahtani, 2011), with an advantage that learners are able to learn at a time that suits them whilst a disadvantage is that the learners will not be able to receive instant feedback from instructors as well as their colleague learners (Almosa and Almubarak, 2005).

The Use of E-Learning in Education

The development of multimedia and information technologies, as well as the use internet as a new technique of teaching, has made radical changes in the traditional process of teaching (Wang 2007). Development in information technology, According to Yang and Arjomand (1999), has generated more choices for today's education. Agendas of schools and educational institutions have recognized e-Learning as having the prospect to transform people, knowledge, skills and performance (Henry, 2001).

Also according to Love and Fry (2006), colleges, universities, and other institutions of higher learning race to advance online course capability in a speedily developing cyber education market. E-learning, has come to be more and more important in institutions of higher education. Just as there are different types of e- Learning, there are also different ways of employing the technique in education. Algahtani, (2011), in his evaluation of E-learning effectiveness and experience in Saudi Arabia, discovered three distinct models of using e-learning in education including the "adjunct, blended e-Learning and online". The three ways of using e-Learning technologies as discovered by Algahtani (2011) are described below.

The "adjunct e-Learning is the situation which e-Learning is employed as an assistant in the traditional classroom providing relative independence to the learners or students (Algahtani, 2011). In the blended e-Learning, Algahtani (2011) and Zeitoun (2008) explained that, in this way of using e-Learning, the delivery of course materials and explanations is shared between traditional learning method and e-learning method in the classroom setting. The third one which is the online is devoid of the traditional learning participation or classroom participation. In this form of usage, the e-Learning is total so that there is maximum independence of the learners or students (Algahtani, 2011; Zeitoun, 2008).

Benefits of E-learning

The adoption of E-learning in education, especially for higher educational institutions has several benefits, and given its several advantages and benefits, e-learning is considered among the best methods of education. Several studies and authors have provided benefits and advantages derived from the adoption of e-learning technologies into schools (Klein and Ware, 2003; Algahtani, 2011).

Some of the advantages that the adoption of e-learning in education, obtained from review of literature is that it is flexible when

issues of time and place are taken into consideration. Every student has the luxury of choosing the place and time that suits him/her. According to Smedley (2010), the adoption of e-learning provides the institutions as well as their students or learners the much flexibility of time and place of delivery or receipt of according to learning information.

E-learning enhances the efficacy of knowledge and qualifications via ease of access to a huge amount of information; it is able to provide opportunities for relations between learners by the use of discussion forums. Through this, e-learning helps eliminate barriers that have the potential of hindering participation including the fear of talking to other learners.

E-learning motivates students to interact with other, as well as exchange and respect different point of views. E-learning eases communication and also improves the relationships that sustain learning. Wagner et al (2008) note that e-Learning makes available extra prospects for interactivity between students and teachers during content delivery.

E-learning is cost effective in the sense that there is no need for the students or learners to travel. It is also cost effective in the sense that it offers opportunities for learning for maximum number of learners with no need for many buildings.

E-learning always takes into consideration the individual learners differences. Some learners, for instance prefer to concentrate on certain parts of the course, while others are prepared to review the entire course. E-learning helps compensate for scarcities of academic staff, including instructors or teachers as well as facilitators, lab technicians etc. The use of e-Learning allows self-pacing. For instance, the asynchronous way permits each student to study at his or her own pace and speed whether slow or quick. It therefore increases satisfaction and decreases stress (Codone, 2001; Algahtani, 2011).

Disadvantages of E-learning

E-learning, in spite of the advantages that it has when adopted in education, also has some disadvantages. Studies support that e-learning possesses some disadvantages (Klein and Ware, 2003; Akkoyuklu and Soylu, 2006). For example, despite the claims that e-Learning can improve the education quality, Dowling, Godfrey, and Gyles (2003) argue that making learning materials available online results in improved learning results only for specific forms of collective assessment. The most noticeable condemnation of e-Learning is the complete absence of vital personal interactions, not only between learners and instructors, but also among colleague learners. According to Almosa (2002), regardless of all the disadvantages of e-learning, there are a lot of benefits which inspire its use and community education, cultural diversity and globalization, and eradicating boundaries of place and time.

The disadvantages of e-learning are that, E-learning as a method of education makes the learners undergo contemplation, remoteness, as well as lack of interaction or relation. It therefore

requires a very strong inspiration as well as skills with to the management of time in order to reduce such effects, with respect to clarifications, offer of explanations, as well as interpretations, the e-learning method might be less effective than the traditional method of learning.

The learning process is much easier with the use of the face to face encounter with the instructors or teachers, when it comes to improvement in communication skills of learners, e-learning as a method might have a negative effect. The learners might have an excellent knowledge in academics, they may not possess the needed skills to deliver their acquired knowledge to others, since tests for assessments in e-learning are possibly done with the use of proxy, it will be difficult, if not impossible to control or regulate bad activities like cheating.

E-learning may also probably be misled to piracy and plagiarism, predisposed by inadequate selection skills, as well as the ease of copy and paste. E-learning may also deteriorate institutions' role, socialization role and also the role of instructors as the directors of the process of education, also not all fields or discipline can employ the e-learning technique in education. For instance, the purely scientific, engineering and technical fields that include practical cannot be properly studies through e-learning. Researchers have argued that e-learning is more appropriate in social science and humanities than the fields such as medical science and pharmacy, engineering and technology department where there is the need to develop practical skills.

The emergent of Covid-19

COVID-19 pandemic as a global disruption has affected people regardless of nationality, level of education, income or gender. Education is no exception. Students from privileged backgrounds, supported by their parents that are eager and able to learn, could find their ways behind closed school doors to alternative learning opportunities. The less privileged has no opportunity for alternative learning when their schools were shut down.

This crisis has exposed the lack of competence or ability and the lack of justice in our education systems from access to telecommunications networks and computers needed for online education, and the supportive environments needed to focus on learning, up to the instances between resources and needs. Civid-19 pandemic has forced schools and universities to close and send students home. This really has given room for online learning plans and technology for students and lecturers. In many respect, the education industry's move to instruction rhymes with the work-from-home method. Covid-19 has really pushed remote learning to be broadly accepted and some institutions were caught unprepared. As learning goes digital, budget will be raised, and the administrators will have to plan. Higher institutions administrators have a lot to do to cope with the change that the pandemic has caused in the delivery of teaching and learning in their respective institutions.

Statement of the problem

It has been discovered in recent years that ICT is being canvassed by several people as being effective in improving teaching and learning. In the present information age, the issue of students' use of internet is of crucial importance. This is so because the use of internet by students might enhance competence and confidence in them. However, many students still patronize traditional book materials as a source of information in our universities rather than e-learning. During the covid-19 era, many institutions in Nigeria that were already equipped switched to the alternative mode of teaching and learning via e-learning that is more efficient and reliable for that period. The success of e-learning in any educational institution could be acclaimed to depend on the availability and effectiveness of facilities.

This study intends to investigate on the readiness of Ekiti State University to provide uninterrupted teaching and learning during the globally disrupted era in educational system caused by Covid-19 pandemic. This study sought to find out how available and effective the use of alternative e-learning facilities in the Ekiti State University during the covid-19 era.

Purpose of the Study

The main purpose of this study is to find out the availability and effectiveness of e-learning facilities for teaching and learning in Ekiti State University Specifically, the study seeks to;

i. Determine whether e-learning facilities are available for teaching and learning in Ekiti State University
ii. Find out whether the available e-learning facilities are effective for teaching and learning in Ekiti State University
iii. Determine the influence of e-learning on teaching and learning in Ekiti State University.

Research Questions

In order to carry out this study, the following research questions were generated:

1. What are the e-learning facilities available for teaching and learning in Ekiti State University?
2. How effective are the available e-learning facilities for teaching and learning in Ekiti State University?
3. How do the available e-learning facilities influence teaching and learning in Ekiti State University?

Methodology

A survey research design was used for the study. The population of the study comprise of all the undergraduate students in two faculties in Ekiti State University. The sample for the study consisted of one hundred and sixty [160] respondents. The face and content validity of the instrument was established by experts from the department of Test and measurement and Vocational and Technical Education. The reliability of the instrument was ensured by using the Cronbash Alpha reliability method,

thereafter Alpha value of 0.62 was obtain as the reliability coefficient. Data collected were analyzed using Mean and Standard Deviation and Ranking which means the degree of the acceptability of each research question items.

Results

Research Question 1: What are the e-learning facilities available for teaching and learning in Ekiti State University?

Table 1: E-learning Facilities available for Teaching and Learning in Ekiti State University

S/N	Items	Mean	SD	Ranking
1	Laptop are available for e-learning teaching and learning in EKSU	1.92	1.104	8th
2	Smart school network is available for e-learning teaching and learning in EKSU	2.76	1.174	7th
3	Projectors and available for e-learning teaching and learning in EKSU	2.81	1.017	6th
4	Computers are available for e-learning teaching and learning in EKSU	3.20	.970	4th
5	Good internet facilities are available for e-learning teaching and learning in EKSU	3.21	1.018	3rd
6	Social internet networks are available for e-learning teaching and learning	3.29	.850	2nd
7	Email messages are available for e-learning teaching and learning	3.00	1.028	5th
8	Mobile phones are available for e-learning teaching and learning in EKSU	3.63	.742	1st

From the above table, the available facilities are in a ranking position. The table therefore, reported that mobile phones has the highest mean score of (3.63), mobile phones were ranked as the first facilities that are mostly available for teaching and learning through e-learning perhaps because it is the most common devices that can be found with majority of students. This is followed by social networking with the mean score of (3.00). The third available facilities are email messages with the mean score of (3.00). projectors and smart school network are ranked in 6th and 7th position which is closing to the least facilities that is available. Projector has the mean score of (2.81) while smart school has mean score of (2.76). Laptop has the least mean score of (1.92), this indicate that laptop are not common among the students and lecturers for teaching and learning through e-learning. Probably, they are more familiar with the use of mobile phone is was ranked highest among all other facilities with the mean score of 3.63.

Research Question 2: How effective are the available e-learning facilities for teaching and learning in Ekiti State University?

Table 2: Effectiveness of Available e-learning facilities for teaching and learning in Ekiti State University.

S/N	Items	Mean	SD	Ranking
1.	Available Laptops are effective for e-learning teaching and learning in EKSU	1.86	1.184	8th
2.	Available smart school network is effective for e-learning teaching and learning in EKSU	3.44	.957	1st
3.	Available projectors are effective for e-learning teaching and learning in EKSU	3.42	.879	2nd
4.	Available computers are effective for e-learning teaching and learning in EKSU	3.16	1.063	5th
5.	Available internet network are effective for e-learning teaching and learning in EKSU	3.25	.832	4th
6.	Social networks handles are effective for e-learning teaching and learning	3.29	.961	3rd
7.	Electronic mails are effective for e-learning	3.10	1.041	6th
8.	Mobile phones are effective for e-learning teaching and learning in EKSU	2.42	1.221	7th

Source: Field Survey, 2021

From the above table, the effectiveness of the available facilities is in a ranking position. The table therefore, reported that smart school has the highest mean score of (3.44), smart school were ranked as the first facilities that are mostly available for teaching and learning through e-learning perhaps because it is the most common devices that can be found with majority of students. This is followed by projectors with the mean score of (3.42).

The third effective available facilities are social networks with the mean score of (3.29). Computers and E-mail are ranked in 6th and 7th position which is closing to the least facilities that is available. Computer has the mean score of (3.16) while E-mail has mean score of (3.10). Mobile phones have the least mean score of (2.42), this indicate that mobile phones are not common among the students and lecturers for teaching and learning through e-learning. Probably, they are more familiar with the use of smart school was ranked highest among all other facilities with the mean score of 3.44.

Research Question 3: How does the available of e-learning facilities influence teaching and learning in Ekiti State University?

Table 3: Influence of Available E-learning facilities in teaching and learning in EKSU.

S/N	Items	Mean	SD	Ranking
1.	Available laptops influences e-learning teaching and learning in EKSU	3.16	.603	3rd
2.	Available smart school network is influences e-learning teaching and learning in EKSU	3.22	.782	2nd
3.	Available projectors influences e-learning teaching and learning in EKSU	2.68	1.151	5th
4.	Available computers are effective for influences e-learning teaching and learning in EKSU	2.92	.876	4th
5.	Available internet network influences e-learning teaching and learning in EKSU	3.44	.679	1st

Source: Field Survey, 2021

From the above table, the influence of the available facilities is in a ranking position. The table therefore, reported that network internet has the highest mean score of (3.44), smart school were ranked as the first facilities that influence teaching and learning through e-learning perhaps because it is the most common devices that can be found with majority of students. This is followed by smart school with the mean score of (3.2). The third available facilities that influences teaching and learning in EKSU is laptops with the mean score of (3.16). The forth available facilities that influences teaching and learning in EKSU are computers with the mean score of (2.92). The fifth available facilities that influences teaching and learning in EKSU are projectors with the mean score of (2.68).

Discussion

The finding of the study in the first research question revealed that mobile phone was ranked highest among all other devices available for learning in the University. This is followed by social network which is also activated with the use of mobile phone. Without mobile phone, social network cannot function effectively. The study corroborates the finding of Mehdi, Maryam and Sahar (2020) that mobile phone was the common devices that are available for e-learning. The study further supported by the finding of Ilci (2014) that mobile learning has also emerged as a new technological achievement and educational trend that provides both educators and learners with ample opportunities

The findings in research question two revealed that smart school network is effective among all other facilities available

and this is followed by the effectiveness of the available projector in the school. The study of Dowling, Godfrey, and Gyles (2003) confirmed that making learning materials available online results in improved learning results only for specific forms of collective assessment. The findings further revealed that projector was ranked second among the effective facilities that was used for e-learning for teaching delivery in Ekiti State University.

More so, the findings of the study in research question three shows that the availability of internet network was ranked highest among all the available facilities influencing e-learning for learning and teaching in Ekiti State University followed by smart school network, this could be because third generation wireless networks provide unfettered broadband internet access and wire-line broadband DSL access through local exchanges. This study was supported by Gotschall (2000), that e-learning has a strategy for executing educational and corporate training.

Conclusion

Despite considerable and rich advances in the availability and effectiveness of e-learning facilities for teaching and learning in Ekiti State University, there is still a void with respect to the utilization of the available facilities. Specifically, the available mobile phones are less effective due to lack of knowledge on how to use it for e-learning by some lecturers or students, this may also happen if either the students or lecturers are short of data subscription. Through the findings made, it was concluded that some of the e-learning facilities were available but less effective, more so, some were less available but are effective. These facilities are limited compared with global requirements for effective teaching and learning delivery in the 21st century.

Recommendations

Based on this study, the following recommendations were made:

1. The University should provide enough and adequate facilities that will be more effective for teaching and learning.
2. Both lecturers and students should be trained on how to use e-learning to deliver and receive lectures by e-learning expert.
3. The school management should make sure that the available e-learning facilities are effective for use.

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IMPACT OF COVID-19 LOCKDOWN ON ACADEMIC PROGRAMME AS PERCEIVED BY STUDENTS OF BAMIDELE OLUMILUA UNIVERSITY OF EDUCATION, SCIENCE AND TECHNOLOGY, IKERE EKITI

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Abstract

The study investigated the impact of covid-19 lockdown on the academic programme as perceived by students of Bamidele Olumilua University of Education, Science and Technology, Ikere-Ekiti. A descriptive research design of the survey type was used for the study. The population of the study consisted of all students of Bamidele Olumilua University of Education, Science and Technology, Ikere-Ekiti. The sample comprised 200 participants selected from the online collated data via a google form. A stratified random sampling technique was used to select 200 students from Faculty of Education by sending google form links to them.The face and content validity of the instrument was ensured through a consortium of experts. The instrument used for the study was tagged Questionnaire for students on the Impact of COVID-19 lockdown on the academic program in tertiary institutions in Ekiti State. The test-retest method was used to ensure reliability coefficients of 0.85 respectively. The data collected were analysed using descriptive and inferential statistics. The hypotheses were tested using correlation analysis and chi-square at 0.05 level of significance. The study revealed that COVID-19 has done a lot of havoc on the educational programme in Nigeria while the learning behavioriour of many students has been modified. Many students encountered numerous challenges in operating the virtual learning applications during the lockdown. The study revealed that COVID-19 has a significant impact on the academic programme of tertiary institutions in Ekiti State and that Covid-19 has significantly affected students learning behaviour in Ekiti State Tertiary Institution. It was therefore recommended that institutions administrators should find ways of bridging the learning gap that has been created during the covid-19.

Keywords: *Covid – 19, lockdown, academic programme, impact.*

Introduction

Many Nigerians have found life miserable as a result of the coronavirus disease, which first appeared in August 2019 in Wuham, Chian, and was dubbed COVID-19. COVID-19 claimed the lives of numerous people and separated them from their loved ones. The researcher observed that some individuals appear to be living in poverty in a country like Nigeria, which has over 250 million people. Many Nigerians have reported finding it tough to cope with the circumstances during the lockdown extension... Business, education, the economy, and other aspects of society were all affected by the pandemic. Some children have lost their fathers and mothers as a result of the virus, while others have become widows or widowers, and many have died as a result of the illness. In the same spirit, all educational institutions were closed, and traders were no longer able to go to the market as usual to conduct their business, but instead had to follow government orders.

Before the outbreak of pandemics, a lot had happened in the fight between ASUU, ASUP, and the federal government. In 2020, Nigeria's Tertiary institutions were on the verge of going on a total strike when a pandemic intervened to derail the planned strike. Consequently, during the total lockdown, students at tertiary institutions were found not to have the usual learning attitude to education. Rufai (2020) declared unequivocally that the world had been experiencing a learning crisis prior to the epidemic, which had continued to widen the gap between the two sides. He went on to say that poor children only had access to inadequate education, which had the potential to further impoverish the beneficiaries. In countries with fewer resources, weaker economies, and, most importantly, more susceptible education systems, the ever-growing nature of inequalities is plainly discernible. The Federal Government ordered the closure of all university institutions, secondary schools, and primary schools across the country on March 21, 2020, as a result of the epidemic, and the total lockdown began on March 26, 2020. Following Federal Government directions on March 21, 2020, tertiary institutions, primary and secondary schools across the country were closed due to the coronavirus outbreak.

Students and lecturers in Nigerian tertiary institutions have experienced both positive and negative effects. Many students have been exposed to the operation of online learning in several tertiary institutions, and some professors' familiarity with the operation of e-learning has been greatly improved. In this aspect, coronavirus appears to have greatly aided the learning experience of certain lecturers and students who are unfamiliar with how to deliver instruction via an online or distance program. According to Agbele, Alaba, and Oyelade (2020), the relevance of online education cannot be overstated. If used properly, the Coronavirus Disaster could be useful to the education sector and result in a variety of unexpected effects. A large number of students can be taught at the same time by a single teacher via online teaching. However, online pedagogy has a number of obstacles,

including accessibility, affordability, flexibility, learning pedagogy, life-long learning, and unpredictable educational policy. The Covid-19 epidemic, on the other hand, has improved the technological orientation of both pupils and instructors in society. Toritseju (2020) The COVID-19 epidemic appear to have transformed digital and online education around the world, but children in rural and underprivileged regions in Lagos State, Nigeria, are falling behind because they lack the skills to adapt and transfer to new learning methods.

Many pupils are unable to deal with teaching and learning after the absolute lockdown was lifted, according to observations. Many students appear to have been carried away with their daily usage of social media, which has harmed their ability to think clearly. Furthermore, many pupils' reading gaps have been reported to be expanding as a result of students being with their parents when the school was closed. Youki Teriba (2020) stated that kids' amnesia of some of what they acquired in school is not a new phenomenon. Summer learning loss, on the other hand, differs significantly from pandemic-related learning loss: Summertime marks the end of official instruction, and all students lose learning at roughly the same rate. However, during the epidemic, education has been unequal, as some students have been able to fully participate in online learning while others have faced challenges, such as a lack of internet connectivity, that have hampered their development. Youki Teriba anticipated that pupils will lose around three months' worth of reading gains and five months' worth of math advances on average.

Due to the global school closures caused by COVID-19 in the year 2020, educational systems all over the world are striving to provide kids with equal online learning opportunities. However, little is known about how different solutions are adopted or how effective they are. According to Simon and Hans (2020), the shutdown of all schools not only disrupts teaching and learning around the world, but also occurs during a critical assessment period, causing many exams to be postponed or canceled.

Statement of the Problem

The researcher observed that the emergence of the Coronavirus Pandemic (COVID-19) in the year 2020 seems to have a major impact either negatively or positively on Nigeria's educational system. Many students seem to have forgotten what they had learnt before lockdown while some lecturers could not get their full financial entitlement from both public and private institutions as a result of total lockdown. Many students are observed to have engaged in other illicit activities during the Covid-19 lockdown. Covid-19 is observed to have caused a serious interruption in academic activities and many institutions seem to have resorted to e-learning due to total lockdown. Many institutions appear to find it difficult to teach their students via e-learning during the pandemic because they seem to have

not been using it before. Observations have shown that some institutions that have decided to be teaching their students via audio-visual programs seem to have faced some challenges in reaching their students due to epileptic power supply, and poor internet connection. Also, some primary and secondary school students who have not been exposed to an e-learning environment before seem to have found it difficult to operate online learning while at the same time some parents perhaps do not have adequate skills in the operation of online learning. Covid-19 seems to have pushed some students to different online activities that have drained them away from their academic pursuits, many were fun of staying on the social media throughout the day while many appears to have turned to Yahoo Yahoo boys.

Purpose of the Study

The purpose of the study is to examine the impact of the COVID-19 pandemic on the academic programs as perceived by BOUESTI students.

Research Questions

1. What impact does COVID-19 and the Lockdown have on academic programmes in tertiary institutions in Ekiti State?
2. What is the learning behaviour of students in Ekiti State Tertiary Institutions during the covid-19 lockdown?

Research Hypotheses

1. COVID-19 will not significantly have an impact on the Academic programme of tertiary institutions?
2. Covid-19 lockdown will not significantly influence the learning behaviour of students

There is no significant relationship between the impact of Covid-19 and students learning behavior

Methodology

A descriptive research design of the survey type was used for the study. The population of the study consisted of all students of Bamidele Olumilua University of Education, Science and Technology. The sample comprised 200 participants selected from the online collated data via a google form. A simple random sampling technique was used in the study to select 200 participants in Ekiti State. The face and content validity of the instruments were ensured through a consortium of experts. The instruments used for the study was tagged Questionnaire for students on the Impact of COVID-19 lockdown on the academic programme in tertiary institutions in Ekiti State. The test-retest method was used to ensure reliability coefficients of 0.85 respectively. The data collected were analysed using descriptive and inferential statistics. The hypotheses were tested using correlation analysis and chi-square at a 0.05 level of significance.

Results

Research Question 1: What impact does COVID-19 has on Academic programme as pecieved by BOUESTI students

Table 1: Impact of Covid-19 on academic programme as Perceived by BOUESTI Students.

S/N	Description	Agree	%	Disagree	%
1	New learning approach during Covid-19 and total lockdown	98	49	102	51
2	Suspension of internal and external examinations	101	50.5	99	49.5
3	Suspension of teaching and learning	152	76	48	24
4	Academic calendar	200	100		0
5	Suspension of all extra-curriculum activities in tertiary institutions	102	51	98	49
6	Disruption of academic activities	180	90	20	10

Table 1 indicates that 49% of the total respondents learnt new modern approaches for teaching and learning during the covid-19 lockdown while 51% disagree. 50.5% of the total respondents agreed that covid-19 caused suspension of internal and external examinations while 49.5% disagree. 76% of the total respondents agree that teaching and learning were suspended during the covid-19 while 49.5% disagree. On academic calendar, all the respondents agree that covid-19 affected the tertiary institutions' academic calendar. 51% of the total respondents agree that covid-19 caused suspension of all extra-curriculum activities in the institution while 49% disagree. Item 6 revealed that 90% of the total respondents believed that covid-19 and total lock down has disrupted the academic. Therefore, the result shows that Covid-19 has a negative impact on the academic programme of students in BOUESTI.

Research Question 2: What is the learning behaviour of students during the covid-19 lockdown

Table 2: learning behaviour of Students during Covid-19 lockdown

S/N	Description	Agree		Disagree	
		Freq	%	Freq	%
1	I find it difficult to learn through online	124	62	76	38
2	My academic activities remain stand still during the total lockdown.	131	65.5	69	34.5
3	I find it difficult to cope with reading during the total lockdown	119	59.5	81	40.5
4	I find it difficult to cope with new modern teaching approach	143	71.5	57	28.5

5	Covid-19 has affected my reading habit	127	63.5	73	36.5
6	I cannot assimilate very well due to long vacation from school	145	72.5	55	27.5
7	I became inactive in reading during covid-19 lockdown	131	65.5	69	34.5
8	I prefer e-learning for teaching approach	80	40	120	60

Table indicates that 62% of the total respondents find e-learning difficult during the lockdown while 38% disagree. In item 2, 65.5% of the total respondents agreed that the academic activities remain stand still during the total lockdown while 34.5% disagree. Item 3 shows that 59.5% of the total respondents agree that they find it difficult to cope with reading during the total lockdown while 40.5 disagree. Item 4 revealed that 71.5% of the total respondents agreed that they find it difficult to cope with new modern teaching approach while 28.5% disagree. 63.5% of the total respondents agree that covid-19 affected their reading habit while 36.5% disagree. Item 6 revealed that 72.5% attest that they cannot assimilate very well due to long vacation from school while 27.5% disagree. In item 7, 65.5% of the total respondents agree that they became inactive in reading during covid-19 lockdown while 34.5% disagree. Item 8 shows that 40% of the total respondents agree that they prefer e-learning for new teaching approach while 60% disagree. Therefore, the result shows that after covid-19 lockdown, many students find it difficult to cope with their learning. The reading habit of some students suddenly changed after the resumption from the covid-19 total lockdown.

Hypotheses Testing

Hypothesis 1: COVID-19 will not significantly have impact on Academic programme of tertiary institutions.

Table 3: Impact of Covid-19 on Academic programme

	Chi-Square Value	Df	P-Values	Decision
Pearson Chi-Square	30.420			
No. of Valid Cases	200	1	.000	Reject

The result indicates that covid-19 lockdown has a significant negative impact on the academic programme in tertiary institutions in Ekiti State. Pearson chi-square (x^2=30.420, df=1, $p<0.05$) shows that covid-19 has a statistically significant impact on the academic programme in tertiary institutions in Ekiti State.

Hypothesis 2: Covid-19 lockdown will not significantly influence learning behaviour of students

Table 4: Influence of Covid-19 on learning behaviour of students

	Chi-Square Value	Df	P-Values	Decision
Pearson Chi-Square	12.5			
No. of Valid Cases	200	1	.000	Reject

The result in table 4 shows that there is statistically significant negative influence of covid-19 on learning behaviour of students in tertiary institutions in Ekiti State. Pearson chi-square (x^2=12.5, df=1, p<0.05). this shows that impact of covid-19 influence students' learning behaviour. Therefore, covid-19 modified the behaviour of students during the lockdown.

Hypothesis 3: There is no significant relationship between the impact of Covid-19 and students learning behaviour

Table 5: Relationship between impact of Covid-19 and Students learning behaviour

Variable	N	Mean	SD	Df	R	P	Decision
Impact of Covid-19	200	8.1600	2.01362				
Learning Behaviour	200	10.9000	3.80822	198	.891**	.000	Rejected

P<0.05 level of significance

In Table 5, there is a significant positive relationship between the impact of covid-19 and the learning behaviour of students of tertiary institutions in Ekiti State (r=0.891, p<0.000). this implies that covid-19 significantly has an impact on the learning behaviour of students in tertiary institutions and will lead to change in the learning behaviour of students. The result shows that the p value is less than the significant level. therefore, the results did not support the stated null hypothesis and the null hypothesis was therefore rejected.

Discussion

The study revealed that the covid-19 lockdown seriously interrupts the institution's academic programme which shows a negative relationship with academic programe which invariably affected the activities of the institutions both curricular and non-curricular activities. Slade et al., (2017) in Carolina, Spogmai, Thomas, Suguru, and Annika (2020) supported that research on past school closures indicates that any interruption in schooling, including regularly scheduled breaks, can result in a significant learning loss.

This finding is consistent with Simon & Hans' (2020) observation that school, college, and university closures not only disrupt teaching for students around the world, but also coincide with a critical assessment period, causing many tests to be postponed or canceled. Internal evaluations are perhaps viewed as less significant, and many have been canceled. Ogunmodede, Ogunlade and Ayinde (2021) affirmed that the retention ability of

students in tertiary institutions was dropped as a result of the total lockdown of all tertiary institutions due to the outbreak of coronavirus. The study found that many students seem to have forgotten what they have learned before the total lockdown.

The finding of the study revealed that the covid-19 lockdown has a significant negative impact on the academic programme of tertiary institutions in Ekiti State. The result agrees with the finding of Ogunode (2020) that Covid-19 would affect the academic programme of senior secondary schools and that the academic programme of secondary schools will be affected. The study further supported that both internal and external examination will be affected. Another result of the study revealed that covid-19 lockdown significantly affects the learning behaviour of students and modified their behaviour. Trotman (2020) affirms Students' ability to learn is as much affected by their inter-and intrapersonal behavior as it is by their academic skills.

Conclusion

The study concluded that covid-19 has a statistically significant impact on the academic programme in tertiary institutions in Ekiti State. The study also found the outbreak of the covid-19 pandemic has significantly modified the learning behaviour of students in tertiary institutions in Ekiti State. There is also a negative relationship between the covid-19 and the learning behaviour of students in tertiary institutions in Ekiti State. Because the academic programe was negatively affected.

Recommendations

Based on the findings, the following recommendations are made:

1. Institutions administrators should find ways of bridging the learning gap that has been created during the covid-19
2. The Schools administrators should make sure that lecturers develop new teaching strategies to cover all their course contents.
3. The government should put all necessary measures in place to prevent tertiary institutions in Ekiti State from any eventual future lockdown.
4. Government should provide for necessary facilities that can facilitate online teaching and learning in tertiary institutions

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DETECTION OF GENDER- RELATED DIFFERENTIAL ITEM FUNCTIONING OF WEST AFRICAN SENIOR SCHOOL CERTIFICATE EXAMINATION MULTIPLE CHOICE MATHEMATICS ITEMS IN EKITI STATE

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Abstract

The study investigated detection of gender-related differential item functioning of West African senior school certificate examination multiple choice mathematics items in Ekiti State, Nigeria and its implications for educational assessment. It begins by identifying Test as a major tool for educational assessment and then looked into concept of differential item functioning. The research adopted the descriptive research of the survey type. The population for the study consisted of all senior secondary school students in the 203 public and 235 private secondary school students in Ekiti State. The sample for the study consisted of 1200 senior secondary school III students drawn from 12 public and 12 private secondary schools in Ekiti state. The sample was selected using multistage sampling procedure. The instrument used for data collection was multiple-choice Mathematics items administered by WAEC 2019, which consisted of 50 items. The data collected were analyzed using a two-parameter logistic model (2PL) implemented in BILOG-Mg version 3.3.0 software to answer the general questions. Hypotheses were tested using Bilog M.G. software statistical analysis which was used to generate IRT Item Characteristic Curve (ICC) for each WAEC examination items to show whether items function differentially. An independent sample t-test was implemented using R programming language software version 4.1.1, and Analysis of Variance (ANOVA) were also used to test the postulated hypotheses. All the hypotheses were tested at 0.05 level of significance. One of the findings indicated that the multiple-choice Mathematics items administered by WAEC 2019 gives males examinees greater opportunities in respond to mathematics items than their female counterparts. It was recommended among others that the mathematics teachers to pay more attention and encourage the female students in the class.

Keywords: Differential item functioning, test, multiple-choice item, item performance.

Introduction

Mathematics is a subject that is seen by the society as the foundation of scientific and technological knowledge that is vital in socio- economic development of the nation. Due to this fact, Mathematics is made a compulsory subject in schools at all levels in Ekiti State and Nigeria as a whole. This is why Mathematics is so important that every child must study it for six years in primary school, three years in junior secondary school and three years in senior secondary school. Students are expected to pass this subject before being

promoted to the next class or gain admission into a higher institution of learning in Nigeria. Mathematics is one of the senior secondary school subjects that require assessment to ascertain students' basic knowledge and skills and understanding of the concepts and the nature of mathematical problems in any society.

These objectives can be achieved by the use of different assessment instruments such as; essay tests and objective tests which are utilized by the teacher depending on the aims of the measurement. The focus of this study is on objective tests. Objective test is one of the assessment instrument used in testing or assessing students' academic achievement in any given instruction. The objective test is the most commonly used test format in all school levels, also in entrance examinations to secondary and tertiary institutions. The tests are to make free choice of one correct or best answer from the alternatives given to a question (Omirin & Ajayi, 2013). It is an instrument designed and used to elicit sample of behavior, a set of well constructed stimuli presented to a testee to find out whether learning has already taken place (Adebule & Oluwatayo, 2011)

In Nigeria, there exist a number of national examination bodies and they include National Examination Council (NECO), West African Examination Council (WAEC), National Business and Technical Examination Board (NABTEB), and Joint Admission Matriculation Board (JAMB). These bodies cater for candidates of various backgrounds all over the country. Candidates who participate in the examinations conducted by these examination bodies are in different settings and therefore differently toned for personal and environmental reasons. As a result of this, the problem of test item bias cannot be ruled out in these examinations.

The environment (urban/rural) which a child finds himself/herself goes a long way to determine one's academic achievement in life. Children who come from rich environment have better academic achievement than those from poor environment. Urban areas are well equipped with learning facilities, qualified teachers, good roads and good communication networks which puts them at an advantageous position compare to their rural counterparts where such opportunities are inadequate or somehow lacking. According to Akubuiro cited by Anagbogu (2009), urban learning environment has a greater access to socio-cultural and economics facilities and services and as produce a high performing leaner. While the rural students who have not been exposed to these favourable experiences and rich, environments find it difficult to bridge the gap and so results to poor performance in their various subjects.

To find out if differential item function exists in Ekiti state unified mathematics Examination (ESUME) and confirm if the test items function in different ways for groups of test- takers. Nworgu (2011) in his contribution opined that current research data have implicated test used in national examination as functioning differently with

respect to different subgroups. That is students' scores in such examination are determined largely by the testees' abilities. Ogbebor and Onuka (2013) supported this in their findings that 10 items were bias out of 60 items of Economics multiple-choice items in NECO Examination with respect to school type (public or private) and 8 items were biased in respect to school location (urban and rural). Scores generated from a test that contains items that are biased against one group or the other or test result from unfair testing procedures cannot be used to make a valid quality decisions in education.

According to Berret (2001) multiple choice tests are generally biased towards male while the female students experience more difficulties with questions involving numerical, spatial or high reasoning skills. Also, Adebule (2013) observed that questions always arise concerning whether high average test scores by certain groups are due to actual achievement differences, bias in test or combination of both. Conversely, the favoured groups are the advantaged group during promotion and admission or selection into science-based courses in the high intuitions while the disadvantaged groups on the other hand are disallowed due to some factors tagged extraneous and irrelevant variables that interfere with measurement of the underlying psychological construct being measured. These factors relate to the group like gender, location, school type have significant influence on the testees' response to item.

DIF is necessary, but not sufficient condition for item bias. Thus, if DIF is not apparent for an item, then no item bias is present. However, if DIF is present the its presence is not a sufficient condition to declare the item bias, rather one would have to apply a follow-up item bias analysis (e.g content analysis, empirical evaluation) to determine the presence of item bias. For instance, if in a mathematics test, girls display higher probability of answering any item correctly more than boys of equal ability level due to the fact that the content in the test are biased against boys, then we say the item exhibit DIF and should be considered for modification or removal from the test item.

An item is biased if it discriminates between members of different groups who have the same ability on what is being measured. Put different groups who have the same trait level differ in their score on the item. In his contribution, Adebule (2009) defines bias in test as a situation when item is in an achievement; tests are found to favour one group over another for reasons not explainable by differences in achievement level between groups.

The West Africa Examination Council was established in 1952 with the sole responsibility of conducting examinations required in the public interest in West Africa, which are conducting examinations and awarding certificates that are equivalent to those of examining authorities in Unite Kingdom. The West African countries include five Anglophonic countries which are Ghana, Nigeria, Sirerra Lone, Liberia and the Gambia as well as a

part of Cameroon. The council conducts four different categories of examinations; they are international Examinations, National Examinations, Examination conducted in collaboration with other examining bodies, and Examinations conducted on behalf of other examining bodies. The international exams are exams taken in the five countries with WAEC ordinance. It consists of West African Senior School Certificate Examination (WASSCE). From 1952 to 1968, WAEC performed its duties well without much criticism.

Criticisms started becoming louder in 1969 as a result of massive failure and other variables. (Anigbo 2018). However, from 1970s, some issues appeared to be getting too much for WAEC to handle such as timely release of result, massive failure, uncontrollable population explosion of candidates, overloading of works, cases of leakage of examination papers and increased rate of examination malpractice (Kolawole, 2007)

Examination bodies often carry out empirical verification for detecting biased items in their respective examinations in order to redeem and exclude items found to be biased so that all the examinees can be assured of equity in the examination and also to ensure that the ability of examinees are reliably assessed Examination bodies are expected to construct test items in such a manner that test items are free from writing errors such as wordiness, irrelevancy, offensiveness, and excessive stimulations, so that when an inadequacy exists between groups' examination item scores, the disparity will be attributed to true differences in whatever the test purports to measure in the examinees (Aborisade,2016). As educators take cognizance of the possibility of test item bias in national testing situation, candidates from educationally disadvantaged areas and low socio-economic status would be certain to be fairly treated.

National examination bodies often over-predict or under-predict some candidates from certain states during the selection exercise, to the extent that some examining bodies have different policies of awarding the final grade to examinees. For instance, JAMB has accepted different cut-off points for selecting candidates into Nigerian tertiary institutions based on merit, catchment area, educationally disadvantaged states and institutional discretion. Nigerian as a nation is a heterogeneity setting and there is an assumption that human development is a process dependent upon interaction between inherited qualities and environmental forces.

Researcher on this note have been interested in knowing whether WASSCE multiple choice mathematics items administered by WAEC function differentially between groups based on gender, school location and school type, many researchers has therefore on different occasion, time and location compared the difficulty and the discriminating power of WASSCE using the same or different subject. Their findings however has brought confusion

as to what exactly the position of the situation should be as researchers continue to come out with different findings and drawing different conclusions.

Differential item functioning occur when a characteristic of the item that is not relevant to the test purpose differently influences responses of examinee (Ercikan & Lyong-Thomas, 2013). There is an expectation that if an item on a test is not biased, then examinees from two groups who have equal overall ability ought to have the same probability of correctly responding to it. When examinees from different groups that has comparable ability levels have different probabilities of getting an item correct, differential item functioning (DIF) is said to occur (Battuaz, 2015).

A test that exhibits item bias is one that is unfair to a subgroup of the general population in which it is being used. Item bias occurs when two groups (reference group and focal group) that are matched in terms of their relevant knowledge and skills perform differently in an item (Umoinyang, 2011). DIF is a threat to test validity and invalidates interpretation of the test results for some groups of the same population (Pido, 2012). Item bias occurs when examinees of the same ability do not have the equal probability of getting an item correct (Ojerinde, 2016). This arises mainly due to the sex, cultural, ethnic, religious, or class background of the examinees. Item bias manifest itself in context, language and item structure and format bias (Congbogo & Opara, 2019).

Content bias refers to a situation where knowledge and or skills tested are not part of the educational background of the examinees. Lack of familiarity with content in test items disadvantages individuals in their performance. The individual's responses to items are not based on other irrelevant abilities. Language bias occurs where words in items have different or unfamiliar meanings for different examinee subgroups. The item has difficult vocabulary, group specific language, and vocabulary and reference pronouns. Item structure and format bias occurs where there is ambiguity in the instructions, items stem or options. The content or clues and explanations given to successfully complete the task provided disadvantage individuals in some subgroups (Karami & Nodoushan, 2016).

Since gender equality in education is important in terms of social justice and human rights, it has always been one of the most popular areas in international reports and studies. When examining gender differences in Mathematics, boys shows higher achievement than girl in 28 out of 31 participating countries in Programme for International Assessment Projects (PISA) 2000, and in 38 out of 40 countries in PISA 2004, in 38 out of 65 countries, boys shows higher success tha girls, while in only 5 out countries this situation is reverse. In 22 countries, the achievement of girls and boys are similar. (OECD, 2004).

When the differences according to gender are considered in terms of item type, it is seen that boys have higher achievement

than girls in multiple-choice item (Ebisine, 2013). Researches have shown that as a cause of this condition, boys tend to take more risk and do not refrain from responding to items even if they are not sure whereas girls prefer to leave the items blank, in addition, Madu (2012) illustrate that boys are superior to girls in complex multiple-choice mathematics items in PISA 2003. However, a different situation is observed in terms of constructed response items Ebisine, (2013) found that girls show higher achievement tha boys in constructed response items. As a result of this situation Abedalaziz, Leng and Alahenadi (2010) stated that girls express their thoughts more effectively because of their language skills are higher lane,

A paper presented at the 33rd Annual Conference of International Association for Education Assessment (IAEA) held in Azerbaijan 16-21, 2007 by Executive Secretary and Deputy Director of Nigeria Education Research Development Council (NERDC) title "The Predictive validity of Public Examinations: A Case Study of Nigeria" revealed that poor prediction might be due to the quality of assessment instruments used by public examination bodies like WAEC, NECO, NABTEB, UME etc hence, recommended that there may be need to address the psychometric properties of the test instruments used in national assessment (Obioma & Salau, 2007).

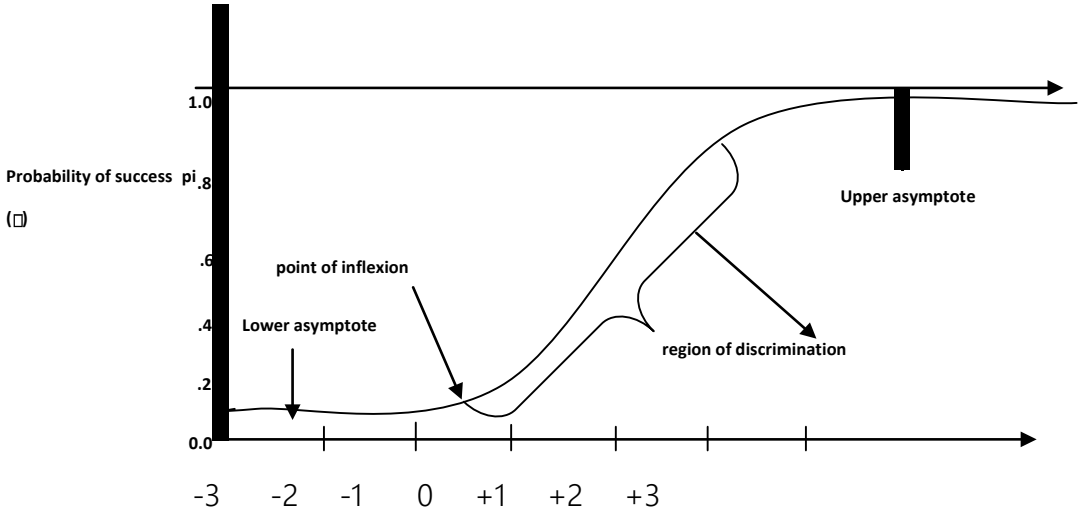
In this study, the West African Senior School Certificate Examination mathematics multiple choice items constituted the area of focus. This paper therefore, looked into test as a major tool in educational assessment especially when it involves making decision(s) about students and its validity in terms of its fairness to the different sub-groups of the examinees.

Differential item functioning is a collection of statistical methods utilized to determine if examination items are appropriate and fair for testing the knowledge of difference group of examinee (e.g male and female). DIF methods, therefore, assess the test-takers' response patterns to specific test item. DIF occurs when a statistically significant difference is evident in the probability that test-takers from the two district groups who have the same underlying ability on the measured construct demonstrate differing probabilities of correctly answering the item (Adebule, 2013). Thus, if DIF is not evident for an item, then there is no item bias. Therefore, DIF is required but not sufficient for item bias. That is if DIF is apparent, then its presence is not sufficient to declare item bias (Roever, 2005). Consequently, a difference in the performance of groups of examinees with different abilities on specific items is not indicative of item bias, but rather item impact (Aborisade, 2016)

Methods of Detecting Test Item Bias in the Measurement of Ability

Many methods of detecting test item bias in the measurement of ability exist these include: item characteristic curve, regression method, chi-square method and transformed item difficulty method among others.

Item characteristic curve approach of detecting test item bias, states that a test is unbiased if all the individuals having the same underlying ability have equal probability of getting the item correct regardless of subgroup membership (Aborisade, 2016). In other words, an item is said to be unbiased if the characteristic curves for the item measured on two groups are identical. If the situation does not hold, then the item is biased and the area between the group ICCs serve as a measure of the item aberrance (Lord, 2002). All item characteristic curves are plotted from test data and form curves of the same general form: from left to right, beginning low, inclining sharply, and leveling off dramatically as illustrated thus:



Item characteristic curve for a 3-parametic logistic model

Two things are to be noted in this diagram above and they are: (i) the slope of the curve is monotonic; that is, it always rises and never exactly horizontal, (ii) the two asymptotes, the upper and the lower, which may approach but never, actually reach 1.00 and 0.00 respectively.

Research Hypotheses

The following research hypotheses were formulated for the study:

1 Items in WASSCE multiple-choice Mathematics administered by WAEC do not function significantly between male and female examinees.

2 Items in WASSCE multiple-choice Mathematics administered by WAEC in 2019 do not significantly function differentially across the school location.

Methodology

The study adopted the descriptive research of the survey type. The population for this study consisted of all senior secondary school students (SSS3) in the 203 public and 235 private secondary school students in Ekiti State. The sample for the study consisted of 1200 senior secondary school III students drawn from 12 public and 12 private secondary schools in Ekiti state.

The sample was selected using multistage sampling procedure. The instrument was reviewed and vetted for face and content validity by the researcher's supervisor and other two experts in Tests and Measurement with Mathematics background who examined the items. This was done for proper scrutiny and vetting. Each of the items of the instrument was equally matched with the general questions and research hypotheses in order to determine whether the instrument measure what it purport to measure. The instrument was adjudged to have both face and content validity for data collection.

The instrument was trial-tested using 120 SSS3 students in three secondary schools outside the sampled schools in Ekiti State. Their responses were scored and analyzed using Kuder-Richardson (KR-20) formula to determine the internal consistency (reliability) of the instrument. The Kuder Richardson formula 20 (KR_{20}) was used to established a reliability coefficient of 0.75 for the objective test, which showed it was reliable The data collected in this study were analyzed using a two-parameter logistic model (2PL) implemented in BILOG-Mg version 3.3.0 software to answer the general questions.

Hypotheses were tested using Bilog M.G. software statistical analysis which was used to generate IRT Item Characteristic Curve (ICC) for each WAEC examination items to show whether items function differentially. Students' responses to WASSCE Mathematics items were calibrated using a two-parameter logistic model (2PL) implemented in BILOG-Mg version 3.3.0 software. This is one of the numerous software available for Item Response calibration of test items in educational assessment. , an independent sample t-test was implemented using R programming language software version 4.1.1. was used to test hypotheses at 0.05 level of significance.

Results

Hypothesis 1

Items in WASSCE multiple-choice Mathematics administered by WAEC in2019 do not function significantly between male and female examinees.

Table 1 presented the outputs of the item response theory (IRT) technique to analyse the DIF of 2019 mathematics items with respect to the Gender of the examinees.

Items in WASSCE multiple-choice Mathematics administered by WAEC in 2019 do not significantly function differentially across the school location.

Table 1: IRT analysis of DIF with respect to Gender

	Gender				
Item	Male	Female	Difference	Decision	Remarks
1	1.667	1.416	0.252	NO DIF	
2	1.315	1.638	-0.323	NO DIF	
3	2.270	2.122	0.149	NO DIF	
4	0.776	0.925	-0.149	NO DIF	

5	0.439	1.327	-0.887	DIF	Favour male students
6	1.466	1.595	-0.129	NO DIF	
7	1.577	2.278	0.700	DIF	Favour male students
8	2.193	1.565	0.628	DIF	Favour female students
9	1.972	1.988	0.016	NO DIF	
10	1.900	1.648	0.252	NO DIF	
11	1.533	1.794	0.261	NO DIF	
12	1.466	1.751	0.285	NO DIF	
13	3.401	3.273	0.127	NO DIF	
14	2.763	3.544	0.781	DIF	Favour male students
15	3.997	2.486	-1.511	DIF	Favour female students
16	3.895	3.363	-0.532	DIF	Favour female students
17	1.690	2.617	0.927	DIF	Favour male students
18	2.482	2.388	0.094	NO DIF	
19	2.851	2.681	0.170	NO DIF	
20	2.472	3.839	1.367	DIF	Favour male students
21	2.379	3.475	1.096	DIF	Favour male students
22	2.482	2.282	0.200	NO DIF	
23	2.564	2.531	0.033	NO DIF	
24	3.099	2.823	0.275	NO DIF	
25	1.035	3.200	2.165	DIF	Favour male students
26	2.882	3.852	0.970	DIF	Favour male students
27	0.776	0.923	-0.148	NO DIF	
28	2.169	2.304	-0.136	NO DIF	
29	1.971	3.879	1.908	DIF	Favour male students
30	2.564	2.786	-0.222	NO DIF	
31	1.876	1.923	-0.047	NO DIF	
32	-0.432	-0.117	-0.315	NO DIF	
33	1.782	2.424	0.642	DIF	Favour male students
34	2.455	2.946	0.491	NO DIF	
35	0.147	0.992	0.845	DIF	Favour male students
36	1.839	1.124	-0.715	DIF	Favour female students
37	1.020	1.722	0.702	DIF	Favour male students
38	1.555	1.597	-0.042	NO DIF	
39	3.734	2.825	-0.909	DIF	Favour female students
40	1.600	1.701	0.101	NO DIF	
41	0.341	0.978	0.637	DIF	Favour male students
42	0.108	0.275	0.166	NO DIF	
43	2.564	2.707	0.144	NO DIF	
44	2.194	3.870	1.676	DIF	Favour male students
45	3.003	3.928	0.925	DIF	Favour male students
46	2.705	2.446	0.259	NO DIF	
47	0.051	0.060	-0.010	NO DIF	
48	2.897	1.131	-1.766	DIF	Favour female students
49	0.584	-0.065	0.649	DIF	Favour female students

50	2.676	2.569	0.107	NO DIF

Table 2a: Descriptive statistics of items that function differentially between male and female examinees

	Gender	Mean	Std. Deviation	Std. Error Mean
Adjusted Difficulty Indices	Male	3.08	0.90	0.34
	Female	1.71	0.94	0.24

Table 2b. Independent sample t-test of items that function differentially between male and female examinees

			Adjusted Difficulty Indices	
			Equal variances assumed	Equal variances not assumed
Levene's Test for Equality of Variances	F		0.15	
	Sig.		0.70	
t-test for Equality of Means	T		-3.22	-3.27
	Df		20.00	12.29
	Sig. (2-tailed)		0.00	0.01
	Mean Difference		-1.37	-1.37
	Std. Error Difference		0.43	0.42
	95% Confidence Interval of the Difference	Lower	-2.25	-2.28
		Upper	-0.48	-0.46

Table 3a presented the descriptive statistics of items that function differentially between male and female examinees. It was shown that items that function in favour of male examinees had ($\overline{X}$= 3.08, SD = 0.90) while items that favour female examinees had ($\overline{X}$= 1.71, SD = 0.94). This result implies that, on average, male examinees had more mathematics test items favouring them than their female counterparts' number of items. Moreover, the mean difference was further confirmed using an independent sample t-test (see Table 5b). The statistics showed that the mean difference was statistically significant (t = -3.22, df = 20, p = 0.00 (i.e p < 0.05)). Consequently, the null hypothesis, which stated that items in WASSCE multiple-choice Mathematics administered by WAEC do not significantly function differentially between male and female examinees, was therefore rejected.

This implies that the male examinees like numerical subjects such as mathematics and have a better understanding (easy) than female contemporaries. This

submission has been established in the literature as well. In addition, female examinees found the items somehow difficult compared to their male counterparts. Also, WAEC must always establish psychometric properties of their test items to conclude that items that constitute their test are devoid of item bias across sub-population of examinees.

Hypothesis 2

Gender of the students will not significantly influence item performance as it relates to difficulty of WASSCE Mathematics administered by WAEC

To answer this hypothesis, item performance indices (see Table 4; columns 2 & 3) for all the items across the Gender of the examinees were used to conduct the analysis. To achieve this feat, an independent sample t-test was implemented using R programming language software version 4.1.1. The results are presented in Tables 8a and 8b as follows;

Table 4a: Descriptive statistics of items performance between male and female examinees

	Gender	N	Mean	Std. Deviation	Std. Error Mean
Item Performance	Male	50	1.93	1.02	0.14
	Female	50	2.15	1.06	0.15

Table 4b. Independent sample t-test items performance between male and female examinees

			Item Performance Equal variances assumed	Equal variances not assumed
Levene's Test for Equality of Variances	F		0.15	
	Sig.		0.70	
t-test for Equality of Means	T		-1.02	-1.02
	Df		98.00	97.89
	Sig. (2-tailed)		0.31	0.31
	Mean Difference		-0.21	-0.21
	Std. Error Difference		0.21	0.21
	95% Confidence Interval of the Difference	Lower	-0.63	-0.63
		Upper	0.20	0.20

Table 8a presented the descriptive statistics of items performance between male and female examinees. It was shown that test item performance (difficulty/threshold) for male examinees had ($\overline{X}$= 1.93, SD = 1.02) while items performance for female examinees had ($\overline{X}$= 2.15, SD = 1.06). This result implies that female examinees found the mathematics test items harder than their male counterparts on average for all the items. Moreover, the mean difference was further confirmed using an independent sample t-test (see Table 8b). The statistics showed that the mean difference was not statistically significant (t = -1.02, df = 98, p = 0.31 (i.e p > 0.05)). Consequently, the null hypothesis, which stated no significant difference in the item performance levels of WASSCE Mathematics items based on Gender, was therefore not rejected. This implies that overall, the level of difficulty of the test items was similar across male and female examinees. However, observed few items across the Gender that displayed the presence of item biasness still needs to work on by the public examining body. Thus, the body must ensure in the near future that all the items in the test give equal opportunity to all the examinees irrespective of their demographic profiles.

Discussion

Based on the finding the result showed that items that function in favour of male examinees had ($\overline{X}$= 3.08, SD = 0.90) while items that favour female examinees had ($\overline{X}$= 1.71, SD = 0.94). This result implies that, on average, male examinees had more mathematics test items favouring them than their female counterparts' number of items. Moreover, the mean difference was further confirmed using an independent

sample t-test (see Table 3b). The statistics showed that the mean difference was statistically significant (t = -3.22, df = 20, p = 0.00 (i.e p < 0.05)). The findings revealed that items that behave in favour of urban examinees had ($\overline{X}$= 2.89, SD = 0.69) while items that favour rural examinees had ($\overline{X}$= 1.85, SD = 0.82). The implication is that, on average, urban examinees had more mathematics test items favouring them than the number of items of their female counterparts. The result showed that items that behave in favour of urban examinees had ($\overline{X}$= 2.89, SD = 0.69) while items that favour rural examinees had ($\overline{X}$= 1.85, SD = 0.82). The implication is that, on average, urban examinees had more mathematics test items favouring them than the number of items of their female counterparts. The findings is in conformity with the findings of Ogbebor & Onuka (2013). However, the study contradicts Adebule (2013) that mathematics items did not function differentially on the basis of the school location of the examinees.

The mean difference was further verified using an independent sample t-test, as shown in Table 5b. The result remarked that the mean difference was statistically significant (t = -3.16, df = 20, p = 0.01 (i.e p < 0.05)). This implies that those examinees from urban areas had a better chance in mathematics than their contemporaries in the rural environment.

Also, WAEC must embrace the item response theory framework of establishing the psychometric properties of their test items before finalising the set of items that make up their test to remove item bias across sub-population of examinees from different school locations.

Conclusion

The findings revealed that the multiple-choice mathematics items administered by WAEC in 2019 function differentially on gender.

Recommendations

Based on the findings of the study, the following recommendations were made:

1. females students should be encouraged and motivated in studying Mathematics.
2 government should pay more attention to schools in rural areas by providing learning materials

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MASTERY LEARNING INSTRUCTIONAL STRATEGY: EFFECT ON STUDENTS' ACADEMIC PERFORMANCE AND ACQUISITION OF SCIENCE PROCESS SKILLS IN SENIOR SECONDARY SCHOOL SCIENCE

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Abstract

Achievement in Senior Secondary Science has over the years been appalling. Literature linked this decline with inappropriate instructional strategies. On the basis of this, the effect of Mastery Learning was investigated. Prettest, Posttest, Control group quasi-experimental design was adopted. Three null hypotheses were tested. Mastery Learning Instructional Strategy and the Conventional teaching strategies were the treatment. 155 SSII Science students from two schools in Ilorin metropolis participated. Instruments used were Science Achievement Test (.71) and Science Process Skill Inventory (.73). Analysis of Covariance and Estimated Marginal Means were used for data analyses. Result showed that Mastery Learning Instructional Strategy was more effective in enhancing achievement and acquisition of Science Process Skills than the Conventional Teaching Strategy indicating that Instruction had significant effect on achievement ($F_{(1.155)} = 107.465, p < .05$) and acquisition of SPSs ($F_{(1.155)} = 93.593, p < .05$). Gender did not have any effect on achievement ($F_{(1.155)} = 1.364$ P >.05) and acquisition of SPSs ($F_{(1.155)} = 1.129$ P >.05). Interaction of treatment and gender could not produce any significant effect on achievement and acquisition of Science Process Skills ($F_{(1.155)} = 1.925$ P >.05and $F_{(1.155)} = .726$ P >.05 respectively). Recommendation was that MLIS be adopted in teaching and learning of Science at the Secondary School level as it is not gender sensitive.

Key Words: Mastery learning, instructional strategy, science process skills, academic achievement

Introduction

A modern and vibrant education system entails wide-ranging activities that would ensure functional, qualitative education of

the highest possible standards at basic, post-basic and tertiary levels. Ibidapo-Obe (2010), expressing his views on Vision 2020 and its attainment, opined that achieving the Vision is very possible if we focus on quality education, especially in Science and Technology and pursue it consistently. This view aligns well with Owolabi (2013), where he expressed that Science is an integral part of human life, impacting on every sphere of it so much so, that it is intricately linked with a nation's development. Furthermore, the National Policy on Education stipulates that Secondary School education should equip students with viable means to live effectively in modern age of Science and Technology (FME, 2004). Science therefore, is receiving much emphasis in education because it is a great enterprise which nations depend on in order to advance technologically.

Onasanya and Omosewo (2011) have also described Science as the foundation upon which the bulk of present day technological breakthrough is built. Through Science, man has been able to understand his environment better. This has enabled him to manipulate the environmental conditions to his benefits and acquire his needs faster and better.

The awareness of the vital role of Science and Technology in National development has prompted both the developed and developing countries of the world to include Science and Technology subjects in their school curricula right from the first stage of learning; the Primary school (Oriahi, Uhumuavbi & Aguele, 2010). According to them, the proper teaching and handling of Science and Technology subjects in schools will result in the training of the minds of students in the understanding of the world around them, in the acquisition of appropriate skills, capacities, competencies necessary for them to live and contribute to the development of their society.

Literature, (Ango, 2002, Nwagbo & Chukelu, 2011) has widely shown that in today's information age, for educational system to be relevant and fitting into the pace of things, they should provide students with information acquisition skills instead of directly providing them the information they need. As opined by Padilla (1990), one of the most important and pervasive goals of schooling today, is to teach students to think, and that all schools' subjects should share in accomplishing this overall goal. He further emphasized that Science, more than any other discipline contributes its unique skills, with its emphases on hypothesizing, manipulating the physical world and reasoning from data, towards attaining this goal. The main goal of Science teaching therefore should be to help students understand the nature of Science and how to use scientific enquiry methods, and thus improve students' achievement in Science subjects by so doing.

Because of the importance and relevance of science to the individual and the society, the National Policy on Education (2013) on Senior Secondary School stipulates that, at least one science subject must be offered at the Senior Secondary School as part of

the core subject requirement for graduation from this level of education, irrespective of the students' subject combination. For the students of Science, three main Science subjects; Physics, Chemistry and Biology are compulsory while a majority of other students in the commercial and arts classes often offer Biology as their compulsory Science subject.

Science as an area is a precursor for many fields of learning, contributing immensely to the technological growth of the nation (Nwagbo & Chukelu, 2011). These they highlighted to include Medicine, Forestry, Agriculture, Biotechnology and Nursing. The study of Science in Senior Secondary Schools can equip students with useful concepts, principles and theories that will enable them to face the challenges before and after graduation, particularly in today's information communication technology driven age. The National Policy on Education (2013) and the Science curriculum see Science as a practical and inquiry-oriented area that should be taught practically, that is, involving the students in the art of doing (Okoye & Okechukwu, 2006). They submit that when the students are involved in 'doing science' in the study of Science contents and concepts, science process skills such as careful observations, classification, measurement, inference, communication, interpreting, predicting events, designing experiments, organizing information, reporting and generalization will be acquired (Ango, 2002, Sunyono, 2018).

The acquisition of these Science Process skills (SPSs) and enhancement of achievement in science cannot be realized except through the effective effort of the classroom teacher working through effective learning strategies (Nwagbo & Chukelu, 2011). Ajaja and Kpangban (2000) asserted that what the student knows or does not know depends mainly on the teacher. A number of factors have been identified as contributing to the non-acquisition of skills by students which invariably lead to poor academic performance and one of the factors according to them is the teacher's method of teaching or strategy adopted (Ezike (2012), Othman, Amiruddin & Mansori (2015) in Amiruddin and Zainudin, 2015). Okoli (2006) indicated that many science teachers prefer the traditional expository method shying away from the activity oriented strategies that are more learner-centred. Nwagbo (2008) observed that such teacher-centred approaches do not enhance academic performance or promote the acquisition of Science Process Skills. In the same vein Williams and Ochiama (2018) are of the view that productive and rewarding outcomes of instructional process depend upon effective teaching methods and this is why researchers are trying to find out constructive, productive and worthwhile methods at every level.

Science educators over the years have been focusing attention on how to improve Science instruction in schools by going beyond the stereotypic methods of obtaining knowledge in science (Okoye & Okechukwu, 2006). Ariyo (2011) noted that

this is more so as the academic achievement of students in the sciences has been a subject of concern to major stakeholders in Science Education. Yoloye (2004) and Adeyemo (2005) adduced to several pedagogical factors, socio psychological variables as well as other attribute variables as correlates of the prevailing poor performance in Nigerian Secondary School sciences. To this effect, Okoye (1999), Okebukola (2002) and Okechukwu (2003) have shown that Biology teachers and indeed all science teachers should therefore be equipped with the right teaching strategies for effective learning to take place. They share the opinion that if learning experiences are based on sound pedagogical principles of learning, taking into account learner characteristics, it may be possible for a majority of learners to attain all the competencies necessary for good performance.

It is against this background that this study investigated the effects of Mastery Learning on the acquisition of Science Process Skills (SPS) and the achievement of students in Senior Secondary School Science. Mastery learning Instructional Strategy (MLIS) is an instructional approach where students are allowed unlimited opportunities to demonstrate mastery of content they are taught.

Mastery learning as an instructional strategy was introduced into the pedagogical literature by Bloom (1968) while working to develop what he considered a better approach to instruction. While appreciating the value of traditional practice, pointed out that it was vital for teachers to assess students' learning at the end of the unit, and also use classroom assessment as learning tools both to provide students with feedback on their learning progress and to guide the correction of learning errors. Assessment should be used as part of the instructional process diagnose individual learning difficulties and prescribe remediation procedure. He outlined a specific instructional strategy to make use of this feedback and corrective procedure describing it as learning for Mastery.

Commenting on mastery learning, Guskey (2007) wrote, a classroom with a Mastery Learning focus as opposed to traditional form of instruction would reduce the achievement gaps between groups of students. The basic theoretical assumption of MLIS is that students must have predetermined sets of necessary skills and knowledge in order to achieve their learning objectives (Amiruddin and Zainudin, 2015). The concept of Mastery learning is attributable to behaviourism principles of operant conditioning. The theory states that learning occurs when an association is formed between a stimulus and response (Skinner, 1984). The learner is therefore expected to exhibit behaviour that is both observable and measurable which is an indicator that learning has occurred. This agrees with Anderson's (2000) and Filgona's (2016) comments that to demonstrate mastery over each lesson, students must be able to overtly show evidence of understanding before moving to the next lesson. Also Guskey (2007) in Amirudin (2015) wrote that the theoretical

basic assumption of MLIA is that students must have predetermined set of necessary skills and knowledge in order to achieve their learning objectives

Apart from the influences of instructional strategies on learning outcomes, gender is also often implicate in students' achievement in science, though often as intervening variable (Yoloye, 2004). Literature (Alele, 1999, Okeke, 2007, Amelink, 2009, Nwagbo & Chukelu, 2011, Ariyo, 2011) has shown that the issue of gender and gender stereotyping permeate every aspect of human endeavour, with the consequences cutting across social, economic, political and educational development, especially in the areas of Science and Technology.

However, there have been conflicting reports with respect to gender and achievement in Science (Igwe, 2002). International trends reveal mixed results with regard to the gender difference in Science achievement. In some instances, such as course work completed, females perform equal to their male peers, however, assessment geared towards measuring mastery of content, reveal that differences between male and female education surface in Elementary School and continue at the High School level (Ingels & Dallon, 2008). Differences in Science achievement at the higher level are attributed in part to fewer females attaining degrees in Science, Technology, Engineering and Mathematics (STEM) fields (Madigan, 1997, Hazari, Tai & Saddler, 2007). This study is theretofore expected to contribute to the ongoing debate.

Empirical studies (Wambugu & Changieywo, 2007, Oloyede, 2010, Abakpa & Iji, 2011, Jacobson & Obomamu, 2011, Dorgu, 2012, Amiruddin & Zainudin 2015, Williams & Ochiama 2018) on the use of MLS in Africa and Nigeria in particular, have also consistently reported significant higher performance in students for which it was employed, in a given task. Other research findings also suggest that MLS yields greater interest and more positive attitudes in various subjects than non-Mastery learning strategies (Ngesa, 2002, Wachanga & Mwangi, 2004). These studies have been done mostly in areas of Mathematics, Physics, Chemistry, Social studies and English Language. Be that as it may, performance indicators in Nigerian education, continue to show dismal deterioration, rather than improvement, in standard of education generally, and in Secondary Science and Mathematics in particular. All stakeholders in education keep calling for ways to curb this debilitating trend in performance, which is a bane for the nation's development. It has become imperative therefore, that very urgent intervention strategies be put in place to stimulate the desired changes. An experimental study of the effect of Mastery Learning Instructional Strategy on Students' academic performance and acquisition of Science Process Skills and in Senior Secondary Science could be a pointer to an effective pedagogical strategy for positive change.

Purpose of study

The main purpose of this study was to investigate the Effect of Mastery Learning Instructional Approach on students' academic performance and acquisition of Science Process Skills in Senior Secondary School Science

Research hypotheses

For the purpose of this study, three null hypotheses were postulated and tested at .05 level of significance.

H_{01}. There is no significant effect of treatment on students':

(a) Performance in Senior Secondary School Science and

(b) Acquisition of Science Process Skills

There is no significant main effect of gender on Students'

(a) Academic performance in Senior Secondary school Science and

(b) Acquisition of Science Process skills.

H_{03}. There is no significant interaction effect of treatment and gender on students':

(a) Academic performance and (b) Acquisition of Science Process Skills in Senior Secondary School Science

Methodology

Research design: The study adopted a pre-test, post-test, control group quasi-experimental design

Population: The target population for this study was Senior Secondary two (SSII) Science students in all the Senior Secondary Schools in Ilorin Central of Kwara state.

Sample and Sampling Procedure One hundred and fifty-five (155) Senior Secondary two (SSII) Science students drawn from two mixed, public schools in Ilorin metropolis were used for the study. SSII students were used because they are the most stable and relevant class of Senior Secondary students, not fresh in Senior Secondary School Science like the SSI class, and not preparing for terminal national examinations like the SSIII class. Purposive sampling technique was used to select both the schools and students. This was well suited for the study because given the nature of the study, existing student' classes had to be used intact.

Instruments

Two instruments were used. They are the Science Achievement Test (SAT) and Science Process Skills Inventory (SPSI).

(i) Science Achievement Test (SAT)

The SAT was a 30-item multiple choice objective test with four options lettered A, B, C and D. The test covered topics selected from Biology, Chemistry and Physics. The SAT measured the students' level of mastery of the instructional content before and after the treatment.

The construction of the test covered the six major levels of the cognitive domain (Knowledge, Comprehension, Application, Analysis, Synthesis and Evaluation). These six levels were condensed into three following the scheme used by the Educational Testing Service in order to overcome the difficulty of generating items which adequately measures these levels (Okpara and Onocha, 1995). The condensed form is given as follows: Remembering (Knowledge)-Recall, Understanding (Comprehension and Application) and Thinking (Analysis, Synthesis and Evaluation). Content validity of the SAT was established by two Science experts in University of Ilorin Secondary School. It was administered to a parallel sample 30 students that were not part of the experiment It was scored and used for reliability estimation. A coefficient of 0.71 was obtained using KR-20.

(ii) Science Process Skills Inventory (SPSI)

The Bourdeau and Arnold (2009), SPSI was adopted to measure the students' level of acquisition of Science Process Skills for this study. The inventory is an 11-item Likert scale type questionnaire designed to measure the six basic science skills. Each item consists of a statement describing a skill expressed by; Never (N), Sometimes (S), Usually (U), and Always (A). This was also completed by each student before and after the treatment. The inventory was administered to the same thirty randomly selected SSII students used for the BAT to establish the reliability. Cronbach's alpha calculated yielded a coefficient of 0.73.

Research procedure

Since intact classes were used for the study in both the experimental and control groups, the regular Science teachers in the two schools were used to do the teaching. The research covered a total period of six weeks. Week one was used to train the teachers for the treatment, and administration of the SAT and SPSI pre-tests to the two groups. Week two to week five (4 weeks) were used to implement the teaching (treatment).

Week six was used for the administration of SAT and SPSI post tests following treatment. Two broad topics: The chosen topics taken from the school scheme of work as at time of study, were taught to the two groups for twelve 35 minutes lesson periods in the four weeks of treatment by the Biology, Chemistry and Physics teachers. The researchers designed lesson plans for the experimental and control groups with the same, instructional objectives, instructional materials, teachers' and students' activities (which included lots of hands on and practical activities, to enhance students acquisition of skills); and notes of lesson.

The experimental group's teacher taught the class, using the lesson plans prepared for the group, using the MLIS. The lesson plan used here differed slightly from that of the control group's with the inclusion of two short responses, (2-3 items) formative test in each of the lessons. The teacher administered one of the tests at the end of each lesson and got the students to exchange and mark them to get the intermediate picture of their performance.

The teacher began each next lesson by discussing the corrections to the previous test and goes on over the last lesson when less than 80% of the class could not answer all the questions correctly. The teacher then administered the second equivalent test for the lesson in such a case but moved on to the new lesson only when satisfied that at least 80% of the class answered all the formative questions correctly. This means that students who have not mastered the learning unit will be required to undergo remedial instruction (Hussain and Suleiman 2016; Filgona, Filgona and Linus 2017; Barr & Wessel 2018).The teacher for the experimental group had to give extra lessons, for an hour during evening prep period of the class for two days in each of the first two weeks of the four weeks of treatment to keep up with the scheme of work.

Data Analysis

The data collected were analysed using Analysis of Covariance (ANCOVA) and Expected Marginal Means

Results

The result of this study was based on the three stated null hypotheses tested at 0.05 level of significance.

H_{01a}. There is no significant main effect of treatment on Students' performance in Senior Secondary school Science. To test this hypothesis, Analysis of Covariance (ANCOVA) was carried out and the result is presented in Table 1.

Table 1: Summary of ANCOVA of Post-test Achievement scored by Treatment

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	1604.702	4	401.175	37.656	.000	.374
Intercept	16921.482	1	16921.482	1588.303	.000	.379
Pre-test	40.676	1	40.676	3.818	.053	.064
Treatment	1144.915	1	1144.915	107.465	.000	.237
Gender	14.533	1	14.533	1.364	.205	.014
Treatment * Gender	20.504	1	20.504	1.925	.050	.031
Error	1598.072	150	10.654			
Total	80886.000	155				
Corrected Total	3202.774	154				

a. R Squared = .501 (Adjusted R Squared = .488)

The data above show a significant main effect of treatment in Science ($F_{(1.155)}$ = 107.465, $p < .05$). Based on this finding, the hypothesis was rejected showing that the strategy of instruction had effect on achievement. In order to show how the two groups performed, Estimated Marginal Means (EMM) was used and the result is presented in Table 2 below.

Table 2: Estimated Marginal Means of Post test Achievement Scores according to Treatment

Grand Mean

Dependent Variable: Post-test

Mean	Std. Error	95% Confidence Interval	
		Lower Bound	Upper Bound
22.523[a]	.286	21.957	23.089

a. Covariates appearing in the model are evaluated at the following values: Pre-test = 8.55.

Treatment: Instructional Strategies

Estimates

Dependent Variable: Post-test

Instructional Strategies	Mean	Std. Error	95% Confidence Interval	
			Lower Bound	Upper Bound
Experimental Group Mastery Learning	25.492[a]	.392	24.717	26.267
Control Group Conventional Teaching Strategy	19.553[a]	.418	18.728	20.379

a. Covariates appearing in the model are evaluated at the following values: Pre-test = 8.55.

From the data in the EMM Table, the grand mean is 22.523 for achievement. The data revealed that Mastery Learning Instructional Strategy had higher adjusted mean score of 25.492 while the Conventional Teaching Strategy (Control) had an adjusted mean of 19.553.

H_{01b}. There is no significant main effect of treatment on acquisition of Science Process Skills. ANCOVA was carried out to test the hypothesis and the result is presented in Table 3.

Table 3: Summary of ANCOVA of Post-test Achievement scored by Gender

Tests of Between-Subjects Effects

Dependent Variable: Posttest

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	3134.012[a]	4	783.503	30.777	.000	.451
Intercept	8439.719	1	8439.719	331.523	.000	.688
Pretest	38.201	1	38.201	1.501	.222	.010
Treatment	2382.636	1	2382.636	93.593	.000	.384
Gender	28.729	1	28.729	1.129	.290	.007
Treatment * Gender	18.491	1	18.491	.726	.395	.005
Error	3818.607	150	25.457			
Total	161035.000	155				
Corrected Total	6952.619	154				

a. R Squared = .451 (Adjusted R Squared = .436)

The data show a significant main effect of treatment on students' acquisition of Science Process Skills ($F_{(1.155)} = 93.593$, $p < .05$). Based on this finding, the hypothesis was rejected showing that the instructional approach had effect on the acquisition of Science Process Skills. In order to show how the two groups performed, Estimated Marginal Means (EMM) was used and the result is presented in Table 4.

Table 4: Estimated Marginal Means of Post test Achievement Scores according to Treatment

Grand Mean

Dependent Variable: Post-test

Mean	Std. Error	95% Confidence Interval	
		Lower Bound	Upper Bound
31.707[a]	.441	30.836	32.578

Treatment: Instructional Strategies

Estimates

Dependent Variable: Post-test

Instructional Strategies	Mean	Std. Error	95% Confidence Interval	
			Lower Bound	Upper Bound

Experimental Group Mastery Learning	36.023[a]	.606	34.826	37.220
Control Group Conventional Teaching Strategy	27.391[a]	.648	26.111	28.672

a. Covariates appearing in the model are evaluated at the following values: Pre-test = 17.64.

From the data in EMM Table, the grand mean is 31.707 for acquisition of Science Process skill. The data revealed that Mastery Learning Strategy had higher adjusted mean score of 36.023 while the Conventional Teaching Strategy (control) had an adjusted mean of 27.391 which is lower than the grand mean.

H_{02}. There is no significant main effect of gender on Students' (a) achievement in Senior Secondary school Science and (b) acquisition of Science Process skills. From the ANCOVA summary, Table 2, it could be seen that there was no significant effect on gender on students' achievement in Science ($F_{(1.155)}$ = 1.364 P >.05). Based on this result, hypothesis 2 was not rejected. This means that gender did not produce any remarkable change in the achievement of students in Science. In like manner, gender did not have any effect on the Acquisition of Science Process Skills ($F_{(1.155)}$ = 1.129 P >.05) as shown on the ANCOVA summary of Table 3. Therefore hypothesis 2 (b) was also rejected.

H_{03}. There is no significant interaction effect of treatment and gender on

(a) students' achievement in Senior Secondary School Biology and

(b) acquisition of Science Process Skills

From the ANCOVA summaries, Table 1 and 3, it could be seen that there were no significant interaction effect of Treatment and Gender on students' achievement in Science ($F_{(1.155)}$ = 1.925 P >.05) and Acquisition of Science Process Skills ($F_{(1.155)}$ = .726 P >.05) respectively. Based on this result, both hypotheses were not rejected. This means that the interaction effect of Treatment and Gender did not produce any remarkable changes in the achievement of studies in Biology and Acquisition of Science Process Skills.

Discussion

The results of this study show significantly higher performance in Science and Acquisition of Science Process Skills among the experimental group exposed to MLS during treatment as opposed to those taught using the Conventional Teaching Strategy. This is so because of the nature of the experimental strategy which requires that lessons are repeated until about eighty percent success is achieved. In the process, elaborations are made which enhances understanding and hence improves achievement and acquisition of Science Process Skills. Even in Nigeria and around Africa with their peculiar needs and context, studies have shown MLS to be most suitable for improving students' performance in Science subjects and acquisition of Science Process Skills. Filgona, Filgona & Linus

(2017) worked on the effects of Mastery Learning Strategy and Learning Retention on Senior Secondary School Students' achievement in Physical Geography. The results of the study revealed that Mastery Learning Strategy improved the students' learning retention and achievement compared to traditional method. Hussain & Suleman (2016) reported that Bloom's mastery learning approach had a positive effect on students' academic achievement and retention compared to traditional learning approach. Salami (2001), found that MLS was quite effective in bringing about a difference in the academic achievement in Chemistry of students in the experimental class than close in the control group. Ango (2002) carried out a study with the MLS on the acquisition of Science Process Skills, Wambugu & Changeiywo (2008) used the strategy in teaching Physics among Secondary School students, Oloyede, (2010) used the strategy in an experimental study in teaching Chemistry and Abakpa & Iji (2012) used it to teach Geometry, a branch of Mathematics. Also Dorgu (2012) found that the strategy was effective in enhancing achievement in Christian Religious Studies than the conventional teaching strategy.

Gender on the other hand was found to have no statistically significant effect on Students' achievement in Biology and acquisition of Science process skills. The result of this study is an indication that MLS improve the achievement scores of both male and female students in post BAT and SPSI equally. The non significant difference in the mean achievement scores is an indication that the MLS minimizes gender difference in understanding learning instruction. This is line with Olele (2002) who also found that Mastery Learning does not produce any difference in the achievement of male and female students in English Language. The studies showed that there is no gender difference when good teaching method is used. However, it disagrees with the views of Abiam and Odok (2006), Akinsola (2007), Eng, Li and Julaihi (2010), and Vale (2009) who reported that female students are weaker in some area of Mathematics and Science than the male students. Dorgu (2012) also reported that male students performed better in CRS when taught with the MLS.

Conclusion and Recommendations

The findings of the study confirms that Mastery Learning Strategy with its guaranteed positive impact on students' learning, essentials skill acquisition and achievement, is workable even with all the factors militating against Secondary School Science teaching an learning in Nigeria. It may as well be the panacea of pedagogical change we need to curb the falling trend of Secondary Science Education.

On the basis of this conclusion, this paper recommends as follows:

- Building formative assessment into lessons for learners' feedback and correction should be introduced at policy level.
- Rigorous teacher training and retraining of teachers are

expedient to change the typical science teacher's attitude towards seeing science teaching as more of doing than talking; being contented with the normal curve trend of students' achievement as okay, as well as train the teacher in the MLS' more effective use of classroom assessment and time to suit learner characteristics.

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EXPLORATORY ANALYSIS OF VARIABLES OF BRAIN DRAIN OF TECHNICAL EDUCATION LECTURERS IN COLLEGES OF EDUCATION IN SOUTH EASTERN, NIGERIA

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Abstract

Attrition or brain drain rate of lecturers in technical education from colleges of education in Nigeria is becoming uncontrollable. The purpose of study was to analyze variables of brain drain of technical education lecturers in colleges of education in south eastern, Nigeria. The population of the study consisted of 49 lecturers of technical education in colleges of education in South Eastern, Nigeria. The sample for the study comprised 36 male lecturers and 13 female lecturers of technical education in colleges of education. A 52 item well-structured questionnaire developed from literature reviewed together with focused group discussion were used for data collection. The instrument was subjected to face and intrinsic validity. The reliability coefficient of the instrument was 0. 78. Factor analysis was employed in analyzing data for answering research questions. The study found that variables of brain drain of the lecturers emanating within and outside of the college system can be categorized under promotional, welfare and prestige factors. The study also found that variables that enhance the retention of both male and female lecturers of technical education in colleges of education in South Eastern Nigeria were under promotional, teaching/training and welfare factors. Based on the findings, it was recommended among others that governments and school administrators should maintain a conducive and cooperative environment for lecturers in the colleges of education in Nigeria for smooth running of their programmes

Keywords: Exploratory analysis, technical education, attrition of lecturers, brain-drain, College of Education, factor loading

Introduction

Education is the activity performed to impart the required knowledge or skills to students in formal institutions. These activities include assessment of students, classroom management and supervision of students. The activities are span through

the periods of crèche, care centres, nursery schools and other higher levels of education. Okoro (2010) explained that education is what makes an individual to function and be relevant not only for himself/herself but to the society irrespective of place, time and circumstances. In Nigeria, education can be acquired in primary school, secondary school and tertiary institutions. The type of education acquired in universities, polytechnics and colleges of education is called tertiary education.

Colleges of education in Nigeria are tertiary institutions where teacher education is obtained. Ellah (2007) described colleges of education as types of institution that prepare intermediate level teachers for a minimum of three years to make them qualify to teach their respective subjects. Bakare, Zakka and Fittoka (2010) explained that these colleges are under the control of the National Commission for Colleges of Education (NCCE) which uses the minimum standard to monitor the implementation of their teacher education programmes. The colleges of education produce teachers for the implementation of primary and junior secondary school curricula. Colleges of Education run various technical education programmes such as automobile technology, technical drawing, woodwork technology, metal work technology, building technology and electrical/electronic technology.

Individuals are trained in these areas of education to teach in primary, secondary schools and technical colleges. They are made specially to equip students with knowledge, skills and attitudes required to impart the curricula of primary and secondary schools. The two major categories of human resources found responsible in imparting skills in technical education programmes are instructors and lecturers. Instructors are supporting academic officers that teach practical activities in a particular course(s) to students. Onipede (2013) described instructors as academic support staff within the programme with minimum qualification of Higher National Diploma (HND). Instructors teach practical contents in the workshops while lecturers teach theoretical contents to students in classroom setting. Lecturers are individuals that teach courses specified in the minimum standard recommended by NCCE to students in different programmes. Lecturers at colleges of education possess minimum qualification of first degree. They specialize in any areas of technical education programmes and are involved in teaching technical education courses to students in colleges of education. Kolade (2014) stated that the acquisition of the required knowledge and skills in teacher education programmes of colleges of education depends on the quality of the lecturers available.

Current trend of globalization requires that teacher education institutions should be equipped to produce teachers with skills and competencies to develop learners as critical citizens in a digital world (Institute of Education, 2013). Colleges of education programmes in Nigeria need academic staff to effectively implement it

and develop high quality teachers with the experience and determination to deliver high quality teaching and learning in a sustainable and inspiring manner supported with innovative research and technology. The importance of lecturers in technical teacher education programmes in colleges of education has been expressed in various forms. According to Power (1996), one teacher in a school is worth more than 100 volumes of books for imparting the required knowledge, skills and attitudes to learners. Lecturers therefore are the hub or pivot on which technical education programmes revolves.

Sawyer (1997) stated that the colleges of education should be a stimulating place for learners, but that can only be possible with their marks. Having a good lecturer implementing educational programme is like having a nation being led by a good leader. Similarly, the policy document (FRN, 2004) hinged the entire level of education attainable in the country on teachers, by declaring that the education system cannot rise above the quality of its teachers. All these statements point to the inevitability of lecturers in the colleges of education; and therefore lecturers deserve a special focus and attention.

The occurrence of brain drain of technical education lecturers in colleges of education in Nigeria therefore becomes an issue that requires special attention of all those concerned with the planning and implementation of the technical courses in colleges of education. Brain drain refers to large scale movement or migration of top flight man power from various developing countries (predominantly African Countries) to more developed countries notably United States of America, Canada, United Kingdom, Germany, France, Italy, Holland, Newzeland and Australia. (Emeghara, 2013). Brain drain or attrition of lecturers therefore refers to the reduction in number of the lecturers in a college of education or school system. Ndomi (2003) explained that one way of obtaining sufficient information on attrition of teachers in a school system is to identify the variables that cause it, and their coefficients.

The coefficients of the variables provide a clear understanding of the brain drain and also serve as data for factorial analysis of the variables responsible for brain drain of lecturers in colleges of education. The measurement of these variables of brain drain in education is called edumetrics. Edumetrics is a systematic process of accessing the educational component in quantitative format and creating universal acceptable result in teaching and learning process or in education setting (Kumar, 2013). It is also referred to as the application of test score interpretation to educational contexts.

Variables responsible for brain drain are factors causing the continuous exit of lecturers from the colleges of education in South Eastern Nigeria thereby creating a gradual reduction in the number of qualified technical education lecturers The movement of some quality and well educated technical education lecturers with higher degrees into university systems has been observed over the years,

despite their well packages and less academic activities or workloads have been observed. Most of the lecturers after being trained through the Tertiary Education Trust Fund (Tetfund) Intervention and other sources still leave colleges of education for universities. Those who trained themselves for higher degrees such as Masters and Ph. D also prefer joining the university systems. This situation needs to be carefully studied to identify the specific variables causing the attrition or brain drain of these technical education lecturers, and the interest of those that are still teaching in colleges of education. This is necessary to provide inputs to policy makers for combating undesirable effects of attrition of the technical education lecturers in South Eastern, Nigeria.

Purpose of the Study

The major purpose of the study was to identify the exploratory analysis of variables of brain drain of technical education lecturers in colleges of education in South Eastern, Nigeria

Specifically, the study sought to:

1. identify the variables of brain drain of lecturers of technical education in colleges of education that emanate from the college system and those that emanate from outside the college system in South Eastern, Nigeria
2. identify the factors that enhance retention of lecturers of technical education colleges of education in Southeastern, Nigeria.

Research Questions

The following research questions were formulated in line with the purpose of the study.

1. What are the variables of brain drain of lecturers of technical education in colleges of education emanating within and outside the college system?
2. What are the variables enhancing the retention of male and female lecturers of technical education in colleges of education in Southeastern Nigeria?

Methodology

Research Design

This study adopted cross-sectional survey design. Hall (2013) stated that a Cross-sectional survey is described as snapshots of the populations about which data are gathered. Cross-sectional design is suitable for this study since questionnaire are developed from the literature and focuses group discussion by the researchers and were utilized to collect data from respondents that were considered to be representative of the entire groups.

Population and Sample

The population of the study consisted of four hundred and eight one (481) technical education lecturers. The population was made up of 356 male and 125 female lecturers of technical education. Simple random sampling technique was used to select 49 lecturers made up of 36 male and 13 female lecturers of technical education

in colleges of education in South Eastern, Nigeria

Instrument for Data Collection

The instrument used for data collection was 52 structured questionnaire consisting of variables on brain drain of lecturers of technical education in colleges of education that emanate from the college system and those that emanate from outside the college system; and the factors that enhance retention of male and female lecturers of technical education in teaching in colleges of education in Southeastern states Nigeria.

The instrument was validated using two types of validation; face and intrinsic. For face validation, the copies of draft of the structured questionnaire were given to three experts.to certify the adequacy, suitability and coverage of the items. Some suggestions were made by the experts to improve on the construction of the questionnaire items. This procedure conforms with what Gay (1992) suggested, that face validity should be determined by expert judgment.

The intrinsic validity was obtained through the use of the test statistics. This statistics was derived from' Rulon's formula, that intrinsic validity is an index of reliability (Guilford, 2000). The intrinsic validity coefficients obtained for each section of the instrument were as follows: Section A, 0.89; Section B, 0.83. These values indicated a high level at which the items on the questionnaire measure what they should measure. The reliability coefficient of the instrument was determined using Cronbach Alpha and 0.72 coefficient was obtained.

Data Analysis

Exploratory factor analysis was used to analyzed the data. Principal component analysis with varimax rotation was adopted with factor loading of 0.40. Factor loading of less than 0.40 or variables that load is more than one factor were discarded.

$Y_n = a_{n1}X_1 + a_{n2}X_2 + * * + a_{nn}X_n$

Where:

Yn = observed variables of brain drain of lecturers of technical education in colleges of education that emanate from the college system and those that emanate from the college system and those that emanate from outside the college system.

$a_1 – a_n$ = factor loadings or correlation coefficients.

$X_1, X_2, \ldots X_n$ = unobserved underlying factors that enhance retention of male and female lecturers of technical education in teaching in colleges of education in Southeastern states Nigeria

Results

Research Question 1

What are the variables of brain drain of lecturers of technical education in colleges of education emanating within and outside of the college system?

Table 1: Varimax Rotated Factors of Brain Drain of Lecturers of Technical Education in Colleges of Education emanating within the College System

SN	Observed / Variables	Factor 1: Promotion factor	Factor 2: welfare factor	Factor 3: Prestige/Respecting factor
A	Variables Emanating within the College System			
1	No much challenges in colleges of education	0.485	0.368	0.228
2	Allocation of excessive teaching loads to lecturers	0.227	0.120	0.107
3	Compulsory setting of examination questions with model answers	0.161	0.455	0.283
4	Compulsory moderation of examination questions set by lecturers	0.283	0.075	0.453
5	Unfair evaluation of lecturers performance by the management of the colleges	0.451	0.269	0.230
6	Inadequate training facilities for students' practical	0.365	0.215	0.050
7	Lack of sufficient pedagogical skills	-0.368	0.225	0.235
8	Lack of modern equipment and machines in the colleges	0.276	0.515	0.250
9	Lack of staff offices for lecturers	0.257	0.511	0.166
10	Students indiscipline to lecturers	0.224	0.206	0.541
11	Students lack of interest in the technical courses	0.053	0.252	0.104
12	Poor quality of facilities provided for teaching technical courses	0.175	0.466	0.289
13	Concentration on practical activities than class work	0.183	0.284	0.309
14	Delay in payment of normal allowances	0.268	0.485	0.185
15	Narrow chances of raising to top position	0.620	0.227	0.227

16	Use of quarries to threaten lecturers	0.435	0.441	0.341
17	Delay in the payment of promotion arrears	0.575	0.483	0.283
18	Lack of insurance policy cover for lecturers of technical education	0.269	0.451	0.051
19	Non professionalization of teaching in colleges of education	0.215	0.365	0.365
20	Delay in normal promotion of lecturers of technical education	0.425	0.468	0.368
21	Incommensurate salary with volume of work	0.215	0.376	0.676
22	Lack of commendation of outstanding lecturers in colleges of education	0.511	0.517	0.253
23	Wit-chanting lecturers of technical education during paper assessment	0.406	0.224	0.175
24	Poor electricity supply	0.252	0.053	0.183
25	Lack of respect for lecturers of technical education by other colleagues and school management	0.266	0.275	0.468

Table 2: Varimax Rotated Factors of Brain Drain of Lecturers of Technical Education in Colleges of Education emanating Outside of the College System

S/N	Observed/ Variables	Factor 1: Promotion factor	Factor 2: Welfare factor	Factor 3: Prestige/ Respecting factor
26	Bonuses paid to lecturers in universities	0.268	0.468	0.355
27	Better allowances paid by the universities	0.120	0.120	0.275
28	Respect and prestige accorded university lecturers by public	0.355	0.355	0.469
29	Opportunities available in the universities to pursue higher degrees	0.275	0.575	0.215
30	Better conditions of service offered by other universities	0.269	0.469	0.175
31	Higher salaries paid to employees in other organizations	0.215	0.215	0.183

32	Provision of loan facilities to employees in universities	0.225	0.385	0.268
33	Employment opportunities in other organizations	0.215	0.227	0.120
34	Opportunities for lecturers in the universities to become professors	0.516	0.241	0.355
35	Recognition given to universities as apex institutions	0.206	0.283	0.575

Tables 1 and 2 present varimax-rotated principal component factor analysis of Brain Drain of Lecturers of Technical Education in Colleges of Education emanating within and Outside of the College System. From the result presented, factor loading of less than 0.40 were discarded. The naming of each factor was equally adopted to group the variables into three major strategic factors as; promotional; welfare, and prestige/respecting. Promotional brain drain of lecturers of technical education in colleges of education emanating within and outside of the college system include: no much challenges in colleges of education (0.485), unfair evaluation of lecturers performance by the management of the colleges (0.451), narrow chances of raising to top position (0.620), use of quarries to threaten lecturers (0.435), delay in normal promotion of lecturers of technical education (0.425), lack of commendation of outstanding lecturers in colleges of education (0.511), wit chanting of lecturers of technical education during paper assessment (0.406) and opportunities for lecturers in the universities to become professors (0.516).

Under factor 2 (Welfare factor), the identified variables include: (0.455) compulsory setting of examination questions with model answers (0.515), lack of modern equipment and machines in the colleges (0.511), lack of staff offices for lecturers (0.466), poor quality of facilities provided for teaching technical courses (0.485), delay in payment of normal allowances (0.483), delay in the payment of promotion arrears (0.451), lack of insurance policy cover for lecturers of technical education (0.517), lack of commendation of outstanding lecturers in colleges of education (0.468), bonuses paid to lecturers in universities (0.57), opportunities available in the universities to pursue higher degrees and better conditions of service offered by other universities (0.469).

The variables of brain drain of lecturers of technical education in colleges of education under factor 3 (respect/prestige factor) include: compulsory moderation of examination questions set by lecturers (0.453), students indiscipline to lecturers (0.541), lack of respect for lecturers of technical education by other colleagues and school management (0.468), respect and prestige accorded university lecturers

by public (0.469) and recognition given to universities as apex institutions (0.575).

Research Question 2

What are the variables enhancing the retention of male and female lecturers of technical education in teaching in colleges of education in Southeastern states Nigeria?

Table 3: Varimax Rotated Variables Enhancing the Retention of Male and Female Lecturers of Technical Education in Teaching in Colleges of Education in Southeastern States, Nigeria

SN	Observed / Variables	Factor 1: Promotion factor	Factor 2: Teaching factor	Factor 3: Welfare. Factor
1	Regular leave and holidays in the school calendar	0.385	0.268	0.228
2	Having less workloads	0.227	0.210	0.107
3	The promotion requirement in colleges of education is cheaper	0.441	0.255	0.283
4	Less hustling and bustling in teaching	0.283	0.575	0.253
5	There are opportunities for private practices/businesses	0.251	0.269	0.230
6	There are no challenges in colleges of education	0.365	0.215	0.050
7	Opportunities for sponsorship for further studies come easily in colleges of education	0.368	0.225	0.435
8	Teaching in colleges of education is pensionable	0.276	0.515	0.250
9	In-service training opportunities	0.257	0.451	0.166
10	Less competition among staff of colleges of education	0.224	0.206	0.541
11	Very easy to make carrier in colleges of education	0.513	0.252	0.104
12	There is fat package for academic staff in colleges of education	0.175	0.266	0.589
13	There is functional association in colleges of education to fight for the interest of academic staff	0.183	0.284	0.399
14	Quick opportunity to get to administrative positions	0.671	0.212	0.291
15	Provision of good offices and accommodation for staff	0.210	0.213	0.211
16	Remuneration is adequate for a normal living	0.262	0.211	0.452
17	Promotion satisfaction	0.413	0.112	0.234

Table 3 presents varimax-rotated principal component factor analysis of variables enhancing the retention of male and female lecturers of technical education in teaching in colleges of education in Southeastern states Nigeria. From the result presented, variables with factor loading of less than 0.40 were discarded.

The naming of each factor was equally adopted in this study to group the variables into three major strategic factors as; promotional, teaching/training and welfare. Promotion enhances the retention of male and female lecturers of technical education in teaching in colleges of education promotion wise in south eastern Nigeria include: the promotion requirements in colleges of education is cheaper (0.441), very easy to make carrier in colleges of education (0.513), quick opportunity to get to administrative positions (0.671), and promotion satisfaction (0.413).

Under factor 2 (teaching/training factor), the identified variables include: less hustling and bustling in teaching (0.575), teaching in colleges of education is pensionable (0.515) and in-service training opportunities (0.451) while the variables for enhancing the retention of male and female lecturers of technical education in teaching in colleges of education under factor 3 (welfare factor) include: less competition among staff of colleges of education (0.541), there is fat package for academic staff in colleges of education (0.589) and remuneration is adequate for a normal living (0.452).

Discussion of Results

This study found that the variables of brain drain of lecturers of technical education in colleges of education emanating within and outside of the college system can be categorized under promotional factor, welfare factor and prestige factor. The variables under these identified factors include: no much challenges in colleges of education, compulsory setting of examination questions with model answers, lack of modern equipment and machines in the colleges, lack of staff offices for lecturers, narrow chances of raising to top position, delay in the payment of promotion arrears, lack of commendation of outstanding lecturers in colleges of education, better conditions of service offered by other universities, respect and prestige accorded university lecturers by public and opportunities for lecturers in the universities to become professors. The findings of this study on the variables of brain drain of lecturers of technical education in colleges of education emanating within and outside of the college system agreed with the findings of Adeagbo (2014) that teachers in secondary schools prefer to change from teaching to other lucrative profession because of some factors such as delay in payment of salaries, welfare and delay in promotion

The study found that the variables that enhance the retention of male and female lecturers of technical education in teaching in colleges of education in Southeastern states under promotional, teaching/ training and welfare factors include: promotion requirement in colleges of education is cheaper, very easy to make carrier in colleges of education, quick opportunity to get to administrative positions, promotion satisfaction, teaching in colleges of education is pensionable, in-service training opportunities, less competition among staff of colleges of education, there is fat package for academic staff in colleges of education

and remuneration is adequate for a normal living.

The findings of the study also agreed with the opinion of Adelabu (2003) that payment of salaries of teachers is not regular and school environment is not conducive for active teaching and learning and facilities in most schools are dilapidated and inadequate. This could be the one of the reasons why teachers are leaving their jobs for another jobs. In a situation where the motivational initiatives that could be used to retain technical teachers on the job in colleges of education are provided for effective teaching and learning of vocational/technical subjects , and sponsoring technical teachers to workshops, trade fair, conferences, and summit in their areas of specialization, embarking on regular retraining of technical teachers, assign to technical teachers responsibilities and others could be put in place to retain technical teachers in post primary schools.

Conclusion

It was concluded from the findings of the study that variables of brain drain of lecturers of technical education in colleges of education emanating from promotion, welfare and prestige factors. Variables that emanate from promotion factor include no more challenges in colleges of education, unfair evaluation of lecturers' performance by the management of the colleges, use of quarries to threaten lecturers, delay in normal promotion of lecturers of technical education, lack of commendation of outstanding lecturers in colleges of education and wit-chanting lecturers of technical education during paper assessment. It was also concluded that emanating variables from welfare factor include compulsory setting of examination questions with model answers, lack of modern equipment and machines in the colleges, lack of staff offices for lecturers and poor quality of facilities provided for teaching technical course. The emanating variables from prestige include compulsory moderation of examination of examination questions set by lecturers, lack of respect for lecturers of technical education by other colleagues and school management, respect and prestige accorded university lecturers by public.

Recommendations

The following recommendations were made based on the findings of the study:

1. The governments and school administrators should maintain a conducive and cooperative environment that could retain lecturers of Colleges of education for smooth running of their programmes
2. The school administrators with the help of governments should make the welfare of lecturers in colleges of education a priority to avoid them leaving for universities and other organisations.

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COMPARATIVE EFFECTIVENESS OF TWO INSTRUCTIONAL STRATEGIES ON PHYSICS STUDENTS' ACADEMIC PERFORMANCE IN OSUN STATE, NIGERIA

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Abstract

The study determined the effectiveness of collaborative and flexible grouping learning strategies in enhancing immediate academic performance of Physics students in Senior Secondary Schools in Osun State. Pre-test, post-test, control quasi-experimental design was adopted for the study. The target study population comprised Senior Secondary School Two (SSS II) Physics students in Osun State, while the study sample comprised three intact classes of 129 Senior Secondary School Two (SSS II) Physics students in Ife East Local Government Area, Osun State. Multistage Sampling Procedure was used to select the sample. Physics Academic Performance Test (PAT) was used to collect data for the study. Data collected were analysed using inferential statistics of ANOVA and Analysis of Covariance (ANCOVA) at 0.05 level of significance. Result from research hypothesis one showed that there was a significant difference in the effectiveness of the strategies in enhancing academic performance in Physics among the students ($F = 9.545$, $p < 0.05$). Result of research hypothesis two showed that there was a significant difference in the effectiveness of the learning strategies in the delayed academic performance of the respondents ($F=13.35$, $p<0.05$). The result however showed that collaborative learning strategy was more effective in enhancing academic performance and delayed academic performances of Physics students than the flexible grouping learning and conventional strategy. It is therefore recommended that policy makers especially the Ministry of Education should try to put forward policies that would encourage adherence to innovative teaching strategies such as collaborative learning strategy in Physics classrooms.

Keywords: Science education, physics, students' academic performance

Introduction

Physics is a branch of science that is centred on matter and its interaction with energy, it is taught at the senior secondary level with the objective of providing basic literacy for functional living in the society; as well as stimulating and enhancing creativity NERDC (2009). With respect to its numerous advantages, Physics is introduced in Nigerian secondary school curriculum so as to provide a solid foundation for everyday living. This will be achieved through adequate teaching and learning with the application of appropriate strategies. The teaching of Physics is also important to develop computational skills and ability to be accurate to a degree relevant to the problem in hand. Physics was also essential to the stimulating and promoting

the creativity of students. (FGN, 2004). To achieve these stated objectives, the onus rest on the teachers to possess adequate pedagogical skills. These pedagogical skills can only be established during teaching/learning process by the teacher. It is then demanded of Physics teachers to begin to;

(i) select the appropriate content based on the use of learners
(ii) select the appropriate instructional materials to make learning meaningful;
(iii) select the appropriate methodology
(iv) select the mode of evaluation so as to test whether the objectives have been accomplished or not.

Despite the effort and ability aimed at enhancing Science and Technology Education in Nigeria, the goals have not been the same with respect to gender. Girls are underachieving and inadequately-represented in Physics as a subject (Ogunleye & Babajide, 2011). This may imply that there exists a gap in the enrolment and performance of male/female students in Physics. Nkwo, Akinbobola and Edinyang (2008) found out that male students achieved higher than girls. Ukwungu (2006) after performing a meta-analysis of gender differences in students' performance in Physics discovered higher success rate in boys than girls. Okwo and Otubah (2007) also reported that boys do better than girls in Physics essay test. On the other hand, Adeoye (2010) reported that females achieved better than males when Physics test items are based on concepts that require learners of low numerical ability while the reverse is the case when the test is based on Physics concepts that require learners of higher numerical ability.

Adequate teaching strategies would be important for the possession, acquisition and application of knowledge learnt in Physics and would enhance full participation of male and female students in Physics. Teachers need to begin to use appropriate strategies needed for the development of a scientifically literate individual. This will first be evident in their learning outcomes in school. When students are taught using adequate skills and strategies, learning outcomes such as students' academic performance, behaviour and delayed academic performances (retention) will be improved. When students' learning outcomes are improved, it then becomes easier to impact on the society as what is learnt is what will be applied. Singh and Mahajan (2017) corroborated this by explaining that Learning outcomes are influencing devices that direct students to the outcomes of the expected course, then they really demonstrate and help teachers understand the path to be followed and make students aware of what they are supposed to learn at the end of the course. This is believed to help map the students' contribution path to society. Unfortunately, this has not been the case in Nigeria.

Students' performance in Physics over the past decade has not been encouraging. Omoifo (2012) explained that there has been a downward trend in students' performance in Physics over the years and

this has however not changed in recent years. The West African Senior School Certificate Examination (WASSCE) Chief Examiners' Reports (WAEC, 2012) showed that candidates' weaknesses in Physics were due to lack of knowledge of the basic concepts, principles, laws and their appropriate applications to solving, analyzing and explaining physical problems. This was also the same problem reported in WAEC Chief Examiners' Report (2018) as students were believed to generally lack understanding of concepts in Physics.

Various findings has revealed fluctuating performances of students in secondary school Physics and the strategies used for teaching might be one of the factors responsible for this, in addition to low level of science process skills exhibited by the candidates. It is expected that teachers select and determine the best strategy that will assist to make teaching and learning effective. This may likely make it possible for the students to effectively learn the way and process of science hence ultimately assist in achieving scientific goals. There are different strategies in science education but one of the key responsibilities of the teachers is to select which is the most effective to achieve learning objectives.

Selecting appropriate teaching strategy for the teaching of Physics is important to prepare students for future endeavours (Zakaria & Iksan, 2007). Teachers' knowledge of appropriate strategy will also depend on the knowledge of the students individual differences. Abubakar and Isyaku (2012) emphasized that teachers and the adoption of teaching strategy are part of the major challenges of Physics education in Nigeria. He stated that lack of competence of teachers in selecting appropriate strategies, unavailability of the right environmental conditions and materials that will help achieve teaching and learning poses great challenge to the actualization and realization of scientific goals especially in Physics. When some of these challenges are alleviated, teachers will be able to employ the use of the right methods and strategies to achieve the goals of learning. Ojediran (2016) emphasized the importance of training of teachers using and selecting appropriate methodology as it was believed that this training will facilitate knowledge and understanding of these teachers in the use of teaching strategies which can help facilitate the needed changes in the society as stipulated by the NUC (National Universities Commission). Furthermore, he added that this training will assist teachers in selecting modern strategies such as cooperative and collaborative strategies that will encourage students to work together in groups, This will ultimately have effects on students learning outcomes since they will have the opportunity to express themselves and share their feelings to one another, thereby making learning meaningful to each member of their respective groups.

One of the modern strategies that might help to improve teaching and learning is the use of Collaborative Learning Strategy

(CLS). This strategy involves the use of small groups to allow students work together and gain from each other (Iji, Ochu, Adikwu & Atamonokhai, 2017). In addition, they observed that the use of collaborative instructional strategies assists students in gaining understanding of concepts in a more meaningful way. It was also seen that collaborative strategy engages the students positively by improving their motivation and team spirit with one another as this will help them retain information for long and also recall and apply this information accurately when the need arises. This depicts that the use of CLS will encourage learners to work together and help each other so as to bring about a holistic and complete academic performance of educational objectives.

Flexible grouping learning strategy is another component of cooperative learning strategy that allows students to work jointly in groups. This strategy is believed to help students improve their learning outcomes. Flexible grouping relates to collaborative learning strategy but at the same time differs in some ways. In flexible grouping, learners are grouped by specific goals of learning, and also, membership changes when the need arises.

In his own findings, Reisner (2008) observed that flexible grouping strategy is mostly applicable to teacher to students' ratio. It permits a class that is lesson specific to individual need and levels of skill of the students. Instructions are also carried out at students' pace, it gives students more opportunity to practice the skills learnt. Several researchers (Ford, 2013; Gary & Chapman, 2002) believe that flexible grouping strategy is better at improving students' performance and meeting students' individual, manipulative, observational and other scientific needs. It brings purposeful opportunities for students to express themselves within their own comfort limit.

Flexible grouping also allows students to work in groups that are mixed differently depending on the goal of the learning task at hand. In this strategy, students break apart once the task is completed (Opitz, 1999). Factors that determine the grouping of students include interests, knowledge or a combination of factors. The group is ever evolving as students are not expected to stuck in a single group from the beginning of the class till the end. Castle, Dentz, and Tortora (2005) sees flexible group as an organizational strategy for the classroom so as to meet a broad range of student needs within a single classroom. The teacher assesses the class before the start of the lesson to define what skills students may need in order to focus on and creates groups to meet the students' individual needs. This makes teaching and learning more effective and enhances academic performance of learning outcomes.

Statement of the Problem

The inclusion of physics education in the curriculum is an essential element in fostering scientific literacy and cultivating critical thinking abilities in students. In the specific context of Osun State, Nigeria, it is imperative to conduct an investigation and

comparative analysis of various instructional strategies to ascertain their efficacy in improving the academic performance of physics students, especially group learning strategies as many studies have confirmed it effective, but the most effective of these strategies is yet to be ascertained.

Given the importance of practical classes in knowledge acquisition, strategies need be explored to improve students learning outcomes particularly in subjects like physics where application of knowledge acquired through classroom interaction is very paramount to immediate and transferred learning. Many strategies have been explored with limited success. This study explores the comparative effectiveness of two strategies in improving Physics Students' Learning Outcomes in Osun State Senior Secondary Schools: hence this study.

This study seeks to assess and compare the results of collaborative and flexible grouping learning strategies in order to ascertain the instructional approach that is more efficacious in promoting meaningful learning experiences and enhancing academic achievements among physics students in Osun State. The outcomes of this research undertaking will make a valuable contribution to the current corpus of knowledge by offering evidence-based suggestions for instructional strategies that can improve the quality of physics education in Osun State. The anticipated outcomes of this study are expected to provide valuable insights for decision-making procedures, offer guidance for educational policies, and ultimately contribute to the facilitation of physics education of exceptional quality that effectively caters to the requirements of students in Osun State.

Purpose of the Study

The specific objectives of the study are to:

i. compare the effectiveness of collaborative and flexible grouping learning strategies in enhancing academic performance of Physics students in Senior Secondary Schools in Osun State; and
ii. compare the effectiveness of collaborative and flexible grouping learning strategies in enhancing academic performances of male and female Physics students in Senior Secondary Schools in Osun State

Research Hypotheses

Based on the objectives of the study, two research hypotheses were formulated at 0.05 level of significance:

Ho_1. There is no significant difference in the post-test scores of students exposed to collaborative and flexible grouping learning strategies in enhancing academic performance of Physics students in Senior Secondary Schools in Osun State.

Ho_2. There is no significant difference in the effectiveness of collaborative and flexible grouping learning strategies

in enhancing academic performance of male and female Physics students in Senior Secondary Schools in Osun State

Methodology

The study adopted a pre-test, post-test, control quasi-experimental design. Three groups were created for the study. The first group (Experimental Group I) was treated with Collaborative strategy while the second group (Experimental Group II) was treated with Flexible Grouping learning strategy, and the third group was taught with the conventional method. The three groups responded to the pre-test which was administered before treatment and also to the post-test and the delayed academic performance test after exposure to the two different treatment conditions. The design for the study is as presented schematically below:

Group I O_1 X_1 O_2 O_3
Collaborative Strategy

Group II O_4 X_2 O_5 O_6
Flexible Grouping Strategy

Group III O_7 X_3 O_8 O_9
Conventional Method

Where:

O_1, O_4, O_7 = Pre-test Observations for Groups I, II and control group (TEM).

O_2, O_5, O_8 = Post-test Observations for Groups I, II and control group (TEM).

O_3, O_6, O_9 = Delayed Academic performance test Observation for Groups I, II and control group (TEM).

X_1 = Treatment using Collaborative Learning Strategy

X_2 = Treatment using Flexible Grouping Learning Strategy

X_3 = Teacher Expository Method.

Targetted study population comprised Senior Secondary School Two (SSS II) Physics students in Osun State. The study sample comprised three intact classes of 129 Senior Secondary School Two (SSS II) Physics students in Ife East Local Government Area Office, Osun State.

Multistage Sampling Procedure was used to select the sample. Out of the three senatorial districts in Osun State, one senatorial district was selected using simple random sampling technique. One Local Government Area was then selected from the selected senatorial district using simple random sampling technique. Senior secondary schools were selected from the selected Local Government Area. Two of the selected schools were randomly assigned to the collaborative and flexible Instructional grouping strategies. Experimental Group I was exposed to the Instructional contents using Collaborative Learning Strategy (CLS) and group II was taught same contents using Flexible instructional Grouping Learning Strategy (FGLS). While the third school students were taught using Teacher Expository Method (TEM).

Physics Academic Achievement Test (PAAT) was used to collect data for the study. PAAT consisted of 25 multiple choice questions. The research instrument

was presented for face and content validation by two experts in Department of Science and Technology Education (STE), Obafemi Awolowo University, Ile-Ife and two experienced Physics teachers in the secondary schools who are seasoned examiners of WAEC and NECO for vetting and corrections. Based on their comments, some of the items in the research instrument were modified in line with their suggestions and remarks.

The instructional package consisted of topics on Equilibrium of Forces, and Simple Harmonic Motion. The central theme of the instructional package was to make the learners actively involved in the lesson delivery process, the pedagogical framework on which the instructional package relied is collaborative and flexible grouping learning, which allows students to work in small groups to complete a given set of tasks, in accordance to the stated objectives of the lessons.

The research procedure consisted of four stages: the pre-treatment, treatment, post-treatment and retention ages respectively. The PAAT was administered to selected students in the three selected schools to ascertain their academic performance in Physics, before the treatments was administered. The treatment stage started two weeks after the pre-test had been administered which lasted for two weeks based on the schools' time table. Experiments were conducted during regular class hours, which consisted of three periods per week (40 minutes each) making a total of 120 minutes weekly for two weeks. The post-treatment stage commenced after the treatment stage was over. The post-test (PAAT) was administered to the three schools, and the scripts were collected for marking, and analysis were then carried out on them. The delayed academic achievement test was later administered two weeks after the post-test was taken to determine their retention ability with the treatments.

The data collected were analysed using inferential statistics of ANOVA and ANCOVA, and tested at 0.05 level of significance.

Results:

Research Hypothesis 1: There is no significant difference in the post test scores of students exposed to collaborative and flexible grouping learning strategies in enhancing immediate academic performance of Physics students in Osun State Senior Secondary Schools

To test the hypothesis, the scores of the respondents to the Physics Academic performance Test (PAT) were collected for the pre-test and post-test and then subjected to Analysis of Covariance (ANCOVA). The pre-test scores acted as covariate to provide a background knowledge on the difference in performance of the students before the treatment was administered and it was shown that no difference exist in the pre-test performance of the respondents ($F= 0.928$, $P > 0.05$). The post-test was then administered after the treatment has been administered to the students. The result of the analysis using the Statistical Package

for Social Sciences (SPSS) is presented in Table 2.

Table 3: ANCOVA Table of the Post test score of the Academic Performance of students exposed to CLS and FGLS and TEM in Osun state secondary schools

Dependent Variable: Academic Performance

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	410.850[a]	3	136.950	7.459	0.000	0.151
Intercept	1191.699	1	1191.699	64.910	0.000	0.340
Pre Test	17.034	1	17.034	0.928	0.337	0.007
Group	350.495	2	175.247	9.545	0.000	0.132
Error	2313.273	126	18.359			
Total	12686.000	130				
Corrected Total	2724.123	129				

a. R Squared = .151 (Adjusted R Squared = .131)

Table 3 showed that $F = 9.545$, $p < 0.05$ for the post-test scores. This implies that a significant difference existed in the effectiveness of Collaborative Learning Strategy, Flexible Grouping Learning Strategy and Teacher Expository Method in enhancing the academic performance of secondary school students in Physics in Osun state. Hence, the null hypothesis that states that there is no significant difference in the effectiveness of collaborative, flexible grouping and teacher expository learning strategies on immediate academic performance of Physics students in Osun State Senior Secondary Schools was rejected. A Partial Eta Squared value of 0.132 showed that the strategies used accounted for 13.2% variation in the performance of the students exposed to the three strategies. Hence, the null hypothesis was rejected. A pairwise comparison in Post- Hoc analysis was then carried out on the three groups to determine the direction of difference in the performance of students in the three groups.

Table 4: Scheffe Post Hoc Comparison on effectiveness of collaborative, flexible grouping and teacher expository learning strategies in immediate academic performance

Dependent Variable: Academic Performance

Scheffe

(I) Group	(J) Group	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval Lower Bound	Upper Bound
CLS	FGLS	3.73*	0.880	0.000	1.55	5.91
	TEM	0.37	0.965	0.928	-2.02	2.77
FGLS	CLS	-3.73*	0.880	0.000	-5.91	-1.55
	TEM	-3.35*	0.944	0.002	-5.69	-1.02

TEM	CLS	-0.37	0.965	0.928	-2.77	2.02
	FGLS	3.35*	0.944	0.002	1.02	5.69

Based on observed means.
The error term is Mean Square(Error) = 18.349
*. The mean difference is significant at the .05 level.

CLS- Collaborative Learning Strategy
FGLS- Flexible Grouping Learning Strategy
TEM- Teacher Expository Method (Control)

The pairwise comparison in Table 3 showed that there is a significant difference in the performance of students exposed to Collaborative Learning Strategy and Flexible Grouping Learning Strategy ($p < 0.05$) with those exposed to Collaborative Learning Strategy performing better than those exposed to Flexible Grouping Learning Strategy with a difference in mean score of 3.73. There was also a significant difference in the performance of those exposed to Flexible Grouping Learning Strategy and Teacher Expository Method ($p<0.05$) as those exposed to Teacher Expository Method also performed better with a mean difference score of 3.35. Those exposed to CLS performed slightly better than those in TEM with a difference in mean score of 0.37.

Research Hypothesis 2: There is no significant difference in the effectiveness of collaborative and flexible grouping learning strategies in enhancing delayed academic performances of male and female Physics students in Osun State Senior Secondary Schools

To test the hypothesis, the scores of the respondents to the delayed academic performance Test were collated and then were subjected to Two-Way ANOVA. The result of the analysis is presented in Table 5

Table 5: TWO-WAY ANOVA Table of the Delayed Academic performance of Male and Female Students Exposed to CLS, FGLS and TEM

Dependent Variable: DA

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	591.999[a]	5	118.400	6.290	0.000	0.202
Intercept	11845.840	1	11845.840	629.282	0.000	0.835
Group	502.532	2	251.266	13.348	0.000	0.177
Sex	11.011	1	11.011	0.585	0.446	0.005
Group * Sex	122.845	2	61.422	3.623	0.042	0.050
Error	2334.224	124	18.824			
Total	14545.000	130				
Corrected Total	2926.223	129				

a. R Squared = .202 (Adjusted R Squared = .170)

Table 5 showed that there was a significant difference in the effectiveness of the learning strategies in enhancing delayed academic performance of the respondents in the study area (F=13.35, p<0.05). It also showed that a significant difference exist in the effectiveness of the strategies on delayed academic performances of male and female Physics students in Osun State Senior Secondary Schools (F=3.623, p<0.05). Hence, the null hypothesis that state that no significant difference exist in the effectiveness of the strategies on delayed academic performances of male and female Physics students in Osun State Senior Secondary Schools was hereby rejected. A partial eta squared value of 0.05 shows that the strategies and sex account for 5 % variation in the scores of the respondents in the study area.

Table 6: Scheffe PostHoc Comparison effectiveness of collaborative, flexible grouping and teacher expository learning strategies on delayed academic performance of male and female students

Dependent Variable: Delayed Academic performance

Scheffe

		Mean			95% Confidence Interval	
(I) Group	(J) Group	Difference (I-J)	Std. Error	Sig.	Lower Bound	Upper Bound
CLS	FGLS	3.98*	0.892	0.000	1.78	6.19
	TEM	0.22	0.978	0.976	-2.21	2.64
FGLS	CLS	-3.98*	0.892	0.000	-6.19	-1.78
	TEM	-3.77*	0.956	0.001	-6.14	-1.40
TEM	CLS	-0.22	0.978	0.976	-2.64	2.21
	FGLS	3.77*	0.956	0.001	1.40	6.14

Based on observed means.

The error term is Mean Square (Error) = 18.824.

*. The mean difference is significant at the .05 level.

There is a significant difference in the delayed academic performance of students exposed to Collaborative Learning Strategy and Flexible Grouping Learning Strategy (p<0.05) with those exposed to Collaborative Learning Strategy having a better delayed academic performance than those exposed to FGLS with a mean score of 3.98. There was also a significant difference in the delayed academic performance of students exposed to Flexible Grouping Learning Strategy and Teacher Expository Method (p<0.05) as those exposed to Teacher Expository Method also have a better delayed academic performance with a mean difference score of 3.77.

Discussion

The study sought to investigate the effectiveness of collaborative, flexible grouping and teacher expository strategies in enhancing Physics students learning outcomes. In order to achieve this study, two objectives were raised, from which three research hypotheses were generated and tested.

Result from research hypothesis one showed that there is a significant difference in the effectiveness of Collaborative Learning Strategy, Flexible Grouping Learning Strategy and Teacher Expository Method in enhancing academic performance in Physics among the students. The result revealed that those exposed to Collaborative Learning Strategy had better performance than those exposed to Flexible Grouping Learning Strategy, while those exposed to Teacher Expository Method also performed better than those exposed to Flexible Grouping Learning Strategy. This result is consistent with that of Backer, Miller and Timmer (2018) who found that the use of collaborative learning strategy improves students' academic performance in science subjects in the United State.

Whereas, McKeen (2019) found that flexible grouping strategy has no direct influence on the academic performance of students in science related subjects in Georgia. Estébanez (2016) explained that students exposed to collaborative learning strategy performed better than those exposed to teachers' method because collaborative learning strategies help students acquire deeper understanding of the subject matter. Also, Kalhotra (2015) found that the use of teacher expository method could improve students' performance compared to flexible grouping. Flexible grouping learning strategy takes time for successful implementation, this may have affected the academic performance of students and also collaboration in groups may be uneven, that is one may have been grouped with with a person who may have contributed little effort (Kalhotra (2015).

Result to research hypothesis two showed that there was a significant difference in the effectiveness of the learning strategies in the delayed academic achievement of the respondents. A significant difference exist in the effectiveness of the strategies on delayed academic achievement of male and female Physics students. Also, the result showed that those exposed to Collaborative Learning Strategy had better performance than those exposed to Flexible Grouping Learning Strategy, while those exposed to Teacher Expository Method also performed better than those exposed to Flexible Grouping Learning Strategy. The result found no significant difference in the effectiveness of those exposed to Collaborative Learning Strategy and Teacher Expository Method. This finding is consistent with that of Tran (2014), who in their research among students in Vietnam found that collaborative learning strategy was effective in the academic achievement as well as delayed academic performance of students, compared to other strategies.

Moore (2008) and Sahin (2010) studies on this same subject matter also supported this findings. In addition, Auwal (2013) in his study in Nigeria found that students exposed to teacher expository method had better performance as well as in delayed academic performance. On the sex difference, Gbenga and Effiong (2015) in their research among Nigerian students found that there is no significant difference in students' academic performance in

science on the basis of sex. However, when these strategies were used, those exposed to collaborative learning performed better than those exposed to other methods of teaching (McKeen, 2019).

Conclusion

The study concluded that collaborative learning strategy was more effective in enhancing academic performance and delayed academic achievement of Physics students than the flexible grouping learning. It was also shown that the strategies used in the study have significant effectiveness in enhancing delayed academic achievement of male and female Physics students as students are exposed to collaborative learning strategy had a better delayed academic achievement than those exposed to flexible grouping learning strategy.

Recommendations

Based on the findings of the study, it was recommended that students:

should be encouraged in the use of collaborative learning strategy in improving their academic achievement.

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DIGITAL MENTORING: A THERAPY FOR GOOD TEACHING AND BAD TEACHING

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Abstract

There is high unemployment in Nigeria and regrettably graduate teachers are also involved. Scholars have proffered as solution, funding by government, change in students' attitude and review or scrapping of outdated curriculum. These do not appear to suffice as the challenges remain prevalent. This study used secondary sources of information based on teaching and challenges of unemployment and proposed a solution that could possibly reduce malaise especially among graduate teachers. The idea of digital mentoring was considered alongside the benefits that are derivable from its application. The innovation to utilize technology to promote lifelong learning by digital mentoring is expected to assist in reducing underemployment and unemployment when adopted. Recommendations were made regarding the establishment of a teaching space by tertiary institutions for graduate teachers to interact on career growth after schooling rather than making them resign to fate after graduation.

Keywords: Digital mentoring, tertiary institutions, teaching, education, unemployment

Introduction

A fragment of the concern of the problem of unemployment is the teaching that mentees and learners get while they are in school or under apprenticeship. The worth of the teaching defines the result that the students possibly exhibit after training. If the quality of the teaching is good enough, it is expected to also produce good results and if the teaching is considered bad, the result is anticipated to be bad also in most circumstances.

The high unemployment rate in Nigeria, the challenges of youths becoming redundant after investing several years in the university classroom and the frustration they receive after graduation call for a review of the teaching methods currently in use in our present day society. Unemployment rate was reported as 27.1% in the second quarter of year 2020 and for the same period, the unemployment rate of 34.9% was reported for age 15-35 by the National Bureau of Statistics (NBS, 2020). That jobless rate was higher than the report of 2016 by the same bureau (NBS 2016).

Consequent upon the problematic nature of underemployment and unemployment in the society, there is a need to strategize

and utilize technology to promote lifelong learning through digital mentoring. Digital Mentoring has to do with the support people receive to build their confidence and skills in digital technology. It is about inspiring people to use digital technology for support through the use of computers, mobile devices and the internet. Contemporary societies faced with youth unemployment and career are being tasked to deliberately explore digital mentoring for reinforcement of the teaching and learning process. This is because scholars, both past and present, have continued to review ideas on how to provide answers to the unending issues of unemployment in Nigeria (Oke & Fabamise, 2018). However, having the knowledge-based skills that are devoid of physical representation of what such cognate skill could demonstrate has been shown to be a disadvantage to the society.

The high turnout of graduates yearly by various institutions of learning and the challenges of such a vast number of promising individuals ending up as jobless or underemployed citizens, underscore the need to rebuke such trainings that do not meet with the expectations of those who are supposed to profit by it. When such concentrated expectations and hope of learners becoming gainfully employed and self-reliant after graduation fails, it has worked contrary to their initial ambition of going to school. If one of the goals of tertiary education as stated in the National Policy on Education include contribution to national development, reduction of skill shortages (FGN,2014) is anything to go by, then understanding the challenges of skill shortages and management as they currently apply to Nigeria could assist in solving the high rate of unemployment in our society. It is time to be more proactive by making concerted effort to move away from bare classroom knowledge-based skills to a technologically adaptive and innovative education landscape in the nation. The time is ripe to ruminate on digital mentoring for adoption as a collaborative strategy for a revitalized classroom that can consolidate good teaching and ease out bad teaching for better results in our 21st century society.

When these challenges are resolved and a new future is chatted for education to accommodate digital mentoring, the increasing cases of insecurity, youths associated vices and instability in the socio-economic environment of our nation would have been addressed as a panacea for independence of the youths to accomplish self-reliance.

Literature Review

Teaching as a professional practice in Nigeria education needs new and innovative approaches that are amenable to global practices that can improve the current teaching experience in the country for the better. The 21st Century is replete with great changes in the teaching procedures globally and the realities of innovative ideas, redefining or modifying the traditional methods as inadequate cannot be over emphasised.

Observations in the society have given credence to the fact that leaving the students after teaching without equipping them with relevant information that can help them combat unemployment or underemployment leaves much to be desired. Mentoring in teaching is about indoctrination on teaching methods that are effective and applicable even after school.

Contemporary mentoring has gone beyond face to face classroom interaction to virtual or classrooms without walls in order to effectively tackle the difficulty of space, population, distance and individual differences among learners. Mentoring therefore, is the assistance an authority renders in guiding a learner or mentee to gain skills and directions for life and career. The mentor makes use of information and experiences at his disposal to model and shapen the mentee into moving along a desired or defined goal set to benefit him and humanity at large. Thus, digital mentoring grows and develops a learner through a stimulating trajectories of practice to build on satisfying career experience.

Good Teaching Bad Teaching

Teaching can be good or bad (Micheal, 2006). At the inception of the national policy on education document, it was stated as part of the objectives of teaching in tertiary education that learners are expected to develop skills that could enable them to be self-reliant and have knowledge based understanding that will make them useful to the society (FGN, 2004). Thus, the problem of underemployment and unemployment in Nigeria is an indicator that the anticipated results are lacking two decades after the policy has been publicized. A holistic framework that is germane is to ensure that the aim of self-reliance by the learners is achieved through pragmatic teaching programmes. Consequently, the need for the tertiary institutions to explore digital mentoring platforms as an alternative pathway for boosting teaching as a vocation becomes sacrosanct. A research on the enrolment and unemployment carried out between 1980 and 2014 appeals to how the curriculum in Universities are drawn and revealed that a relationship exists between enrolments in the institutions and unemployment due to pitiable curriculum (Dang, 2015). Other areas captured included the poor funding by government which truncates the efficiency of the skills learned by students. Where the skills are good enough to stimulate the likelihood of becoming self-reliant the issue of underfunding precludes them from displaying their potentials to the fullest. Some of the recommendations made in the past were that, government should increase funding, students should get more serious with their course work, the curriculum should be reevaluated and the need to resolve parental issues.

However, sustainability of tutoring the students was conspicuously omitted in the study. As institutions continue to lay claim on those that are succeeding in their careers, there is also a counter balancing need to factor in those who have been

made pedestrian as products of the cognate institutions. The implication is that the tree of teaching as a career or vocation is producing both good and bad fruits unabated. Then, there are such questions that require answers like; who takes responsibility for the unskilled graduates, is it the government, society, the tertiary institutions or the learners? The global reengineering of the education sector is on and we cannot afford to be left out hence, there is an urgent need for mindful mentoring in education to usher in the next century educators.

Role of Mentoring in the Society

Scholars have emphasized that in education, mentoring programs had assisted in career development (Muschallik & Pull, 2015). In this regard, emphasis was laid on tertiary institutions where youthful people who engaged in research were supported by more experienced hands. Stan Koki (202?) opined that for mentorship to be purposeful, the function of mentoring should be accepted as inclusive of involvedness, procedure and function for pragmatic effectiveness. As our contemporary world evolves, the idea of electronic mentoring had come into perspectives and scholars are identifying the stages that should be involved (Hamilton & Scandura, 2003). A three phase model was considered as namely, initiation, cultivation and separation. The model clarified the purpose, the ideas to be initiated, specific steps for implementation and assessment in summary. E- Mentoring as termed in the research, is more relevant in the post Covid-19 society and could be applied to diverse platforms and media networks.

In another research, the role of digital literacy mentoring among post graduate students in tertiary institution was appraised (Elena, Oxana, & Anna, 2020). It was justified that librarians play a role in mentoring digital literacy among PhD students. However, the assertion should not be generalized because it was done in a more organized nation. Hence, where there are issues of redundancy in work place, post graduate students might have to learn the route.

Idleness is an insignia of ache in the labour market and the higher the percentage, the higher the distress in any nation. The initiatives of government about promoting some mentorship for the unemployed seems not to have provided the result that can be regarded as impactful. The study of Odia and Odia (2013) highlighted that the government of Nigeria has promoted agenda for graduates, unemployed in different shapes or names as Youwin and graduate internship. Despite all these and new programs including anchor borrower and National Youth Service Corps (NYSC) entrepreneurship programs, the need to create substitutes still exist because the number of graduates coming out of tertiary institutions yearly surpasses the jobs available. One of the reasons for this is that there are skill mismatch that make a lot of people jostle for few vacancies.

The concern of these up and coming Nigerians is how such a disorder and

national embarrassment can be stemmed or eradicated. The enthusiasm to provide answers should be rooted in a thorough and sincere collation of sufficient information on saleable skills needed in the labour market and resolve the areas of conflict. Thus, experts in the private sector, government organizations and the academics need to cooperate and collaborate on how to resolve training mismatches and boost skill deficits.

Current Realities for Digital Mentoring

The current realities in present day Nigeria show unequivocally that various mentoring programs by government to decipher the issue of unemployment has not yielded satisfactory results. This clearly shows that there are some inherent inadequacies in the vision, planning, implementation and performance of the programmes despite colossal funding. Nigerian Institute of Social and Economic Research reported that several years after students graduate, there are still about 20 percent of them that are jobless (NISER, 2013). The effect of spending four to five years in school without any assurance of job placement after graduation, is demoralizing to the youths. The situation is redeemable if the opportunity offered by the current redundancy is seized and utilised for career guidance and interaction that are blended with technological creativities. Statistics have shown that the population of the youth that are attached to technology is high hence, they are not supposed to suffer the magnitude of redundancy they are experiencing now. They are the 'digital natives' who are more at home communicating with modern tools (Prensky, 2001). This is the most appropriate time to leverage on the advantage going by the validation of National Bureau of Statistics on the increasing importance of mobile technologies in Nigeria with here enormous population size and the need to take advantage of the innovation. According to the report, over 144 million Nigerians are on voice usage alone as far back as 2017. (NBS, 2018).

This communication option therefore can justify the need to give attention to the use of mobile technologies for mentoring purposes.

Methodology

Secondary data were used for this study. Teaching limitations and strategies of earlier works were identified. In addition, Information from books and germane facts were incorporated. Findings from the secondary data elicited the fact that the education system has hitherto promoted a teaching programme that has not produced the desired result of enhancing tutoring in career choice and life realities.

Results

Findings from previous studies showed that teaching could produce either good or bad results. In order to resolve the challenges of good and bad teaching, there is a need for the adoption of a lifelong learning through digital mentoring. Technological devices such as computers, mobile phones and devices

could still be used to follow up on impartation of valuable guidance to students especially when such graduate students are lacking gainful occupation after graduation. Expectedly, the experience shared by the tutors should be geared towards influencing and motivating the learners in getting practical solutions to their individual career problems through digital interactions. Consequently, such a liberal, innovative but inclusive platform can encourage the learners to contribute ideas that are potent and challenging to boost their redundant career. Assurance of internet connectivity and availability of technological applications as WhatsApp, YouTube, Zoom, Padlet among others need to be guaranteed. It is possible to provide a mutual but lifelong teaching space of value to the mentors and mentees. In this case, the teacher and the hypothetical ex-students are at liberty to redress precarious situations in their careers.

Discussion

Use of technology in all the spheres of human endeavour is what is commended to the global community especially the youths. Adopting pragmatic innovations that can transmit solutions to graduate unemployment or redundancy which have majorly bedeviled the youth population of the country can create a snowball effect on the resolution of the present hopeless and restive challenges of youth survival. It is high time stakeholders in education sector realized that teaching without follow-ups is not enough to serve as impetus for self-reliance. It is needless emphasizing the fact that, lack of career guidance for real life situation makes cognitive skills learnt within the four walls of citadels of learning questionable.

Recommendations

This paper reviewed works on teaching as a vocation and the situation of high unemployment of graduates turned out of our institutions of higher learning. The reviews and findings prompted the following recommendations as appropriate for enhancing enduring results that can improve our present societal conditions. It was recommended that:

i. the novelty of using digital mentoring in education and after graduation would negate the present loss of direction of learners in knowing essential pathways to follow when jobs are not yet available.
ii. the use of internet connectivity and mobile devices should be made available and affordable for access, information gathering, storage and retrieval .
iii. digital mentoring should be made to promote the goals of continuous mentoring of ex-students or learners until they become useful members of the society.
iv. digital mentoring for improvement of teaching results needs to be given priority consideration.
v. there is a pressing need for teaching to be taken away from total reliance on theoretical postulations from classroom walls through the provision of lifelong

teaching programmes for the youths.

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TEACHING AND LEARNING OF WOODWORK TRADES IN NIGERIAN TECHNICAL COLLEGES USING VIDEOTAPED INSTRUCTIONAL PACKAGE

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Abstract

This study deals with teaching and learning of woodwork trades in Nigerian Technical colleges using video-taped instructional strategies. This study emphasizes the Origin of woodwork trades, teaching and learning of woodwork trades in technical colleges, problems confronting the teaching and learning of woodwork trades in technical colleges, the place of videotaped instructional package on skill impartation in woodwork and the level of learning outcome on the use of videotaped instructional package in woodwork skill acquisition and impartation. It is therefore recommended that government, instructors and researchers at all level should create more interest on the use of educational technology by producing video – tape instructional package not only in imparting skills in woodwork trade, but to also see it as one of the most effective methods of teaching and learning in technical colleges.

Keywords: Teaching and learning, woodwork trade, videotaped, technical colleges, instructional packages.

Introduction

Woodwork technology skills are often imparted on students using: lecture method, project method, demonstration and field trip method. These methods are commonly used because woodwork requires the use of technical skills that will enable students themselves perform effectively based on the appropriate utilization of tools, equipment and proper maintenance for effective workshop practice (Eze, 2006). Also, instructors adopt these methods because they feel to the best of their knowledge, can help the students obtain effective communication and good results (Hamza, 2010).

Assessment of students' perfomance based on the use of any teaching methods for communication according to Jamiesen (2013) would result in either high grade or low grade. The scholar further stated that effective transfer of knowledge in teaching and learning is salient in human life, without which life will be totally meaningless. Since literacy is the goal of a teacher, a free flow of transfer of information between the teacher and learners through the use of videotaped instructional package with conventional method may be considered necessary by the instructors. Instructions from the teachers can then be encoded from signals, decoded and received by the

students for effective utilization of knowledge. Wood (2009) emphasized on communication as most important aspect of teaching and learning process. Thus the transmitted message could be received and interpreted (decoded) based on the receiver's field of study.

In order to alleviate the problems of poor teaching method, lack of professionally competence of vocational instructors, inadequate time allotted for teaching of woodwork practical, students poor attitudes towards vocational subjects and the lack of conducive environment, adoption of videotaped instructional package for Woodwork skill acquisition in technical colleges is suggested. This is because videotaped instruction can give room for skills acquisition at trainee's pace. In addition, it could make teaching and learning real and facilitate playback when required (Ajelabi, 2005).

Origin of Woodwork Trades

Woodwork as a trade is also referred to as skill of making items from wood. The operations in the trade include: furniture making, wood carving, wood turning, carpentry and joinery. Skill acquisition in woodwork trades can only be guaranteed if appropriate method is adopted in the training (Goli, 2002). Woodwork Trades can be seen as one of the branches of vocational courses and foundation of technical education curriculum. The origin of woodwork. dates back to the beginning of human communities. Thus it is a trade that existed in traditional forms of vocational education and allows people to work for their survival practically within family circles. Under indigenous system or traditional vocational education, the Nigerian child was taught various skills like carpentry and joinery, weaving, sculpturing, blacksmithing, carving, farming, fishing, cattle rearing, hair plaiting, dress making, bead weaving, leather work, pottery, brick making, among others (Fafunwa, 1995).

During the colonial era in Nigeria, vocational education was not accorded a worthwhile recognition by the missionary school system. The British Education literacy spread widely almost hundred years in Nigeria and led to reading classics: Latin, Greek and Milton by the educated people. Most of Nigeria's early scholars were well known for their educational development leading to effective learning (Fafunwa, 1995). In the light of this, vocational education institutions had a very unpopular beginning in Nigeria; it was not given an overwhelming official recognition as was accorded grammar school education (Okoro, 1993). The unfortunate situation on the influence of missionary educators gave opportunity for the training of catechists and clerks. The vocational skill training began in formal education curriculum in 1909 when some forms of vocational education programmes like carpentry and joinery, bricklaying, auto mechanics, weaving and others were introduced in Nigeria. During this time, Nasarawa school was opened in 1909 in the North and the technical wings attached to it were leatherwork, carpentry, smiting, weaving and book binding.The apprenticeship programmes then consisted of a number of five parts; hence,

an apprentice was expected to demonstrate their skills and prove their occupational competence during training before they could be awarded apprenticeship certificate. In case of the apprenticeship programme organized in the school setting under entrepreneurship studies, the skills imparted are not enough.

In 1925, a memorandum on education policy by the British Tropical Africa was issued. The policy statement mandated the government to take more active parts in the vocational courses with the provision of tools, equipment and some qualified staff (Nduka, 1982). In the process, trade centres were established in 1934 beginning with Yaba Higher College (Okoro, 1993 and Imarhiegbe, 2003). The establishment of Yaba Higher College gave lots of motivation and courage to start enrolment with the basic facilities available for the programmes. Hence, engineering and Agriculture were offered to the first set of students (Rayan and Unwin, 2001). The conventional methods adopted in teaching the students include: lecture method, project method and field trip method.

In lecture methods, the instructors were to demonstrate some practical skilla while the learners were to view and later practise the observable behaviours of the teachers in actualizing the practical skills to instructors' stated objectives .Hence, the Instructors' role was to evaluate the performance of the learners based on the stated objectives. The evaluation thus, showed how effective the teaching method was.

Project method was meant to assign learners into groups under the supervision of the teachers and the workshop attendance with the aim of carrying out a specified job. Learners were divided into sub-groups depending on the available space in the workshop. The use of basic tools was necessary for the project before achieving the expected skills to be acquired.

Field trips method was carried out outside the school workshop. Instructors and the craft men were to lead the learners to appropriate industries or schools that are well equipped with adequate tools, materials and equipment; while the workshop attendant were to supply the required tools needed for the students. The performances of the students who were properly guided by professional instructors were always encouraging.

Teaching and Learning of Woodwork Trades in Technical Colleges for Skills Acquisition

Woodwork trade is one of the essential trades of vocational and technical education. It requires the acquisition of practical skills with the use of wood for human needs in the vocations such as construction work, packaging and educational materials. Woodwork trades according to Agbo (2000), are types of training set to prepare the students' mind to earn a living in a related field depending largely on application of modern technology and design. According to Okoro (2000), woodwork trade is an integral part of building construction that provides skills, knowledge and attitudes

for effective occupation. In achieving this, adequate workshop is required. The basic projection for a small workshop organization recommended 20 students per one teacher at a time, and if more than 20 students then, medium workshop is required.

Teaching of woodwork trades in technical colleges depends on: the available competent instructors; appropriate teaching method and facilities like tools and equipment for carrying out practical in Wood workshops. Most schools adopt conventional method like project and field trip in teaching students, while those that are fairly equipped adopt lecture method and demonstration methods. According to Adewumi (2009), availability of competent instructors is important no matter what materials, tools and equipment on ground to transfer vocational guidance and skills to the trainees. The instructors should be well-trained in relevant skills and the use of basic facilities, portable powered tools and machines.

Wood workers are generally professional instructors, they are regarded as experienced wood workers because must have served for many years. Since instructors are expected to impact adequate skill on learners, students should be able to demonstrate skills acquired during the workshop practices. The term skill could be defined as the level of efficiency achieved or attained through repetitive performance of an operation. Ezeji (2003) referred to skill as organized way of carrying out activities in a sequential order with potentiality or required ability with moderate cost for the attainment of good performance. For learners to be sound in woodwork practices, constant practice is required. Several methods of instruction could also be used to teach them. However, demonstration method could be seen as one of the best methods in the teaching and learning of woodwork. The use of Videotaped instruction could also be adopted with demonstration method to make acquisition of skill in woodwork more meaningful.

The best method to be used at any time is the method that impacts the necessary skills and abilities more than others. This means that woodwork skill acquisition practice are better achieved through activities or experiments demonstrated by the instructors after given due considerations to the facilities available on ground and students' ability (Ayegbusi; 2001).As supported by Uzoeachi (2007), the effective transfer of knowledge can only be achieved when students learn by practice.

Sufficient impartation of adequate skills by the woodwork instructors on students is necessary before the students can demonstrate the skills. Contrary to this submission, observation shows that the standard of performance of Nigerian technical college graduates, in general is very low, thereby retarding the overall productivity of Nigerian economy (Okorie; 2001). Ogundeji (2012) also observed that the problem affecting Trades Centre in Nigeria is that of production of unskilled technical personnel who cannot function

effectively well in imparting adequate skills in teaching and learning situation. As a result of this deficiency, the performance of trainees is found not encouraging based on the fact that technical college instructors are not sound enough in transferring adequate skill to the students in their various schools Oranu (2001).

In a comparative study on achievement of fortieth grade students taught by demonstration method with that of students taught by viewing and listening in other subjects like chemistry, Nwachukwu (1992) found that there was no significant difference in the performance of students in the three groups. The author expressed that students' achievement in the set objectives depend on: the methods adopted and the material resources used by the instructor in disseminating the instruction.

Consequently, some scholars have showcased the importance of videotaped instructional strategy. For example, in a study on explanatory use of videotaped instructional package in teacher's education, Gareth (1998) stated that videotaped instructional package was used on one hundred (100) students from five Colleges in Lusaka. The scholar found out that students exposed to videotaped instructional package performed significantly better than those exposed to lecture method. Also, in a study on effect of videotaped instructional package on secondary school achievement in creative design, the result of the study revealed that students taught with videotaped instructional package achieved better than those taught with the lecture method (Osokoya; 2007). Therefore it is assumed that the use of videotaped instructional package is indispensable in teaching and learning situation and that it could be a supplement to other teaching method adopted in all technical colleges in Ekiti State. Most of the researches conducted on multi – media package by researchers have proved that videotaped instructional package has high potential in teaching and learning situation. Thus it can multiply and widen the channels for communication between the teacher and the students.

Problems Confronting the Teaching and Learning of Woodwork Trades in Technical Colleges in Nigeria

The existing problems that militate against the effective teaching of woodwork trades in technical colleges are: poor teaching method, lack of professionally qualified instructor, inadequate time allotted for the lesson, students' attitude towards vocational subjects and the environment.

- Inadequate time allotted to the lesson: Time allotted to each vocational subjects in technical colleges is too small, comparing with general subjects like English language and mathematics. According to Oranu (2000), five periods per week should be allocated to teach each vocational subject so that there will be effective transfer of adequate skills. In some schools and colleges, the period allotted to each subject is not up to four periods. The number of periods allotted to teach liberal Arts subjects are the same as

vocational subjects which should not be so. Akaninwor (2001) posited that one of the aims of vocational education in the school and colleges is preparation of individual learners to earn a living by acquiring adequate skills and habits that can make them self-reliant after graduation. The essence is to make them employable immediately after graduation. Nevertheless, the small limited time allowed for technical courses makes it difficult for the course to achieve the full vocational status.

- Lack of professionally competent vocational instructor: Some woodwork instructors in various technical colleges are not competent in their related field Oranu (2001). Some of the vocational instructors cannot effectively perform the essential functions and the required activities. Rather than this, they teach the theoretical aspect of their subjects. that results in poor performance of the students. Okoro (1993) said that the major purpose of vocational education is not to give certificate, but to train skilled workers who can function well in their place of employment. Vocational instructors according to Olaniyan (2001), are not competent because they lack necessary qualifications and do not understand the subjects matter to impart on the students. Also, Sara (2000) criticized that the available high level paper-qualification vocational instructors in tertiary institutions could not perform the skills or provide technical services they were expected to render to their students.

- Lack of using appropriate teaching method: Olumese (2004) pointed out that teaching is a gradual process that makes learning very easy in a teaching learning situation. Therefore, for effective teaching of woodwork technology to be actualized, teachers need to interact with their immediate teaching environment. The scholar further observed that some instructors adopt methods without studying the contents of the instruction.

- Students' attitudes towards vocational subjects: The students look at vocational courses as education for drop-outs. According to Riddell (2008), attitude is a complex word but the students' directions and feelings can be reflected through their reactions and characteristics. Some woodwork students feel that they are being looked down upon by others because of the course they pursue. Hence generally speaking, students who offer vocational subjects in technical colleges are very few (Ozioma, 2011)

The Place of Video – Tape Instructional Package on Woodwork Learning Skill Acquisition

Videotape is an electronic – mechanical device that mostly appeal to sense of hearing and seeing at the same time. Videotaped instruction is seen as one of the most effective methods of communication in teaching and learning process (Ergin; 2007). Also, Nzewi (2003) reported that videotaped instructional package has more advantage over conventional method of teaching because it can help aid retaining and recalling memory assurance. Agommuoh (2003) considered video-taped instructional package as a useful media tools that has a high quality with increased potential in students' learning habit. The use of Audio – Visual Aids in teaching and learning are universal in most of the schools and colleges in developed nations

In under developed nation like Nigeria, very few schools and colleges rely on Videotaped instructional package. They are more conversant with using videotaped instruction in JAMB and the University Post UTME for students seeking admission into the university. In a study by Durbin (2002), computer and the internet were used as teaching tools in a geography class Hence, an increase in the students' achievement rates and knowledge acquisition was observed. Akgun (2007) also reported that VTI has shown positive effect on the academic achievement of students in chemistry. Notwithstanding, vocational courses have been left behind in the use of video – tape instructional package in teaching and learning in Nigerian technical colleges.

Niger Republic employed education television instruction to tackle the problem of shortage of teacher. In order to make this a reality, government, instructors and researchers at all levels should create more interest on the use of educational television by producing video-taped instructional package in vocational subjects. Hence the utilization of video-taped instruction will help achieve the following:

- giving learners / trainees opportunity to learn at their own pace, rate and convenience,
- helping them to assimilate with ease, based on the greater percentage of what they hear, see and manipulate,
- helps instructors and students to learn and teach more quickly and combine active learning with computer technology,
- aiding authentic technological growth in the society thereby improving the economic status of both individual and the entire State,
- helps to ensure quality assurance when working techniques are mastered and adequately utilized especially in vocational skill acquisition.

Level of learning outcome on the Use of video-taped instructional package in Woodwork Skills Acquisition Learning

Personal observation has shown that studies on the use of video-taped instructional package in woodwork vocation are not widely carried out in

Nigeria. Notwithstanding some of the studies carried out on the use of video-taped instruction for impartation of skills yielded positive outcomes. For example, according to Osokoya (2007), the videotaped instructional package mediated instruction was adopted in teaching of secondary school students on creative design, such as fine Arts and Weaving.

The result of the study revealed that students taught with videotaped instructional package achieved better than those taught with the lecture method. In support of Osokoya (2007), Akgun (2007) was of the opinion that effect of televised instruction on the academic achievement of learners in chemistry is more encouraging that students exposed to lecture method group.

Conclusion and Recommendations

Literature review in this study has shown that the choice of videotaped instructional package is effective in the teaching and learning of woodwork. Based on the findings, videotaped instructional package could be recommended for use in teaching and learning of Woodwork. The adoption of videotaped instructional package will help learners to develop learners' knowledge towards woodwork skills acquisition, thereby increasing the level of learning outcome. Also, government, instructors and researchers at all levels should create more interest on the use of educational television by producing video – tape instructional package on each subject for use in imparting skills on the learners in Nigeria technical colleges..

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DEVELOPMENT EDUCATION AND SCIENCE EDUCATION UNDERGRADUATES' PERCEPTIONS OF SUSTAINABLE DEVELOPMENT IN NIGERIA

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A*bstract*

Amidst contemporary issues are social and economic crises across the globe which calls for the attention of institutions of higher learning to provide undergraduates with competence to contribute and promote the quality of life through development activities for the benefits of both present and future generations. The study examined the influence of development education on undergraduates' perception of sustainable development. Descriptive research design of the survey type was adopted by the study. The population comprised all the undergraduates of the Department of Science Education, Faculty of Education, Ekiti State University, Ado Ekiti, Nigeria. The sample was 120 undergraduates from the Department who were purposively selected for the study. The instrument used for the study was a questionnaire. which was validated by experts in the Faculty of Education, Ekiti State University, Ado Ekiti. The reliability coefficient was determined using test re-test method and a coefficient of 0.88 was obtained. Frequency, percentages and mean were used to answer the research questions while the inferential statistics of Pearson's Product Moment Correlation was used to test the hypothesis at 0.05 level of significance. The study revealed that Development Education is not taught in the institution under study. It was also showed that Development Education influences Science Education undergraduates' perceptions of Sustainable Development. Based on the findings of the study, it was recommended that development education should be included in the curriculum and be made compulsory for all students due to its potential to inculcate in students, development literacy and to enhance quality decision making process for healthy society and sustainable development.

Keywords: Perception, environmental education, development education, undergraduates, sustainable development

Introduction

Development globally is expected to be directed towards sustainability. No doubt, uncultured development may not be good enough to meet the so desired sustainable development. It has generally been acknowledged that education plays a major role in the development of nations/societies. Specifically, higher education is expected to play multiple roles in the nation development. Awu

(2021) explain that traditionally, higher education has been assigned multiple roles to; produce human capital for national development, widen access, provide citizen education, drive national socio inclusion policies, develop the agricultural sector, mining, health, women emancipation and gender equality, national defense, the lower educational cycles and many other sectors through embodied knowledge, research, training and capacity building. Thus, development education is pertinent in familiarizing the people with the best practices in development processes most importantly at the higher institutions of learning. Educating undergraduates will go a long way in informing their perception of sustainable development and enhancing local peace, gender equity and justice with respect for culture and human diversity.

The United Nations (UN) submitted that Development Education has a major dimension to enable people to participate in the development of their community. The 17 Sustainable Development Goals are integrated which recognize that action in one area will affect outcomes in others and that development must balance social, economic and environmental sustainability.

According to UN (2015), education "by 2030 ensures that all learners acquire the knowledge and skills needed to promote Sustainable Development through education for Sustainable Development". Expectantly, by 2030, the threatening global issues relating to gender issues, cultural and human diversity, local and global peace and security, equity and justice could have been reasonably addressed. Development Education therefore, could facilitate the achievement of this global goals.

Noddings (1997) opines that a "morally defensible aim of education should be to encourage the growth of competent, caring, loving and lovable people; "social responsibility, social change and social justice are key goals of education". Development Education (DE) enables the actualization of the human and societal dimensions mentioned by the above scholars, hence, the knowledge of DE could initiate the perceptions of undergraduates to promote human and social lives.

Elizabeth (2011) emphasized that poverty reduction depends on the knowledge and skills that people acquired, not the number of years that they sit in a class room and that Development Education prepares learners' minds to adopt societal friendly behavior and sustainable life styles that will drive their employability, productivity, health and well-being and also ensure that their communities and nations strive. The development that will enhance peace, equity and justice would be channeled towards education to enable the people acquire all relevant knowledge that are required. Development Education links teaching and learning to everyday life. Wintere, (2018) emphasized that it helps students to learn to interact with others, learn to apply knowledge in real-life situations, it sensitizes students on how to utilize the knowledge they acquired in

future professions and promote self-directed learning.

Communities of people across the globe should be able to meet their needs and improve their living conditions through necessary awareness on self-discovery, capacity building and problem solving without any hindrance to future generations to meet their own needs. This is what scholars referred to as "sustainable community development or sustainable national development" Aruma (2009) and Aruma & Uzoagu (2018). Development Education promotes self-discovery, capacity building, problem solving, hard work, community collaboration and participation among people.

According to Ugwuzor (2016), people need to know the reasons they should participate in community development projects and the benefits thereafter since their consciousness, enthusiasm and zeal need to be awakened and sustained in order for the development project to be effective in the society. Development Education unravels the reasons for and the benefits in community development projects, therefore it awakens the consciousness, enthusiasm and zeal of individuals in society.

Perceptions are personal constructs which form the bases of individuals' beliefs, which may be the foundation of ones' action. Shepiro, (1991) and Green, (2014) assert that people operate by developing personal constructs which enable them interact with and interpret the world about them. Personal and social environment among others could influence perceptions. Informed undergraduates' perceptions are supposed to spur them to take action for Sustainable Development (SD), but there is an observed undergraduates' reluctance to transfer knowledge into action for SD. It could be assumed that the inability of students to transfer knowledge into actions that favour SD is a factor of inability to reason as a result of lack of adequate knowledge. Therefore, students should be able to reason the cause and effect, advantages and disadvantages, and alternative outcomes for the decision-making process. Hence, Development Education which have the potential to inculcate the aforementioned should be taught to undergraduates in order to promote SD.

Sustainable Development (SD) is a United Nation (UN) idea which emphasizes that human societies must live and meet their needs without compromising the ability of future generations to meet their own needs (Brundland report, 1987). Sustainable Development, according to its content, emphasizes Economic Development, Social Development and Environmental Protection. Undergraduates require SD knowledge for globally acceptable life styles so that SD can be actualized.

The status of undergraduates' perceptions of Sustainable Development seems to have a correlation with family background. Certain parents seem to lack the capacity for their parental roles which could allow children behavioural attitudes that are not in favour of Sustainable Development. For example, Adeyinka (2009) submit that

when parents lack responsibility for their parenthood, children (undergraduates inclusive) will acquire maladaptive behaviours. However, McIntosh, (2008), revealed that sound parental moral values will reflect positive academic interest and performance in children despite the financial status of parents. Therefore, one could assume that the kind of moral values within the family determine the nature of perceptions, attitudes and behaviours children and undergraduates will adopt. Such perceptions, attitudes and behaviours could be in favour of respect for culture, equity, justice, peace and security.

The perceptions of undergraduates on Sustainable Development could have connections with peer group influence. Trust in friends makes students to be relatively more willing to accept messages from close friends (Hallinan & Williams, 1990). The manifestation of risk behaviours such as cultism, drug abuse, prostitution, extravagant spending and lack of respect for knowledge which are not in favour of Sustainable Development could be traced to peer group influence.

According to Pandilla, Walker and Bean (2009), peers may strongly determine preference in the way of dressing, speaking, using illicit substances, sexual behaviour, adopting and accepting violence, adopting criminal and antisocial behaviours. One could assume that the issues of cultism, drug abuse, campus prostitution which are not in favour of Sustainable Development could be due to peer group influence. Conversely, one could also see that good peer relation could encourage students towards positive learning and behaviour which favour Sustainable Development.

Relatedly, gender related issues, policies and practices could be seen as among the factors that influence undergraduates' perceptions of SD. Gender discrimination against the female persons in society has overtime created gender inequalities which is a threat to SD. There is the need for academic reforms to correct this societal anomaly such that male undergraduates will not adopt this age long societal aberration to enable female undergraduates be encouraged to see themselves as indispensable part of the agents of change needed to promote SD.

Family background, could also influence students' perception through the way of upbringing the children in the family. The type of moral standard instill into children in the family goes a long way in shaping the minds of the students towards a friendly society and thus achieving a sustainable society development. David (2008) posit that it is easier to focus on technology or anything else instead of looking inward to the complexities of human psychology which is the most difficult and important challenge of building a decent world. Educating the mind therefore through formal education and parents could give direction to the mind towards a SD.

Statement of the Problem

The form of education that enhances perceptions in favour of Sustainable

Development is required in institutions of higher learning. The dispositions of undergraduates seem not to be in support of SD which may be due to lack of the knowledge of Development Education that are supposed to be part of the requisite knowledge content for achieving Sustainable Development Goals (SDGs). It appears that Development Education are not taught in some institutions of higher learning in Nigeria specifically in Ekiti State. The perceptions of undergraduates seem to have been obscured from the Sustainable Development Goals by family background, peer group and gender influences.

Research Questions

The following research questions were raised for the study:

1. Is Development Education taught in the university under study?
2. Does Development Education influence science education undergraduates' perceptions of Sustainable Development?
3. Does peer group influence science education undergraduates' perceptions of Sustainable Development?
4. Does family background influence science education undergraduates' perceptions of Sustainable Development?
5. Does gender influence science education undergraduates' perceptions of Sustainable Development?

Research Hypothesis

The hypothesis formulated for the study:

Ho_1: There is no significant relationship between Development Education and science education undergraduates' perceptions of Sustainable Development.

Methodology

The study adopted descriptive research design of the survey type. The population for the study comprised 2,892 undergraduates in the Faculty of Education during 2017/2018 – 2020/2021 academic sessions in Ekiti state University, Ado Ekiti. The sample for the study consisted of 120 intact class of undergraduates from the Department of Science Education in the existing six course- options (Biology, Chemistry, Physics, Basic Science, Mathematics and Computer) who were purposively selected for the study. The instrument used for data collection was a questionnaire. The face validity of the instrument was established by sexperts in Science Education and Test, Measurement and Evaluation while the reliability of the instrument was determined using test re-test method.

The instrument was administered on 30 undergraduates outside the sample on two occasions. The scores of the responses were correlated using Pearson's Product Moment Correlation analysis and a reliability coefficient of 0.88 was obtained which was considered high enough for the instrument to be reliable. The copies of the questionnaire were administered to 120 undergraduates from Science Education, covering all the six course options. The data collected from the respondents were analyzed using descriptive and inferential

statistics. The descriptive statistics of frequency, percentages, means and standard deviation were used to answer the research questions while the inferential statistics of Pearson's Product Moment Correlation statistics was used to test the hypothesis formulated at 0.05 level of significance.

Results and Discussion

Question 1: Is Development Education taught in the university under study?

Table 1: Means of the teaching of Development Education in the institution under study.

S/N	ITEMS	A	D	REMARK
1	I receive Development Education-centered lessons in my class activities.	82 (68.4)	38 (31.6)	AGREED
2	Students take courses in Development Education in 100 level (at entry).	62 (51.6)	58 (48.4)	AGREED
3	Development Education course is part of my compulsory courses.	54 (45.0)	66 (55.0)	DISAGREED
4	Development Education is taught as a separate course of study in this institution.	45 (37.5)	75 (62.5)	DISAGREED

Table 1 presents the teaching of Development Education in the institution under study. The result shows that 82 (68.4%) of the total sample agreed that they receive Development Education-centered lessons in class activities while 38 (31.6%) disagreed. On whether students take courses in Development Education at entry in 100 level, 62 (51.6%) respondents agreed whereas 58 (48.4%) disagreed. 54 (45.0%) respondents agreed that Development Education course is part of compulsory courses while 66 (55.0) disagreed. 45 (37.5%) agreed that Development Education is taught as a separate course of study in the higher institution of learning whereas 75 (62.5%) disagreed. Using a criterion mean score of 2.50 for the rating scale, nearly all the items had mean scores below the cut-off point. This implies that Development Education is not taught in the institution under study.

Question 2: Does Development Education influence science education undergraduates' Perceptions of Sustainable Development?

Table 2: Means of Influence of Development Education on Undergraduates' Perceptions of Sustainable Development

S/N	ITEMS	SA	A	D	SD	MEAN
1	Societal problems such as inequalities, insecurity, injustices, unemployment and poverty are prevalent across the globe.	87 (72.5)	29 (24.2)	4 (3.3)		3.69
2	Development Education gives students the needed literacy to tackle societal problems to achieve Sustainable Development.	71 (59.2)	38 (31.7)	9 (7.5)	2 (1.7)	3.48

Table 2 presents the influence of Development Education on undergraduates' perceptions of Sustainable Development. The result depicts that 87 (72.5%) of the total sample strongly agreed that Societal problems such as inequalities, insecurity, injustices, unemployment and poverty are prevalent across the globe, 29 (24.2%) agreed and 4 (3.3%) disagreed. On whether Development Education gives students the needed literacy to tackle societal problems to achieve Sustainable Development, 71 (59.2%) respondents strongly agreed, 38 (31.7%) agreed, 9 (7.5%) disagreed while 2 (1.7%) strongly disagreed. Using a criterion mean score of 2.50 for the rating scale, all the items had mean scores above the cut-off point. This implies that Development Education influence undergraduates' perceptions of Sustainable Development.

Question 3: Does peer group influence science education undergraduates' perceptions of Sustainable Development?

Table 3: Means of influence of peer group on undergraduates' perceptions of Sustainable Development

S/N	ITEMS	A	D	REMARKS
1	Friends can have a potent influence on the way students perceive and response to situations in society.	115 (95.8)	5 (4.2)	Agree
2	Students can be influenced into cultism, drug abuse, prostitution and fornication, examination malpractice and other related bad behaviours which may not be in favour of Sustainable Development.	116 (96.7)	4 (3.3)	Agree
3	Friends can motivate students to be serious with their academic in order to achieve the education goal of Sustainable Development.	120 (100)	-	Agree

Table 3 presents the effects of peer group on undergraduates' perception of sustainable development. The result reveals that 115 (95.8%) of the respondents agreed that friends can have a potent influence on the way students perceive and response to situations in society while 5 (4.2%) disagreed. On whether students can be influenced into c cultism, drug abuse, prostitution and fornication, examination malpractice and other related vices which may not be in favour of Sustainable Development, 116 (96.7%) agreed while 4 (3.3%) of the respondents disagreed. Amazingly, all the 120 (100%) respondents agreed that friends can motivate students to be serious with their academic in order to achieve the education goal of Sustainable Development. Using a criterion mean score of 2.50 for the rating scale, all the items had mean scores above the cut-off point. This implies that peer groups have effects on undergraduates' perceptions of Sustainable Development.

Question 4: How do family background influence science education undergraduates' perceptions of Sustainable Development?

Table 4: Means of influence of family backgrounds on undergraduates' perceptions of Sustainable Development.

S/N	ITEMS	A	D	REMARKS
1	Parents' personality and attitudes can stimulate students against or in favour of Sustainable Development.	115 (95.8)	5 (4.2)	Agree
2	Financial status of parents affects the way students will embrace learning with seriousness.	108 (90)	12 (10)	Agree
3	Inability of parents to give their children education leads to increased ignorance in the light of environment, society and economy and this will not promote Sustainable Development.	115 (95.8)	5 (4.2)	Agree
4	Lack of parental attention to students could lead to criminal behaviours in students which is not in favour of Sustainable Development.	116 (96.7)	4 (3.3)	Agree
5	When parents have sound moral values, irrespective of their financial status, their children could do well in school.	110 (91.7)	10 (8.3)	Agree

Table 4 presents the influence of family background on undergraduates' perceptions of Sustainable Development. The result reveals that 115 (95.8%) of the study participants strongly agreed that parents' personality and attitudes can stimulate students against or in favour of Sustainable Development while 05 (4.2%) disagreed. On whether financial status of parents affect the way students will embrace learning with seriousness, 108 (90%) respondents agreed while 12(10 %) disagreed. 115 (95.8%) respondents agreed that inability of parents to give their children education leads to increased ignorance in the light of environment, society and economy and this will not promote Sustainable Development while 5 (4.2%) disagreed. Also, 116 (96.7%) respondents agreed that lack of parental attention to students could lead to criminal behaviour in students which is not in favour of Sustainable Development, while 4 (3.3 %) disagreed. 110 (91.7%) respondents agreed that when parents have sound moral values, irrespective of their financial status, their children could do well in school while 10 (8.3%) disagreed. Using a criterion mean score of 2.50 for the rating scale, all the items had mean scores above the cut-off point. This implies that family backgrounds influences science education undergraduates' perceptions of Sustainable Development.

Question 5: Does gender influence science education undergraduates' perceptions of Sustainable Development?

Table 5: Means of influence of gender on undergraduates' perceptions of Sustainable Development

S/N	ITEMS	A	D	REMARKS
1	I am aware of the inequality between the female persons and the male persons in society in terms of education, employment, decision making and leadership.	101 (84.2)	19 (15.8)	Agree
2	The male persons are given more opportunity as against the female persons to function in such areas as education, decision making, employment opportunity and leadership in society.	99 (82.5)	21 (17.5)	Agree
3	Gender inequality does not favour gender equity as a Sustainable Development Goal	96 (80.0)	24 (20.0)	Agree

Table 5 presents the influence of gender on undergraduates' perceptions of sustainable development. The result reveals that 10101 (84.2%) of the respondents agreed that they are aware of the inequality between the female persons and the male persons in society in terms of education, employment, decision making and leadership while 19(15.8) agreed. On whether male persons are given more opportunity as against the female persons to function in such areas as education, decision making, employment opportunity and leadership in society, 99 (82.5%) respondents agreed while 21 (17.5%) disagreed. 96 (80%) respondents agreed that gender inequality does not favour gender equity as a Sustainable Development Goal while 24 (20%) disagreed. Using a criterion mean score of 2.50 for the rating scale, all the items had mean scores above the cut-off point. This implies that gender influences undergraduates' perceptions of Sustainable Development.

Hypothesis Testing

Ho_1: There is no significant relationship between Development Education and undergraduates' perceptions of Sustainable Development.

Table 6: Correlation analysis of Development Education and undergraduates' perceptions of Sustainable Development

Variable	N	Mean	SD	r	P
Development education	120	9.69	3.24		
Perception of sustainable development	120	21.58	6.51	0.437*	0.000

*p < 0.05

Table 6 shows that the computed r value (0.4375) is significant at p < 0.05 level of significance. The null hypothesis is rejected. This implies that there is significant relationship between DE and undergraduates' perceptions of SD. The correlation between DE and undergraduates' perceptions of SD is moderate and statistically significant in a positive direction.

Discussion of Findings

The study showed that Development Education was not taught in the university under study. This may not allow undergraduates to understand the context of development and developmental issues around the world so as to act to transform it as the role of Development Education demands, in Toney Daily and Colm Regan concept of Development Education (2015).

Also, the study revealed that Development Education influenced undergraduates' perceptions of Sustainable Development as all the items against question four 4 had mean values above the cut-off point, indicating that Development Education gives students the needed literacy to tackle societal problems such as inequalities, insecurity, injustices, unemployment and poverty to achieve SD Development. The study revealed that the perception of undergraduates in the said university on Sustainable Development is positive even though Development Education was not taught in the university, this suggests that undergraduates in the institution must have gotten their SD knowledge from other sources and not through direct curricular transmission by the contents of Sustainable Development through Development Education. This is in agreement with the findings of David Orr, (2008), that what people know about the contents of SD is derived from other sources such as television and not in direct experience through learning. Barraza and Walford, (2002), also pointed out that undergraduates' perceptions of the contents of SD are influenced by media such as television, computer games and other social activities. A situation where undergraduates in the institution will derive SD knowledge from other sources outside school curriculum may not be adequate if the institution must join the International and global Campaign and advocacy for SD.

The study also showed that gender issues had effects on undergraduates' perceptions of SD. All the items against

question seven 7 had mean values above the cut-off point, indicating that masculine superiority against the female persons which would not favour SD has been established in the minds of undergraduates. Initiating and consolidating academic review and reforms is expedient to correct this societal anomaly as found out in institution of higher learning such that male undergraduates will debunk this observed age long aberration while female undergraduates see themselves as indispensable agents of change needed to promote Sustainable Development.

This is in concord with submission of Melero & Solis-Espallarges, (2012) that there should be a form of Education that acknowledge all subjects as agents of change, including women to promote gender equality.

The study also showed that family background influenced science education undergraduates perceptions of SD as all the items against question six 6 had mean values above the cut-off point, showing that parents personalities and attitudes can stimulate students against or in favour of SD. There is tendency that undergraduates whose parents have sound moral standard will be well behaved and have peaceful co-existence with others, passion for hard work, respect for gender equity and abide with the rules and regulations in the school so as to promote Sustainable Development nationally and internationally.

The study revealed that peer group had influence on undergraduates' perceptions of SD. All the items against question five 5 had mean scores above the cut-off point, which implied that friends could have a potent influence on the way students perceive and respond to situations in society and that students could be influenced into cultism, drug abuse, prostitution and fornication, examination malpractices and other related bad behaviours which may not be in favour of SD. This finding agrees with Pandilla, Walker and Bean (2009), who revealed that peers may strongly determine preference in the way of dressing, speaking, using illicit substances, sexual behaviour, adopting and accepting violence, adopting criminal and antisocial behaviours. The finding is also in agreement with that of Ajayi, Haastrup and Osalusi, (2010) posited that the major causes of cultism in tertiary institution were influence of peer group, parental background, societal decadence, erosion of education standards, militarization of the Nigerian polity, lack of recreational facilities, quest for power and protection among others.

The institution has been doing well in the fight against the influence of peers on science education undergraduates' lifestyles through campaign and advocacy against cultism, drug abuse and examination malpractices among other unsustainable behaviours relating to peer group influences. If this effort is sustained and consolidated, undergraduates of the

institution could be role models among their counterparts.

Conclusion and Recommendations

From the results of the study, it can be concluded that Development Education was not taught in the institution under study. Perceptions of science education undergraduates was in favour of Sustainable Development. Development Education, peer groups, family backgrounds and gender were important factors that influenced science education undergraduates' perceptions of Sustainable Development.

Recommendations

Based on the conclusion of findings, it was recommended that:

1. Development Education should be integrated in the higher institutions' programmes.
2. Parents should endeavour to inculcate moral values and have respect for gender equity and peaceful co-existence so as to promote sustainable development in the society.

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