Effects of Project-Based and Collaborative Instructional Methods on Students' Academic Performance in Metalwork Technology in Public Technical Colleges in Akwa Ibom State, Nigeria

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Abstract
The main purpose of this study was to determine the effect of project-based and collaborative instructional methods on students' academic performance in Metalwork Technology in Public Technical Colleges in Akwa Ibom State. Three research questions and three null hypotheses were raised to guide the study. Population for the study comprised of 264 senior technical two (ST2) students offering Metalwork Technology as a career in the seven public technical colleges in the three senatorial zones of Akwa Ibom State. Random sampling technique was used to select two out of seven public technical colleges for the study. These two technical colleges were Mainland Technical College, Oron Town – Oron, with a population of 48 ST2 students (constitute the experimental group) while Government Technical College, Ewet, Uyo, with a population of 62 ST2 students (formed the control group). The sample size for the study, therefore, was 110 ST2 student of metalwork technology from the two selected technical colleges under investigation. A 20 item multi-choice test tagged metalwork technology performance test (MTPT) developed by the researchers was used to gather data for the study. The research questions were answered using mean score while analysing of covariance was used to test the null hypothesis for the study at .05 significant level. Data analysis revealed that t significant difference in the academic performance of Metalwork Technology students when taught with problem-based and collaborative instructional methods. based on the findings some recommendation were made that: metalwork technology instructors and teacher should adopt project –based instructional method in their teaching to enhanced effective instructional delivery that would ensure the acquisition of saleable skills in metalwork technology.

Keywords: metalwork technology, project-based method, collaborative method, students' academic performance

Introduction

Metal-Work Technology (MWT), which is the process of tapping, drilling, milling, boring shaping and reshaping of metals to create useful objects, parts, assemblies, and large

scale structures, is a very lucrative venture. It is a term that covers a wide and diverse range of metal processes, psychoproductive skills, and tools for producing objects on every scale to include small and ocean going ships, high and mighty buildings of different types and shapes, channels and bridges down to vehicle engine parts and accessories, as well as complicated ornaments. It has been used as a driver of trade, individual hobbies, an industry, and in the creation of art, it can be regarded as both a science and a craft.

Modern metalwork technology processes, though diverse and specialized, can be categorized into one of three broad areas. These include forming, cutting, or joining processes. Current metalwork technology workshops, sometimes refers to as machine shops, embrace a wide range of general/specialised machine tools capable of creating highly precise and useful products. Many simpler metalwork technology techniques, such as blacksmithing, are no longer economically competitive; these may be performed as individual hobbies or historical re-enactments. Metalwork technology generally is divided into three categories as earlier mentioned above. Most metal cutting is done by high speed steel tools or carbide tools. Each of these categories contains various processes. Prior to most operations, the metal must be marked out and/or measured, depending on the desired finished product. Marking out (also known as layout) is the process of transferring a design or pattern to a workpiece and is the first step in the handcraft of metalwork technology.

Marking out process is performed in many industries and machine shops, although in industry, the repetition eliminates the need to mark out every individual workpiece. In the metalwork profession, marking out involves transferring the measurement to the workpiece in preparation for the next step in machining/manufacture process. Metalwork technology is the totality of all the processes involved in the production of metal objects. Other areas of metal work are: fitting and machinery of mechanical production which deals with the use of machine tools or hand tools to produce fabricated metal components and articles; welding tasks, which concerned the joining of two or more pieces of metal together with the aid of heat and welding rod; foundry which deals with castings of molten metal into various shapes; forging which is the process of heating metal pieces to a certain temperature and hammered to a desired shapes.

When metalwork technology programme is completed, the graduates will be able to understand workshops safety rules and their application in machine shop, from the physical properties of manufacturing process and application of ferrous and non-ferrous metals in common use. Select and use common measuring, marking out, cutting and striking tools. Understands the basic working principles of drilling machine and be able to use it for various types of screw treads, rivets and be able to rivet and cut screw by hand, understand the application of various types of screw threads and rivets, understand the system of tolerance and fits, and their application in industrial production, produce simple industrial component on the bench, understand the essential features and working principles of the centre lather and carry out basic operations such as turning, stepped turning, facing, taper turning, knurling and undercutting.

Similarly on completion of metalwork technology trade subject, the graduates will be practically competent. Use all tools correctly, ensuring the machinery guards and protective

eye shield are use at all times, comply with the general rules for safe practice in the work environment at all times. Use and select hand tools for carrying out various bench fitting and assembly tasks, tools, taps, reams, drills, hacksaws, dividers, surface gauge, produce thread using tap and dies, correctly grind point angles, drills, twist and flat drills, select and set drilling machine speeds to perform a range of operations using the appropriate coolants, Cut through the joints and investigate the depth of penetration of the metals at the edge as taught during practice. Carry out the following machining processes – milling, shaping, drilling, reaming, counter sinking, and counter boring, as well as metal joining by a range of processes. Be able to handle soldering, brazing and fusion welding and successfully mark out on other materials using datum lines, angles, radial circles and hole positioning and mastering the skills that will help them to be self-employ or be employed in the world labour market.

However, basic foundation for the acquisition of metalwork technology is laid in technical colleges. Technical Colleges are mandated to train Nigerian youths to become craftsmen, technicians and technologists. This training in different trades qualifies them for jobs in the world labour market as well as for self-employment. These metalwork technology graduates from technical colleges can also be employed in either public or private sector of the economy. According to Nduononwi (2011), both private and public sectors economy require proficient and knowledgeable craftsmen and technicians who can operate and maintain the available metalwork technology equipment, be it oxy-acetylene equipment or electric arc welding machine.

The goal of technical college education is to train students to acquire skills and competencies needed to make them productive citizens (FRN, 2013). The course prepares students to acquire attitudes, knowledge and skills for the purpose of harnessing human natural resources in order to bring about improved quality of lives to the individuals and that of the environment. Metalwork technology programme, like other technical education programme in public technical colleges, prepare students for external examination conducted by National Business and Technical Examination Board (NBTEB) for the award of National Technical Certificate (NTC) and Advance National Examination Certificate (ANTC) (David, 2008).

The curriculum of metalwork technology, as stated in National Business and Technical Education (NBTE) curriculum and module specification of 1987 was broadly divided into three components which include: general education 30%; trade theory (trade practical and related studies) 65%; supervised industrial training/work experience scheme 5%. The industrial training scheme component of the curriculum of the course, as stated in the curriculum document, is compulsory for the full time students and may be taken in the technical college workshop or in the industry before completion of the programme (Nduononwi, 2007). Subjects in general education include: English language and communication, Mathematics, Social studies, Chemistry, and Physics. The general education component of the curriculum in technical college aimed at providing the trainee with complete secondary schools education in critical subjects such the ones mentioned above, to enhance the understanding of machines, tools and materials of the trade subject and their applications, and a foundation for post technical education in higher institutions.

According to Nigeria Policy on Education (FRN, 2013), Technical College Education is that aspect of education which leads to the acquisition of practical skills in; machining/metal work, motor vehicle, auto body repairs and spray painting works; electrical/electronics, building/woodwork construction, interior decoration, carpentry and joinery among others, as well as basic scientific knowledge. Therefore, there is a passionate need for qualitative Technical College education for the acquisition of the desired skills in order to produce graduates that can perform competently in their chosen profession without the need for pre-employment training by the would-be employers. The major goal of technical colleges is to prepare students for successful employment in the labour market at the technical colleges' education level (Nduononwi, 2011). This condition can be met through a curriculum that is relevant and comprehensive with relevant training facilities as well as the best instructional method.

Technical college workshops was designed to offer opportunities for practical training of students in skills acquisition in their chosen trade subject areas for future development of key sector of the economy. Students' practical projects in metalwork technology are an important part of the curriculum in Technical College. This aspect of the curriculum can only be implemented where facilities in the workshop are adequate and relevant. Skills acquisition in metalwork technology requires availability of appropriate facilities, tools and equipment to enhance student learning by allowing them to be involved in demonstrations and practice which will help to build their skills.

According to UNESCO – UNEVOC (2017), the quality of an education is properly defined by the academic performance of its students and graduates. This implies that practice is measured by input and output. Consequently, accomplishing intended learning outcomes can sometimes be blamed on both teachers and learners. In support of this, Udoudo and Nduononwi (2016) opined that effective teaching and learning of metalwork technology generally depends on the instructional method adopted and the attitude exhibited by both teachers and the students taught. In the meantime, records available indicate student's poor performance on metalwork technology in both internal and external examination as reported by NABTEB practical work examiners (NABTEB, 2017). Records showed that there was 65% of students' failure in Metalwork examination (theory) while only 35% passes in the 2016 examination year. In the same examination year, 2016, the failure rate recorded for Technical Drawing (a compulsory subject for metalwork technology students) was 67% while only 33% students passed. Moreover, there was higher rate of failures in Metalwork examination practical in 2016 and 2017 examination years and the failure was in all public technical colleges nationwide, where there was about 72% failures and the pass was 28% good performance rate.

In the same vein, records available in public technical colleges in Akwa Ibom State, indicates poor performance in Metalwork technology, where it shows that the failure rate of students in metalwork technology examination (theory) in the 2018 was 54% while passed rate was 46% of good performance. In the same examination year, practical examination failure rate was 74% while passed rate was 26%. These poor performances in practical work components in metalwork technology in both internal and external examination has raised

concern and attracted the attention of parents, teachers, principals of technical colleges, curriculum designers, state holders in education, employers of labour, the government, and researchers, who are calling on teachers in technical colleges for improvement in their teaching methods, by using appropriate instructional methods.

Instructional methods used by teachers in the teaching of skills in metalwork technology include collaborative instructional method. Collaborative is a method of instruction that basically involves grouping students to work together towards a common academic goal. The method is based on the theory that knowledge is a social construct; that educational experiences that involve interaction and social exchange; that are contextually relevant and engaging and are student-centered, lead to deeper learning. According to Tochonites (2000), collaborative instructional method takes place whenever students interact in pairs or in groups to share knowledge and experiences. In collaborative learning situation in the technical college workshop, the teacher organises students into groups to work and to learn together during practical work periods (Nduononwi, 2016).

The application of collaborative instructional method in the teaching of metalwork technology skills has not fetched good results. The result of this instructional method is that graduates of metalwork technology performances in both internal and external examinations are below normal expectations. These graduates cannot retain the skills they acquired and apply it to solve problems in their chosen field. Collaborative instructional method have been employed in the training of students to acquire skills in metalwork technology for a decade now without recorded success in the area of acquisition of practical skills, work habits, attitudes and the right values required of metalwork graduates in the world labour market. In spite of the application of collaborative instructional method in the teaching of skills in metalwork technology, weaknesses in students' skills acquisition still abound. This is indicative of the students' poor performances in both internal and external examinations such as NABTEB and NECO examinations (Nduononwi, 2016).

It is, however, necessary to look for an alternative instructional method that could increase and improve students' performance in metalwork technology in both internal and public examinations in technical colleges and that would also address the deficiencies in practical skills and work habits in metalwork technology. One of the instructional methods which may be appropriate for teaching of workshop-based skills is project-based instructional method. Project-based instructional method, sometimes refers to as problem-based learning, is a student-centered instructional method in which students learn about a subject through the experience of solving problems.

Problem-based learning instructional method does not focus on problem solving with a defined solution, but it allows for the development of other desirable skills and attributes (Schmidt, Rotgans, and Yew, 2011). This includes knowledge acquisition, enhanced group collaboration and communication. The Problem – based learning instructional method was developed for medical students' education and has since been broadened in applications for other programmes of learning, especially workshop – based programmes. The process allows

for learners to develop skills used for their future practice. It enhances critical appraisal, literature retrieval and encourages on-going learning in a team environment (Schmidt et at, 2011).

The choice of a particular instructional method for the teaching of workshop – based trade subject such as metalwork technology can have implications for a range of factors related to students' ability to acquire skills. It is against this background of searching for an effective instructional method that would facilitate students' acquisition of practical skills in metalwork technology, which would enable them, performs well in their future examinations that form the focus of this study. This study, therefore, is conducted to ascertain the effect of project-based and collaborative instructional methods on students' academic achievement in metalwork technology in public technical colleges in Akwa Ibom State.

Statement of the Problem

In spite of the attempt to produce skilled craftsmen in metalwork technology from public technical colleges who would be self-reliant and enterprising, it has been observed that the objectives have not been realized. This is because graduates of metalwork technology from public technical colleges are roaming the streets of our state in search of employment outside their trade area. They roam the streets in search of jobs different from their career because they were not properly equipped in the college with the practical skills in their chosen career that would enable them to be either employed or be self-employed. The effect of their unemployment due to lack of practical skills is evident in hunger, poverty, emotional distress and criminal tendencies amongst these youths. Training of these students for the acquisition of employable skills for self-reliance and job creation cannot be achieved without the employment of an appropriate instructional method that would enable these students to acquire the needed skills that would help them to be employable or be self-employed. It is on the basis of these problems that this study is under taken to determine the effect of project-based and collaborative instructional methods on students' academic performance in metalwork technology in public technical colleges in Akwa Ibom State.

Purpose of the Study

The main purpose of this study was to determine the effect of project-based and collaborative instructional methods on students' academic performance in metalwork technology in public technical colleges in Akwa Ibom State. Specifically, the study sought to:

1. determine the difference in students' academic performance in boring operation when taught with project-based and collaborative methods of instruction.
2. determine the difference in students' academic performance in drilling operation when taught with project-based and collaborative methods of instruction.
3. determine the difference in students' academic performance in milling operation when taught with project-based and collaborative methods of instruction.

Research Questions

1. What is the difference in students' academic performance in boring operation when taught using project-based and collaborative methods of instruction?
2. What is the difference in students' academic performance in drilling operation when taught using project-based and collaborative methods of instruction?
3. What is the difference in students' academic performance in milling operation when taught with project-based and collaborative methods instruction?

Null Hypotheses

1. There is no significant difference in students' academic performance in boring operation when taught with project-based and collaborative methods of instruction.
2. There is no significant difference in students' academic performance in drilling operation when taught with project-based and collaborative methods of instruction.
3. There is no significant difference in students' academic performance in milling operation when taught with project-based and collaborative methods of instruction.

Methodology

The study employed a quasi-experimental design (pre-test, post-test control group). This implies that intact classes were used for the study. The study was carried out in Akwa Ibom State. The population for the study comprised of 368 senior technical two (ST2) students offering Metalwork Technology as a career in the seven public technical colleges in the three senatorial zones of Akwa Ibom State. Random sampling technique was used to select two out of seven public technical colleges for the study. These two technical colleges were Mainland Technical College, Oron town – Oron, with a population of 48 ST2 students (constitute the control group) while Government Technical College, Ewet, Uyo, with a population of 62 ST2 students (formed the experimental group). The sample size for the study, therefore, was 110 ST2 students. A 20 item multi-choice test tagged Metalwork Technology Performance Test (MTPT), developed by the researchers was used to gather data for the study. The instrument was used as pre-test and post-test measures. The instrument MTPT was subjected to face and content validation by three validators in the Department of Industrial Technology Education for scrutiny, corrections and approval of its validity and suitability for the study. Comments by these three validators were incorporated into the final copy of the instrument before it was administered to the respondents. To ascertain the reliability of the instrument, the researcher made use of test-re-test method. This method involved the administration of Metalwork Technology Performance Test (MTPT) on 40 different study groups of ST2 students of Metalwork Technology outside those used in the main study. The administered instrument was collected and the data gathered was analysed using Cronbach Alpha Correlation Coefficient that stood at 0.89, which reliable for the study. The researchers obtained permission from the principals of the participating colleges before proceeding to conduct the study. The instrument was administered before treatment to the sample of 110 ST2 students from the two participating public technical colleges. The samples received the treatment through the subject teachers who received instructions prior to the experimentation. The administration of the instrument to the samples after treatment produced the post-test scores that were converted into data for analysis. Research questions were answered using Mean Score statistics while Analysis of Covariance

(ANCOVA) was used to test the null hypotheses formulated to guide the study at .05 alpha level.

Results

Research Question 1: What is the difference in students' academic performance in boring operation when taught with project-based and collaborative instructional methods?

Table 1: Mean analysis of project-based and collaborative instructional methods on students' academic performance in boring operation

Instructional Methods	N	Pre-Test	Post- Test	Mean Gain	Mean Difference
Project-Based	58	27	96	69	37
Collaborative	62	31	63	32	

Data presented in Table 1, indicate that students taught boring operation with project-based method of instruction, the mean increases from 27 in pre-test to 96 in post-test with mean gain of 69. On the other hand, students taught boring operation with collaborative method of instruction, the mean increases from 31 in pre-test to 63 in post-test with a mean gain of 32. The difference in mean gain of students taught boring operation with project-based method of instruction exceeds the mean gain of students taught with collaborative instructional method by 37. On the basis of the higher mean gain, therefore, it is concluded that project-based method of instruction enhances students' academic performance in boring operation more than collaborative instructional method do.

Research Question 2

What is the difference in students' academic performance in Drilling Operation when taught with project-based and collaborative methods of instruction?

Table 2: Mean analysis of project-based and collaborative instructional methods on students' academic performance in Drilling Operation

Instructional Methods	N	Pre-Test	Post- Test	Mean Gain	Mean Difference
Project-Based	58	25	88	63	30
Collaborative	62	32	65	33	

Data presented in Table 2, indicate that students taught Drilling operation with project-based method of instruction, the mean increases from 25 in pre-test to 88 in post-test with mean gain of 63. On the other hand, students taught Drilling Operation with Collaborative method of instruction, the mean increases from 32 in pre-test to 65 in post-test with a mean gain of 33. The difference in mean gain of students taught with project-based method of instruction exceeds the mean gain of students taught drilling operation with collaborative instructional

method by 30. On the basis of the higher mean gain, it is, therefore, concluded that project-based method of instruction improves students' academic performance in Drilling Operation more than collaborative instructional method do.

Research Question 3: What is the difference in students' academic performance in Milling Operation when taught with project-based and collaborative methods of instruction?

Table 3: Mean analysis of project-based and collaborative instructional methods on students' academic performance in Milling Operation

Instructional Methods	N	Pre-Test	Post- Test	Mean Gain	Mean Difference
Project-Based	58	34	98	64	28
Collaborative	62	41	76	36	

Data presented in Table 3, indicate that students taught Milling Operation with project-based method of instruction, the mean increases from 34 in pre-test to 98 in post-test with mean gain of 64. On the other hand, students taught Milling Operation with collaborative method of instruction, the mean increases from 41 in pre-test to 76 in post-test with a mean gain of 36. The difference in mean gain of students taught with project-based method of instruction exceeds the mean gain of students taught with collaborative instructional method by 28. On the basis of the mean gain, therefore, it is concluded that project-based method of instruction enhances students' academic performance in Milling Operation more than collaborative instructional method do.

Null Hypothesis 1: There is no significant difference in students' academic performance in boring operation when taught with project-based and collaborative instructional methods.

Table 4: Test of significant for the effect project-based and collaborative instructional methods on students' academic performance in Boring Operation

Sources of Variance	Sums of Square	df	Mean Square	F-cal	F-crit	Decision at P≤ .o5
Between Groups	1287.5	1	665.85	9.32	3.76	Reject Ho1
Within Groups	108.13	119	88.12			
Total	1269.37	120				

Data presented in Table 4, shows that computed F-ratio (9.32) is greater than critical F-ratio (3.76) at .05 significance level and under the degree of Df of 1 and 119. The null hypothesis is, therefore, rejected; this means there is a significant difference in students' academic performance in boring operation when taught with project-based and collaborative methods of instruction.

Null Hypothesis 3

There is no significant difference in students' academic performance in Drilling Operation when taught with project-based and collaborative instructional methods.

Table 5: Test of significant for the effect project-based and collaborative instructional methods on students' academic performance in Drilling Operation

Sources of Variance	Sums of Square	df	Mean Square	F-cal	F-crit	Decision at P≤ .o5
Between Groups	1309.8	1	671.92	8.13	3.76	Reject Ho1
Within Groups	97.23	119	87.08			
Total	1406.23	120				

Data presented in Table 5 shows that computed F-ratio (8.13) is greater than critical F-ratio (3.76) at .05 significance level and under the degree of DF of 1 and 99. The null hypothesis is, therefore, rejected; this means there is a significant different in students' academic performance in Drilling Operation when taught with project-based and collaborative methods of instruction.

Null Hypothesis 4: There is no significant difference in students' academic performance in Milling Operation when with project-based and collaborative instructional methods.

Table 6: Test of significant for the effect project-based and collaborative instructional methods on students' academic performance in Milling Operation**.**

Sources of Variance	Sums of Square	df	Mean Square	F-cal	F-crit	Decision at P≤ .o5
Between Groups	1087.9	1	640.92	11.78	3.76	Reject Ho1
Within Groups	98.17	119	87.08			
Total	1186.07	120				

Data presented in Table 6 shows that computed F-ratio (11.78) is greater than critical F-ratio (3.76) at .05 significance level and under the degree of DF of 1 and 99. The null hypothesis is, therefore, rejected; this means there is a significant difference in students' academic performance in Milling Operation when taught with project-based and collaborative methods of instruction.

Findings of the Study

Students taught Boring Operation with project-based method of instruction exceeds the mean gain of students taught with collaborative instructional method; Students taught Drilling Operation with project-based method of instruction exceeds the mean gain of students taught with collaborative instructional method; Students taught Milling Operation with project-based method of instruction exceeds the mean gain of students taught with collaborative instructional method; There is a significant difference in students' performance in Boring Operation when taught with project-based and collaborative methods of instruction methods of instruction;

There is a significant difference in students' performance in Drilling Operation when taught with project-based and collaborative methods of instruction methods of instruction; There is a significant difference in students' performance in Milling Operation when taught with project-based and collaborative methods of instruction.

Conclusion

The primary objective of this study was to determine the effect of project-based and collaborative instructional methods on students' academic performance in Metalwork Technology in Public Technical Colleges in Akwa Ibom State. Based on the findings of the study, the researcher concluded that It was also concluded that collaborative method of instruction was ineffective in assisting Metalwork technology students acquired and retained the required/necessary practical skills that can help them to be gainfully employed or be self-employed. Moreover, the findings of this research study revealed project-based method of instruction as the more effective method for the teaching of workshop-based trade subjects such as Metalwork Technology and other mechanical trade subjects in Public Technical Colleges.

Educational Implication of the Findings

The educational implication of these findings are that Metalwork Technology students can acquire the required skills that would make them perform better in both internal and external examinations if instruction is through project-based instructional method; be self-employed and or be gainfully employed if teachers adopt project-based method of instruction in the teaching of Metalwork Technology trade subjects.

Recommendations

Based on the research findings and the conclusions drown, the following recommendations were made that Metalwork Technology teachers should adopt project-based instructional method in their teaching to enhance effective instructional delivery that would ensure the acquisition of saleable skills in Metalwork Technology; Metalwork Technology teachers should be trained and re-trained to acquire the teaching skills in project-based method of instruction for effective training of Metalwork Technology students for the industrial sector or the world of work and Curriculum professionals should redesigned and restructure the Metalwork Technology curriculum to include project-based instructional method in order to promote acquisition of saleable skills.

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Family Factors and Reading Comprehension Performance among Primary School Pupils in Uyo Senatorial District of Akwa Ibom State

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Abstract
The article centred on family factors and reading comprehension performance of Primary school pupils in Uyo senatorial district of Akwa Ibom State. The purpose was to establish how family factors; parent marital status and family size influences pupils reading comprehension. Two research questions and two hypotheses were formulated to guide this study. Ex-post facto research design was used. The population of the study consisted of 9,009 primary four pupils in Uyo Senatorial District while 420 Primary four pupils were randomly selected to participate in the study. Stratified random sampling technique was used to draw sample for this study. Two research instruments were used for the study. Family variable Questionnaire (FVQ) was designed to assess the various Family variable and Reading Comprehension Performance Test (RCPT). Three research experts from the Department of English, Early Childhood and Special Education and Department of Educational Foundations validated the instrument. The reliability coefficient was obtained using Cronbach's Alpha and 0.75 and 0.67 reliability index were obtained for FVQ and RCPT respectively. These indicated high reliability of the instruments to measure what was intended to measure. The findings indicated that family variable influenced reading comprehension performance of pupils in primary schools. The results showed that pupils whose parents live together in harmony had the mean score of 72.40 while the pupils whose parents are either single, divorced, separated or dead had the mean score of 51.80. Null Hypothesis one showed that parents marital status influence pupils reading comprehension achievement. From the findings in this study, it was concluded that family factors such as parent's marital status and family size have significant influence on the reading comprehension performance of their children. It was recommended that parents should endeavor to allocate quality time to educational activities. Parents should have the number of children they can comfortably raise and take care of.

Keywords: Reading, Reading Comprehension, family factors, Parent's marital status, family size:

Introduction

. According to Ogbemudia and Aiasa (2013) reading is the process of receiving and interpreting information encoded in language form via the medium of print. Reading is not a passive skill. It requires frequent practice and exercise. Reading changes from what is primarily called word recognition through a process of comprehension; Reading comprehension is defined as the level of understanding of a text or message. This understanding comes from the interaction between the words that are written and how they trigger knowledge outside the text or message. Reading comprehension, which is related to students' academic performance, is a good predictor of later school performance. Dias, Montiel, & Seabra (2015). Comprehension is the goal of reading. According to Oluwole (2008) comprehension skills includes reading more accurately, following a text or story more closely, identify important events and concepts in a text, master new concepts in their content-area classes, complete assignments and assessments, feel motivated to read in school and for pleasure. Family factors takes many forms like quality parenting by both parents, providing literacy rich environment, good models of constructive and educational values. Families are not equal in their involvement as various factors such as environment, parent marital status and family size affect family involvement. The family structure which defines if both parents are living together in the student's home affects their relationship to the child. Bullock (2006) observed that children from disturbed family backgrounds such as divorce, separated single, parents in conflict and anti-social families end to be deviant and as such less reading achievement is realized. This could be true as broken homes usually result in material and parental deprivations which could affect a child's behavior and parenting style. Single parenting does not have this luxury; either parents may be forced to devote more time to the labour market. According to Edin and Kefalas (2005) the quantity and quality of time will reduce with the child this may translate to less socialization, less supervision and monitoring which will result in low academic performance.

Yeung and King (2016) opined that parent's interaction at home counts for the learning development of children. They noted that every child needs a conducive home environment to be a well-adjusted individual. A child being read to regularly from the early stage of life begins to show growing enjoyment of the experience and their attention span increases. Early home activities start children's literacy development by providing early experiences Sénéchal and LeFevre (2014) The marital status of parents plays a crucial role in enhancing the self esteem of children which would subsequently show in attitude towards their reading comprehension achievement (Fetley 2003)

Fremstad and Boteach (2015) emphasized three 'S' of family, namely, structure, stability, and strength of parental relationships in a family, and suggested that they had a positive impact on children's emotional and economic security and overall wellbeing. However, as children get older and are able to read themselves, their individual print exposure contributes to their reading comprehension as well.

Family relationships are important to pupil comprehension reading performance. This is because in a favorable relationship, parents devote more attention to educating their children and show more enthusiasm, which can provide children emotional support and in turn enhance their academic performance and reading ability. (Huat 2015) From birth children are

described as communicators interested in their surroundings. Early manifestations of how children practice reading is embedded in their family structure. As children enter school, they are differently prepared by their families to benefit from educational experiences which manifest in their reading and comprehension skill.

Parents' marital status has been found to strongly influence the amount and quality of children's reading, but the relationship is strongly mediated by other factors. Parent's marital status is the family structure which defines if both parents are living together in the student's home affects their relationship to the child. Bullock (2006) observed that children from disturbed family backgrounds such as divorce, separated single, parents in conflict and anti-social families end to be deviant and as such less reading achievement is realized. In a two-parent family, both husband and wife may work full time or one parent may choose to be responsible for child training, this will produce better behaved and high achievers due to good parent-child relationship, attention to reading and school activities (Duncan and Hoffman 2005).

Single parenting does not have this luxury; either parents may be forced to devote more time to the labour market. According to Edin and Kefalas (2005) the quantity and quality of time will reduce with the child this may translate to less socialization, less supervision and monitoring which will result in low academic performance.

Family size: Family size in this context, refers to the total number of children in the child's family in addition to the child himself. However, the family type that a child comes from either monogamous or polygamous family usually has impact on the child academic performance. Parents with extraordinary large families are not likely going to give their children the much needed attention that makes for better child rearing. Fetley (2003) argued that children's attainment depends on inputs of time and money from their parents: the more children there are in the family the less of both inputs. These inputs are not money alone, but other essential things like time, attention, resource dilution and so on. However, Booth and Kee (2006) confirmed that children from larger families have lower levels of education. The greater family size may negatively affect child outcomes through resource dilution. He further explained that in a small family a child is close touch with its parents and habitually uses more adult language and ideas that he would do if lost in a cloud of siblings. He may therefore appear to have higher intelligence that he really has especially on verbal tests. Smaller families offer greater opportunity for performance as it is easier to provide enough space, learning materials such as books, toys and other resources that aid learning than in a large family (Adesehinwa 2013).

Essien (2002) conducted a study to investigate the influence of family size on students 'academic achievement in Geography in Akwa Ibom State. A total of 50 multiple choice questions were constructed validated and used to measure achievement in Geography. The sample size was 200 students. Home environment questionnaire was used to assess the student's home background. Using t-test analysis, the author discovered that family size influences the achievement of secondary school students in Geography.

Some educational theory explains interaction between pupils, learning and their environment. Bandura's social learning theory (1977) posits that people learn from one another via observation, imitation and modelling. Social learning theory combines cognitive learning theory (which posits that learning is influenced by psychological factors) and behavioural learning theory (which assumes that learning is based on responses to environmental stimuli. In Bandura's social cognitive theory, environment and cognition are important factors in development. Bandura (1977) explained how parents, family and teachers influence children by serving as model for behavior.

The constructivist approach of Vygotsky emphasizes the way in which learners construct their knowledge by gradually processing within their zone of proximal development with the assistance of an adult (Vygotsky, 1978). Vygotsky believed the cognitive development occurs through the child's conversation and interactions with more capable members of the culture-adults. The importance of this theory to parents and teachers is that learning involves sharing of ideas, the more ideas are shared, the more they are acquired.

Ability to read is vital in all learning situations Most children who are able to read tend to have much trouble with reading comprehension; that is understanding what they read. This seems to be the underlying problems behind school failure in educational institution today as more emphasis is placed on reading skills than reading comprehension skills. The lack of reading comprehensions among primary school pupils manifest when such pupils fail both internal and external examinations, they would have ordinary pass if the examinations were oral. It takes a child who understands what he reads to be able to answer questions correctly and pass his examination. The home is the informal institution; the child's initial development of intellectual potentials for success in educational process depends largely on the home background and experiences. These experiences explain the interaction between children and their parents. Apart from the relative lack of interest and poor reading habits among pupils, other common reading problems include inability to recognize sound and pronounce, inability of pupils to put sound together in pronunciation and reading of sentences, some can read, but do not understand. The low level of comprehension is evident in pupils 'inability to read for exact meaning. However, as a backdrop, inability to comprehend when reading has bred more vices like examination malpractice and drop outs from school. It therefore becomes imperative to investigate how family variables (parent's marital status and family size) influence reading comprehension performance among primary school pupils in Uyo Senatorial District of Akwa Ibom State.

Purpose of the Study

The purpose of the study is to determine the influence of family variables on reading comprehension achievements of pupils. This study has the following objectives:

1. To determine the influence of parents' marital status on the reading comprehension performance of pupils.
2. To determine the influence of family size on the reading comprehension performance of pupils.

Research Questions

The following research questions were answered in the study.

1. What is the influence of parents' marital status on the reading comprehension performance of pupils?
2. What is the influence of family size on the reading comprehension performance of pupils?

Research Hypothesis

Two hypotheses were formulated for the study.

1. There is no significant influence of parents' marital status on the reading comprehension performance of pupils.
2. There is no significant influence of family size on the reading comprehension performance of pupils.

Methodology

This study is a descriptive survey and it adopted the ex-post facto research design**.** According to Mathooko, Mathiooko and Mathooko (2007), an ex-post facto design explores a quasi-experimental study examining how an independent variable present prior to study affects a dependent variable. Akwa Ibom North East Senatorial District has a population size of 710,355 male and 652,013 females giving a total of 1,362,368 (NPC, 2006). It comprises nine Local Government Areas, namely; Uyo, Etinan, Nsit Ibom, Uruan, Nsit Ubium, Ibiono Ibom, Nsit Atai, Itu and Ibesikpo Asutan. The Local Government Areas that make up the Uyo senatorial districts have common cultural identity and linguistic heritage. Although, there are some dialectical variation found in Itu, Uruan and Etinan Local Government Areas, the Ibibio dialect seem to be the prevailing language of interaction among the people of Uyo Senatorial District. The choice of the area of study was necessitated by the fact that the literacy level in this district is high and there are many public schools within the area.

The population of this study comprises 9,009 primary four pupils in public primary schools in Akwa Ibom North East Senatorial District**.** (Department of Planning, Research and Statistics, State Ministry of Education and Universal Basic Education, MOE/SUBEB 2020). Multi stage sampling technique was used to select the sample .420pupils out of the 16 schools from four local government area. Simple random sampling was used in each public school, 25 pupils and a maximum of 30 pupils were selected from each school. This gave a total of 420 pupils. A researcher developed instrument Family Variable Questionnaire (FFQ) and Reading Comprehension Performance Test (RCPT) was used to collect data. The family variable questionnaire (FVQ) was designed to assess parents' marital status and family size. The items were designed with simple language that the pupils would be able to understand and to tick ( ) as appropriate. The Family variable scale (FVS) was scored based on the different categories. The Reading Comprehension Performance Test (RCPT) contained reading passages for pupils to read and answer the questions arising from the passages. It was made up of Section A, B and C. Section A consisted of five multiple choice questions Section B consisted of 10questions

that required filling the blank spaces. Section C consisted of 10 questions of filling in the space with correct answers from the box. This gave a maximum score of four (4) marks each for the twenty-five questions in Section A, B and C totaling one hundred (100) marks. To ascertain the face validity of the instruments for the study, the instruments were given to three research experts for validation. The research experts were selected from the Department of English, Early Childhood and Special Education and Department of Educational Foundations. The experts evaluated the instrument taking into consideration the curricula objective of study and adequacy of the items based on the objectives, research questions, hypotheses of the study and area of coverage of the study. Corrections and comments were noted and used to produce the final draft of the instruments.

Test-retest reliability method was used to establish the reliability of the instruments. The Instruments (FVQ and RCPT) were administered on 20 pupils who were not part of the study sample but shared the same characteristics as the population under study. After two weeks of the first administration, the same instruments were administered to the same pupils with the order of the items on the questionnaires altered. This generated two sets of data. The data generated were subjected to Kuder Richardson 21 for family variables questionnaire and Pearson product moment correlation was used for the Reading Comprehension performance Test (RCPT). The result shows a reliability coefficient of .76 and .67 for FVQ and RCPT respectively. This indicated a high reliability of the instruments to measure what it was intended to measure. The researcher visited the schools with a letter of introduction and seeking for permission from appropriate authority to use the school for the study. After permission was granted, the researcher visited the schools on the day approved by the school authorities to administer the questionnaire to the pupils. The researcher was assisted by three research assistants and class teachers in administration and collection of the instruments**.** The instrument was administered to primary four pupils who were respondents to the study. The Reading comprehension achievement test was administered first and after that the respondents were told to turn to the questionnaire section. Thereafter the researcher collected the instrument for data analysis. The data collected and collated were analyzed using mean and standard deviation to answer research questions and the Analysis of variance (ANOVA) to test the hypotheses at .05 levels of significance. The mean scores were used to answer the research questions.

Results

Research Question1: What is the influence of parent's marital status on reading comprehension performance of pupils?

Table 1: Mean analysis of pupils' reading comprehension based on parents' marital status

Variables	N	$\bar{X}$	SD	Remark
Children of parents living together	95	72.40	5.16	
Children of single parents	37	51.80	13.80	

Table 1 showed the mean score of pupils' achievements in reading comprehension based on parents' marital status. The result indicates that pupils whose parents live together in harmony had the mean score of 72.40 while the pupils whose parents are either single, divorced, separated or dead had the mean score of 51.80. The result shows that parents' marital status influence pupils reading comprehension achievement to a large extent. This result indicates that families who stay together enhance academic achievement of pupils otherwise the pupils may be struggling in school.

Research Question 2: What is the influence of family size on the reading comprehension performance of pupils?

Table 2: Mean analysis of pupils reading comprehension based on family size

Family Size	N	Mean	SD	Remarks
Between 1-3 children	95	70.95	5.52	1st
7 children and above	188	56.75	10.78	3rd
Between 4-6 children	137	65.36	9.14	2nd

Table 2 gave the summary of the mean performance of students in reading comprehension based on family size. The result shows that families with children between one and 3 in number had a mean performance score of 70.95, while families that have between 4 and 6 children have a mean performance score of 65.36 and families that have children above 7 in number have a mean performance score of 56.75 this indicates that family size does influence academic achievement of pupils in reading comprehension.

Null Hypothesis 1: There is no significant influence of parents' marital status on the reading comprehension performance of pupils.

Table 3: Analysis of Variance for pupils reading comprehension achievement based on parents' marital status

	S S	Df	M S	Fcal	fcrit	Decision
Between Groups	6184.998	3	2061.666	28.156	2.696	
Within Groups	30460.964	417	73.223			significant
Total	36645.962	420				

**significant at .05 alpha level*

Table 3 showed the summary of the analysis of variance test of significant difference in reading comprehension achievement of pupils-based parents' marital status. The result shows that the calculated f-value is 28.156 at .05 alpha level with 417 degree of freedom and

the critical f value is 2.696. Since the f-cal value is greater than the f-crit value, the null hypothesis is rejected. Thus, there is a significant influence of parent's marital status on the reading comprehension achievement of pupils.

Null Hypotheses 2: There is no significant influence of family size on the reading comprehension performance of pupils.

Table 4: Analysis of variance for pupils reading comprehension performance based on family size

Variable	S S	df	M S	F-cal	F-crit	Decision
Between Groups	669.129	2	334.564	3.878	2.696	
Within Groups	35976.833	418	86.275			significant
Total	36645.962	420				

**significant at .05 alpha level*

Table 4 showed the summary of the analysis of variance test of significant difference in reading comprehension achievement of pupils based their family size. The result shows that the calculated f-value is 3.878 at .05 alpha level with 418 degree of freedom, the critical f-value is 2.696. Since the f-cal is greater than the f-crit the null hypothesis is rejected. Thus, there is a significant influence of family size on the reading comprehension achievement of pupils.

Discussion of Findings

The result of hypothesis one shows that there is a significant influence of parents' marital status on the reading comprehension achievement of pupils. The result shows that the children whose parents stay together have enhanced reading comprehension achievement while children whose parents are separated either by work, divorce or death have dwindling academic achievement therefore, performs poorly in reading comprehension. Ogbemudia and Aiasa (2013) maintained that physical and psychological conditions of the home environment affect the children academically. Ebong (2004) stated that harmonious home creates emotional stability in the child at home and subsequently throughout his school life. Hence the researcher was also concerned with the careful study of the influence of single parenthood due to broken home, death, widowhood and intact home on the learner achievement of students. This finding does not corroborate with that of Bullock (2006) that children from disturbed family background such as divorce, separated homes, tend to be deviant and as such, become backward in school work, read less and hardly achieve much academically. However, Brasell (2008) opined that this may not be completely applicable in all cases of broken homes. Some children irrespective of their parents' marital status, background or structure may work hard and become successful in life.

The finding in hypothesis two reveals that family size has a significant influence on the reading comprehension performance of pupils. The finding in hypothesis five reveals that there is a significant influence of family size on the reading comprehension achievement of pupils. This could be because with less people in the family, more resources can actually be allocated to the education of children. Also, the parents would also have time enough to be involved in each of the child's education and development. It is less cumbersome for parents to take care of few kids than it is to manage a large family when each one needs attention and care. This finding corroborates the finding of Wang and Sheikh-Khalil (2014) that parents' attention, love and care seem to shift from one child to a new born. This means that if a family has one child all attention, love and care are lavished on that child but the attention, love and care then shift as soon as a second child arrives. In this wise the number of children to be catered for in the family influences the amount of time, resources allotted to each child hence the one who gets the least amount of time and resource certainly performs poor in reading comprehension.

Conclusion

Parents who live together and parents with fewer number of children are more involved in their children's reading and academic activities, hence increase academic performances of their children. Parents who are more involved at home with their children's education seem to motivate their pupils for higher academic performance in school.

Recommendations

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

1. Parents who live together monitor and participate in school academic activities and collaborate with teachers for improved reading activities
2. Schools should establish a daily routine and help parents to monitor home activities and provide support to their children at home
3. Parents should endeavour to have the number of children they can comfortably raise and take care of.
4. Schools can assist parents by creating family literacy programs that engage parents in helping their children become better readers in their home.
4. Governments and other non-governmental organization should provide libraries and other educational programme to enlighten parent on family involvement.

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Effect of Students-Team-Achievement-Division (STAD) and Academic Performance of Students in Biology in Essien Udim Local Government Area

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Abstract
Instructional strategy used by science teacher is critical for effective teaching and learning of Biology. The study examined the effects of Student-Team-Achievement-Division (STAD) instructional strategy on Biology students' academic performance on the concept of ecosystem in Essien Udim Local Government Area. Two research questions were raised and two null hypotheses formulated to guide the study. The study was a quasi-experimental with non-randomized pre-test, post-test design. The population was 1,186 senior secondary two (SS 2) students from six co-educational public Secondary Schools in Essien Udim Local Government Area of Akwa Ibom State. Criterion sampling technique was used to select two schools for the study. An intact class of SS2 was adopted from each school and the sample of 147 SSS II (males= 78; females= 69) was obtained. Researchers' made instrument titled "Biology Academic Performance Test (BAPT) which had twenty (20) questions was used for data collection. The reliability co-efficient for BAPT was determined using test retest. The data was analysed using KR20 and r= 0.83 was obtained. The data obtained from tests were analyzed using mean, standard deviation, and Analysis of Covariance (ANCOVA). The result showed that there was a significant difference in the academic performance of students in the concepts of ecosystem taught using Student-Team-Achievement-Division (STAD). There was no significant influence of gender on the students' performance; and that there were no significant interaction effects of learning strategies (Student-Team-Achievement-Division (STAD) and expository) and gender on Biology students' academic performance on the concepts taught. It is recommended that Biology teachers should employ Student-Team-Achievement-Division (STAD) during instructional delivery to enhance students' academic performance in Biology.

Keywords: Student-Team-Achievement-Division (STAD), expository, academic performance, ecosystem

Introduction

Biology is an important intellectual discipline especially in modern advances in biotechnology, medicine processes. It is indispensable in helping individuals think more clearly about quality of live and values involved in the changing world. The Biology curriculum for secondary schools is designed to prepare students to acquire adequate laboratory and relevant skills and knowledge in Biology, as well as ability to apply the knowledge to everyday life (FRN 2014).

Biology as a science subject in the secondary school is a requirement for further learning of science related courses like medicine, anatomy, pharmacy, botany, cytology, embryology, agricultural science among others. The knowledge of Biology can also be applied in industries like food manufacturing, processing, preservation, crime detection through the use of finger print, population control, and disease control in medical field, development of vaccines and animal/Plant hybridization and improvement. All these could be achieved through quality teaching that would enhance student academic performance. Students' academic performance are affected directly or indirectly by many factors such as teaching strategies used by the teacher, gender, school environment, study habit among others. The poor academic performance of secondary school students in Biology seems to have risen in recent years. This observation is supported by West African Examination Council (WAEC) Chief Examiners Report between 2018-2022, which indicated poor students' performance in Biology student's performance. This problem might have adverse effects on the society as it signals failure in attaining scientific and technological development in the country.

Poor students performance in Biology has been attributed to various reasons such as inadequate teaching facilities, use of inappropriate teaching strategies in the teaching of science, especially Biology, abstract nature of some Biology concepts, students variables like gender and self- concept. Idoko (2010) asserted that monotony kills interest in science teaching, hence the use of variety and innovative teaching strategies in teaching Biology is important.

Instructional strategy according to Udofia (2022) includes all the approaches that a teacher may use to actively engage students in deep learning and construction of knowledge. Meanwhile teaching of Biology in Nigerian secondary schools is dominated by teacher centered lecture and expository methods (Ajewole 2012). The author further maintained that the method has failed to produce science students that are committed to science and who can critically reason and transfer what is learnt to new or similar situations. The consistent poor performance of students in Biology has made Biology educators to emphasize the use of students centered strategies like co-operative, simulation, Student-Team-Achievement-Division (STAD) and laboratory strategies to enhance critical thinking and understanding.

Student-Team-Achievement-Division (STAD) strategy is a type of cooperative learning strategy which if well implemented uses a reinforcement system structure to improve learning. Student-Team-Achievement-Division (STAD) is an innovative instructional strategy that could be employed in the teaching and learning of Biology concepts. It is a collaborative learning strategy in which small groups of students with different levels of ability work together to accomplish a shared goal. Here, students are grouped to four or five member learning teams that are mixed in performance level, gender and ethnicity. Wahyuni (2013), opined that Student-Team-Achievement-Division (STAD) aims at motivating students to master skills presented by teacher. Student must help their team mate to learn the material, encouraging them to do their best if they want their team to earn team rewards and thereby making learning important, valuable and fun. It also uses the form of direct learning and group work, during which the students do exercises prepared in form of work sheets by the teacher and discuss the results with members of the group (Kauchak, 2014). In Student-Team-Achievement-Division

(STAD), the teacher presents a lesson, and the students work together within their teams to make sure that all the members have mastered the lesson. After which all students take individual quizzes on the concept, at which time they do not help one another of any gender to boost academic performance.

Expository is derived from the concept of exposition which means to give direct explanation. In the concept of learning, expository strategy is that which most Biology teachers use to explain facts, ideas and other important information to students. Expository teaching strategy is basically a direct instruction, where a teacher stands in front of the room lecturing and students are taking notes and being told what they need to know. Martin (2013), opined that, in expository strategy, the teacher is the source and owner of the knowledge. According to Romiszowski, (2014) expository learning strategy takes place through several stages which are: presentation of information, test of mastery and restatement, providing opportunities of application in form of examples and problem, opportunity to apply new information in real life situations and problem. The disadvantage of this strategy is that, it is teacher-centered, therefore, the teacher is the primary source and main information giver, thereby making students inactive and loss focus.

Students personal variables like gender has been on the front burner of research especially now that gender equality is emphasized. Gender is a construct that is used for being a male or female. According to Udofia and Ekong (2022) the current knowledge demand society and complexity to global challenges call for both male and female students to be given equal opportunities for participation in the classroom. For instance Nzewi (2015) maintained that female students learn more once the classroom environment is friendly. However poor student academic performance and the gender issue are still debatable. Hence the need to carry out this study.

Statement of the Problem

Despite the numerous applications of Biology to all areas of human endeavors, most students perform poorly in Biology at external examinations certificate conducted by WAEC and NECO in Nigerian secondary schools. The poor academic performance of Biology students in external examinations has post a serious threat to scientific and technological development. The observed reasons for poor academic performance include; poor teaching method, inadequate laboratory facilities, abstract nature of some Biology concepts.

Several studies have been carried out to proffer solutions to the problems. Despite all these, students' academic performance in Biology in external examinations has remained low especially in Biology. Although researchers have advocated the use of innovative and student centered teaching strategies such as guided discovery, computer simulations, and co-operative teaching strategies among others in teaching of Biology, study has not been done on the effect of Student-Team-Achievement-Division (STAD) on Biology students' academic performance on the concept of ecosystem in secondary schools in Essien Udim Local Government Area,

Akwa Ibom State.. Hence the study sought to determine the effect of STAD on the students' academic performance in Biology.

Purpose of the Study

The aim of this study was to determine the effect of Student-Team-Achievement-Division (STAD) in Senior Secondary School Students academic Performance in Biology in Essien Udim Local Government Area. Specifically, the study sought to

1. Determine the difference in the academic performance mean scores of Biology students taught ecosystem using Student-Team-Achievement-Division (STAD) and those taught using expository teaching strategy.
2. Determine the difference between the academic performance mean scores of male and female Biology students taught ecosystem using Student-Team-Achievement-Division (STAD) and those taught using expository teaching strategy.

Research Questions

The following research questions guided the study;

1. What is the difference in the academic performance mean scores of Biology students taught ecosystem using Student-Team-Achievement-Division (STAD) and those taught using expository teaching strategy?
2. What is the difference between the academic performance mean scores of male and female Biology students taught ecosystem using Student-Team-Achievement-Division (STAD) and those taught using expository teaching strategy?

Research Hypotheses

The following null hypotheses were raised for the study:

H_{01}: There is no significant difference between the academic performances mean scores of Biology students taught ecosystem using Student-Team-Achievement-Division (STAD) and those taught using expository teaching strategy.

H_{02}: There is no significant difference between the academic performance mean scores of male and female biology students taught ecosystem using Student-Team-Achievement-Division (STAD) and those taught using expository teaching strategy.

Methodology

The study was quasi-experimental and it adopted a pretest - posttest non randomized control group. The population of the study comprised of all the 1,186 senior secondary two (SS2) students from all the 6 co-educational public secondary schools in Essien Udim Local Government Area. Criterion sampling technique was used to select two schools for the study. An intact class of SS2 was adopted from each of the selected schools and the sample size of 147 SSS II students was obtained. The selected schools were randomly assigned to experimental and control groups. The experimental group was taught using Student-Team-Achievement-Division (STAD) and the control group was taught using expository teaching strategy

The researchers developed an instrument tittle: Biology Performance Test on Ecosystem was used. The BPTE consisted of twenty (20) multiple choice (A-D) test items each. The instrument had 2 sections (A and B). Section A contained items on the demographic variables of the students and Section B contained items on the concept of Ecosystem.The instrument was face validated by one secondary school Biology teacher who partakes in WAEC Biology marking and also has eight years of teaching experience and two experts from the Department of Science Education, University of Uyo, The validating were required to check for the appropriateness of the items in terms of the language used, content coverage and class level. All comments and suggestions made appropriately guided the researcher and was used to produce the final form of the instrument. The study took five weeks with one week for training and administration of pretest and three weeks of intensive teaching and one week of post-test administration. One validated researcher-developed lesson package based on three different topics on ecosystem was used to teach the experimental and control groups. The research assistants in the experimental group were made to understand:

(a) The steps in Students Team Achievement Division,
(b) Activities of the teacher and students during teaching-learning process
(c) Process of administration of Biology Performance Test (BPT). After the training, the teachers in both experimental and control groups exposed the students to pretest followed by teaching which lasted for three weeks and a post-test in the fourth week.

Research Question 1: What is the difference in the academic performance mean scores of Biology students taught ecosystem using Student-Team-Achievement-Division (STAD) and those taught using expository teaching strategy?

Table 1: Mean ($\bar{X}$) and Standard Deviation of Students' pre-test and post-test scores classified by treatment groups

		Pretest		Posttest		
Groups	N	Mean	SD	Mean	SD	Mean Gain Score
STAD	83	12.49	2.83	39.52	5.66	27.03
Expository Strategy	64	12.56	2.84	15.53	3.70	2.97

Table 1, shows the pre-test and post-test mean scores and standard deviation of scores of the two groups of students taught using Student-Team-Achievement-Division (STAD) and expository strategy. The post-test and pre-test mean scores of 39.52 and 12.49 respectively, for those in Student-Team-Achievement-Division (STAD) yielded the best mean gain score of 27.03. This is followed by the post-test - pre-test mean gain scores of 15.53 and 12.56 for those in expository strategy group. The post-test standard deviation scores of 5.66 and 3.70 for students in Student-Team-Achievement-Division (STAD) and expository strategy groups respectively indicated that, though students taught using Student-Team-Achievement-Division (STAD) had the highest performance mean scores and the widest scattering of raw scores about

the group mean, those taught using expository method had their raw scores closest to the group mean. Expectedly the two groups had post-test mean scores that are higher than their pre-test mean scores. To know whether the observed differences in the mean scores of the two groups were statistically significant, the testing of hypothesis one is displayed in Table 2.

Research Question 2: What is the difference between the academic performance mean scores of male and female Biology students taught ecosystem using Student-Team-Achievement-Division (STAD) and those taught using expository teaching strategy?

Table 2: Mean and Standard Deviation of Students' pre-test and post-test scores classified by treatment groups and gender

Treatment Groups	Gender		Pre-test		Post-test		Mean Gain
		N	Mean	SD	Mean	SD	Score
STAD	Male	45	12.51	2.79	38.22	5.95	25.71
	Female	38	12.47	2.93	41.05	4.95	28.58
Expository Strategy	Male	33	12.63	3.00	15.00	3.57	2.37
	Female	31	12.50	2.71	16.06	3.83	3.56

The post-test, pre-test mean scores difference by gender displayed in Table 2 shows that the female students in Student-Team-Achievement-Division (STAD) group had the best mean gain score (28.58), followed by their male counterparts in the same group (25.71). Those in expository strategy group had the least mean gain scores of 2.37 for the male and is 3.56 for the female. As is evident from the results displayed, the female's students performed better than their male counterparts. Whether the observed better performance of the males was statistically significant is assessed by the results for testing of hypothesis two displayed in Table 3

Null Hypothesis 1: There is no significant difference between the academic performance mean scores of Biology students taught ecosystem using Student-Team-Achievement-Division (STAD) and those taught using expository teaching.

Table 3: Summary of Analysis of Covariance (ANCOVA) of the students' post-test scores classified by treatment groups with pretest scores as covariate

Source	Type III Sum of Squares	Df	Mean Square	F	Sig.	Decision at .05 alpha level
Corrected Model	20803.582[a]	2	10401.791	429.851	.000	S
Intercept	4870.851	1	4870.851	201.287	.000	S
Covariate(Pretest)	12.065	1	12.065	.499	.481	NS
Treatment	20800.574	1	20800.574	859.578	.000	S
Error	3484.595	144	24.199			
Total	148554.000	147				
Corrected Total	24288.177	146				

S= Significant at .05 alpha level, NS= Not significant at .05 alpha level

In Table 2, the calculated F-ratio for the effect of learning strategies at df 1, 146 is 859.58, while its corresponding calculated level of significance is .000 alpha level. The level of significance .000 is less than .05 in which the decision is based, indicating that there was a significant difference in the academic performance of Biology students taught ecosystem using Student-Team-Achievement-Division (STAD). With this observation, null hypothesis 1 was rejected.

Null Hypothesis 2: There is no significant difference between the academic performance mean scores of male and female Biology students taught ecosystem using Student-Team-Achievement-Division (STAD) and those taught using expository teaching strategy.

Table 4: Summary of Analysis of Covariance (ANCOVA) of students' post-test scores classified by treatment groups and gender with pre-test scores as covariate

Source	Type III Sum of Squares	Df	Mean Square	F	Sig.	Decision at .05 alpha level
Corrected Model	20987.590[a]	4	5246.897	225.735	.000	S
Intercept	4874.476	1	4874.476	209.713	.000	S
Covariate (Pretest)	12.960	1	12.960	.558	.456	NS
Treatment	20943.309	1	20943.309	901.037	.000	S
Gender	137.658	1	137.658	5.922	.316	NS
Treatment* Gender	27.853	1	27.853	1.198	.276	NS
Error	3300.587	142	23.244			
Total	148554.000	147				
Corrected Total	24288.177	146				

S= Significant at .05 alpha level, NS= Not significant at .05 alpha level

In Table 4, the calculated F-ratio for the main effect of gender at df 1, 146 was 5.92 while its significant level is .316. This significant level is greater than .05 alpha in which the decision is based, indicating that the influence of gender on the students' academic performances was not statistically significant. With this observation, null hypothesis 2 was retained.

Discussion of Findings

The findings with regards to the effects of Student-Team-Achievement-Division (STAD) and expository teaching strategies on Biology students' academic performance on the concept of ecosystem showed that there was a significant difference in the academic

achievement of students taught using STAD performing significantly better than those taught using expository strategy. The students taught using expository learning strategy had very low academic performance scores.

This result could be attributed to the fact that Student-Team-Achievement-Division (STAD) is a student-centered strategy and students engage in a group discussion about the concept taught. This group discussion enhanced interaction and promote independent thinking and construction of knowledge which helped them perform outstandingly on the concept. Whereas students exposed to expository learning strategy were memorizing the facts given by the teacher leading to poor performance because this method does not permit critical thinking in learning. In other word, the relative better enhancing effect of STAD compared with expository strategy could also be attributed to the activity approach which kept the learners adequately engaged during the teaching-learning process as against the didactic teacher-centred approach of the expository method.

The result of this finding is in line with the findings of Mohammad (2017), Ebeneser (2017), Adesoji and Ibrahim (2009) and Joel (2018) who in their different findings on the effect of STAD and expository learning strategies on students' academic performance reported that there is a significant effect of STAD on Students' academic performance. This means that students taught using STAD learning strategy achieved academically better than their counterparts taught using expository teaching strategy.

On research question two and hypotheses two, the influence of gender on students' performance, it was observed that its influence was not statistically significant given the instructional strategies used. This observation indicated that gender is not a strong determinant of students' academic outcomes. The findings is at variance with Adesoji and Ibrahim (2009) who found significant main effect on gender on students' academic achievement in Chemistry with the female performing better than the male.

With reference to treatment-gender interactions on the students' performance the findings on Table 4 showed no significant interaction effects of teaching methods and gender on Biology students' academic performance on the concept; indicating that the effect of treatment was the same at all levels of gender, and that the influence of gender on treatment was the same at all levels of treatment. This implies that Student-Team-Achievement-Division (STAD) could be used to enhance academic performance in Biology irrespective of Gender.

Conclusion

Based on the findings of the study, it is hereby concluded that of the two learning strategies investigated, Student-Team-Achievement-Division (STAD) learning strategy is the more effective in facilitating students' academic performance in Biology. Also gender had no statistically significant influence on students' academic performance in Biology.

Recommendations

1. Biology teachers should make effective use of Student-Team-Achievement-Division (STAD) strategy in teaching concepts in Biology.

2. The government, in collaboration with professional organizations like STAN, should seek organize regular workshops to train Biology teachers in the use of STAD in the classroom.
3. Curriculum planners should ensure the incorporation of Student-Team-Achievement-Division (STAD) strategy in the Biology curriculum for the teaching and learning of Biology.

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