



Effect of School Location on Students' Academic Achievement in Biology in Ogoja Education Zone, Cross River State, Nigeria.

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ABSTRACT

This study was aimed to find out how school location (urban and rural) influences students' academic achievement in Biology in Ogoja Education Zone, Cross River State, Nigeria. The research design adopted for the study is the quasi-experimental non-randomised factorial design, using a pretest-posttest control group for this study. The population consisted of all senior secondary school one (SS 1) Biology students in the 85 public secondary schools in Ogoja Education Zone. While the sample for the study comprised 220 Senior Secondary One (SS1) Biology students drawn from six secondary schools through a simple random sampling technique (118 from urban and 102 from rural locations) Biology Achievement Test (BAT) with 50 multiple-choice questions was the instrument for data collection, administered to the 220 students across their different schools. The reliability of the instrument was obtained to be 0.88 using the Kuder Richardson formula (KR-20). An independent t-test analysis was used for data analysis. The result showed that the calculated t-cal value was 8.20, while the critical table value was 1.96; therefore, there is a significant difference in the mean scores achieved in Biology between rural and urban secondary school one students. The difference is in favour of urban schools. It was concluded that students in the urban areas performed academically better than their rural counterparts. It was then recommended, among others, that schools in rural areas should similarly and adequately be provided with the necessary learning facilities, such as well-equipped laboratories with qualified and committed teachers for effective teaching and learning of Biology in the area.

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Introduction

Science explains the natural existence of man and his activities. It could be seen as problem-solving in order to improve the living standard of man. Science education is an essential instrument for national development and growth. The importance of Science and Technology on society cannot be overemphasised. Recent inventions and discoveries have cumulatively helped to improve man's standard of living in health, industry, agriculture, and productivity. Omika (2016) asserted that the relevance of science to national goals, aspirations and economic development dictates, to a large extent, the huge commitment and support which nations make and give to Science and Technological development.

Giving priority to science education, especially at the secondary school level, might help Nigeria as a developing country, to raise a science-oriented generation of youths that would be better prepared and equipped with scientific knowledge and skills. This would help ensure effective dissemination and inculcation of scientific concepts, culture and thinking as well as boost the pace of development. This is based on the notion that the growth and development of any nation is a measure of its level of science education, through which citizens are made to acquire technical competencies for industrialisation (Onyinye, Egbo & Agujiobi 2023).

Ali and Ullah, (2020) observed that science education is the process whereby learners are prepared or equipped with knowledge and skills to help ensure effective dissemination and inculcation of scientific concepts, culture, critical thinking process, innovation and activities through generally accepted pedagogical strategies and tactics based on the application of learning and teaching and educational theories (Alkhalidi, Pranata & Athanda 2016). It is that particular field of study that exposes learners to the contents as well as methodology of acquiring scientific knowledge for practical application (Asore, Annan

& Ngman Wara 2022). Indeed, the development of every nation is pivoted around a strong science educational system of the nation (Putra & Wizu 2019).

In a fast-growing world, a country is considered developed when it has advanced in science and technology (Duran et al 2021). Science plays a critical role in shaping the society, advancing education and improving the lives of individuals. It serves as a cornerstone of progress and innovation offering solution to pressing global challenges while fastening intellectual and societal development. (Kerzie & Zorko 2023). The contributions of science in any nation are profound and multifaceted. Science drives societal development by providing the tools and knowledge needed to address issues such as health, technology and environmental sustainability (Taim, 2023). Through scientific research, societies have been able to combat diseases, improve living standards and develop technologies that enhance their quality of life. For instance, medical advancements such as vaccines and antibiotics have significantly reduced mortality rates and eradicated diseases like smallpox (World Health Organisation, 2021). Furthermore, science enables countries of the world to address climate change through renewable energy solutions and policies informed by empirical data (IPCC, 2022). These contributions underscore science's pivotal role in ensuring societal well-being and sustainability.

Thus, Science offers a deeper understanding of the world and empowers individuals to make informed decisions about health, safety and personal well-being (Astaini & Kueniawan 2019). And it is against this background that Biology has been identified as a very important subject and its importance in scientific and technological development of any nation has been widely reported (Alkhalidi, Pranata & Athanda 2016, Ali & Ullah 2020, Onyinye, Egbo & Agujiobi 2023).



Biology as a science subject combines with other science subjects like Chemistry and Physics as well as Mathematics, to qualify one for admission into tertiary institutions to study courses like Medicine and Surgery, Nursing Science, Pharmacy, Agriculture, etc.

Biology is key to the study of science-based courses (Aliyu, 2017). This is because, it is a core natural science whose knowledge (of Biology) is very important and applicable to all areas of life, and without it, life on the planet earth is miserable and primitive (Anamezie, 2018). Furthermore, the production of essential human needs such as soap of all kinds, drinks, drugs and preservation of food items are all products of the knowledge and application of Biology (Faulconer & Gruss, 2018; Kapizi, Akcoy & de Jong, 2019). Kapizi, Akcoy and de Jong (2020) found in their study that Biology provides understanding and explanation about the formation of life, reproductive health, and key aspects of drug production. This no doubt implies that adequate knowledge of Biology is very significant to improving the standard of living and a progressive society. From the foregoing, it is observed that Biology cuts across all spheres of life and thus determines the well-being of the people and the society. As a core science subject, Biology performs the function of gatekeeper for the future study of pure sciences, Medicine, Pharmacy, Agriculture and all other professions at the secondary school level (Aliyu, 2017).

In spite of the significance of Biology in the development of science, students' performance in the subject at the secondary school level has always been an issue in Nigeria. Reports from the West African Examinations Council Chief Examiner for May/June Senior Secondary School Certificate (SSCE) in Biology also indicate a persistent trend of students' poor performance over the years in SSCE (2020-2023) (Okafor, 2017).

This has made both teachers, parents/guardians, government and other stakeholders in the education

industry to lament and seek the remote and immediate causes and possibly find out what could be done to arrest the ugly situation. In order to address this issue of poor performance, researchers over the years have carried out studies on factors that affect the achievement scores of students in Biology (Anamezie, 2018; Astalini & Kumiamon, 2019). Various factors can significantly impact students' academic performance in Biology, both positively and negatively. As highlighted by Joseph (2019), these factors range from student-specific influences to teacher-related variables. A critical determinant of academic success is the school's location, which can have a significant impact on students' performance. The school is a social and learning agent that provides the environment upon which a child may be formally educated in order to attain educational goals (Oredein, 2016).

Similarly, Joseph (2019) defines school as one of the institutions that is responsible for the development and training of the mind and skills of man. School is also for the preparation of a person for the challenges and responsibilities in society at large. Meanwhile, Okorie and Ezeh (2016) define school location as a particular place, in relation to other areas in the physical environment (rural or urban), where the school is situated. Human beings have unlimited capacity to learn from any location, but many, however, can be limited by the behaviour patterns and facilities that the immediate environment offers (Oredein, 2016; Okafor, 2017; Mohammed, Chado & Dalhatu 2021).

Again, School location refers to the place where the school is situated, whether in an urban or rural area. Urban schools are those in the municipalities, while rural schools are those located in the villages or semi-urban areas, that is, schools on the outskirts of the cities and towns. The location of a school has a big role to play in the academic achievement of students at school. Omoye and Agbaje (2016) asserted that students in urban schools generally perform better than those in rural schools due to superior educational resources and infrastructures,



yet research by Igbo and Leaton (2022) challenges this direct relationship, highlighting that school location may not universally dictate academic success. Urban schools typically offer a more conducive learning environment characterised by well-equipped libraries, advanced technology, adequate instructional materials and comprehensive evaluation processes. These resources foster a more favourable academic climate, enabling students to thrive (Yaro et al, 2016 Okechukwu & Ukeh, 2022).

Conversely, rural schools face numerous challenges, including limited access to educational materials, inadequate infrastructure and, significantly, a language barrier. In rural settings, local dialects often dominate informal languages, creating an additional obstacle for students whose official language of instruction is English Language. The academic curriculum is delivered in English, Nigeria's official language is English. This linguistic divide is less of an issue in urban areas, further contributing to the performance gap between urban and rural students.

Literature Review

(Kuyenum et al, 2018, Ugwonyi et al 2020). In Nigeria, schools located in rural areas are usually faced with problems like a shortage of teachers, lack of laboratories, poorly equipped libraries, among others. These shortcomings negatively affect students' achievement. Evidence abounds that the educational aspirations of students who study in rural areas are weaker than those of their urban counterparts. Macmillan (2012) found that students in rural areas place less value on their studies such that their achievements are affected.

Kuhfeld, Soland, Tarasawa, Johnson, Ruzek and Liv (2020) submitted that the location of schools could also be a factor that affects the performance of students in science subjects. According to the researchers, urban areas and those with moderate population and better life, provide schools there with regular electricity, water supply. Adequate

number of teachers, modern learning facilities and infrastructure for better instructional delivery that may lead to students' higher achievement levels in urban schools than rural schools (Okafor, Okonugu & Ojo, 2020 Mohammed, Chado & Dalhatu, 2021).

Okorie and Ezeh (2016) examined the influence of gender and location on students' achievement in chemical bonding. The researcher started by posing a question about whether students' achievement in chemical bonding is a function of their gender and school location. This question and two hypotheses guided the study. A pretest-posttest non-equivalent control group, quasi-experimental design was used, with a population of 5,966 Senior Secondary School class one (SS 1). Biology students in 57 senior secondary schools in Nsukka Education Zone of Enugu State, Nigeria. Adapting the purposive sampling technique, nine (9) schools were selected to draw 311 SS 1 students. Intact classes were used. Instruments for data collection were the students' interest scale on chemical bonding (SISCB) and the Chemical Bonding Assessment Test (CBAT). The instruments were validated and had a reliability coefficient of 0.68 and 0.87, respectively.

Research questions were answered using descriptive statistics. The hypotheses were tested using analysis of covariance (ANCOVA) at a $P < 0.05$ level of significance.

Results of the study showed that the mean achievement score of female students was higher than the scored by male students. It was also discovered that the mean achievement score of rural students was higher than that of urban students' gender with a significant effect on students' achievement in chemical bonding was significant. The result also showed that location was a significant main effect on students' achievement in chemical bonding was significant. This study found that school location had a significant implication on students' achievement in



Chemistry, as they were during chemical bonding classes.

Similarly, Anamezie (2018) investigated the interaction effects of method and location on the academic achievement of secondary school biology students using a constructivist teaching method. A pretest-posttest non-equivalent control group design was adopted. The study was conducted in Enugu North and East Local Government Areas of Enugu State. The population of the study was 5,104 senior secondary one (SS I) Biology students. The sample size was 118 (60 males and 58 females). Stratified random sampling was used to draw two co-educational schools, one from Urban Schools and the other from rural schools. In each of the two schools sampled, two intact classes were assigned to the constructivist teaching method, while the control group was assigned to the lecture method. The data generated were analysed using the mean with standard deviation. Analysis of Covariance (ANCOVA) was used in testing the hypothesis at $P < 0.05$. The result of the study showed that the students' achievement in Biology was better than when they were taught basic concept in ecology using constructivist teaching method than when they were taught using lecture method. The result also showed that location had a significant influence on academic achievement of Biology students in favour of urban schools.

In another development, Agbaje, Awodun and Omotade (2024) studied the impact of school location on the academic achievement of science students in the Senior Secondary School Certificate Examination. The purpose was to determine whether geographical location has any impact on the achievement of the students in Biology, Chemistry and Physics. The design adopted for the study was an ex-post facto survey type. A total of one hundred and twenty (120) science students were randomly selected from six (6) public secondary schools in Ekiti West Local Government Area of Ekiti State, Nigeria for the study. Computerised result sheets sent to each school by

the West African Examination Council (WAEC) were collected on the 2020-2023 May/June West African Senior Secondary School Certificate Examination (WASSCE) from all the selected schools for the study (WASSCE, 2018).

The average of the scores of each candidate selected for participation in this study was computed in Biology, Chemistry and Physics. These served as the achievements in science. Three research hypotheses were formulated and tested using t-Test statistical analysis at $p < 0.05$ level of significant. The findings revealed that there was statistically significant difference in the achievement mean scores of students in rural and urban school.

Similarly, Onoyase (2015) carried out a study on the academic performance of students in urban, semi-urban and rural secondary schools in Ikono Local Government Area of Akwa Ibom State, Nigeria. A survey design was employed in the study, and hypotheses were formulated to guide the study. The researcher collected data on the Senior Schools Certificate Examination results conducted by the West African Examination Council (WAEC) in the year 2001. The subjects selected for analysis were English Language, mathematics and biology. Others were chemistry and geography. 3 out of 6 secondary schools in the study area were used for the study. 90 out of 220 students in the three secondary schools were used for the study, representing 49.1 per cent. One-way analysis of variance (ANOVA) was used to analyse the data. The findings of the study showed that there was a significant difference in the academic performances among students in urban, semi-urban and rural secondary schools.

Purpose of the Study

The purpose of this study is to find out the effect of school location (urban and rural) on students' academic achievement in Biology in Ogoja Education Zone, Cross River State, Nigeria.



Research Question

In line with the purpose, one research question was asked in this study, thus;

Does the location of the school influence students' academic achievement in Biology in Ogoja Education Zone, Cross River State Nigeria?

Statement of Hypothesis

There is no significant difference in the mean achievement scores of urban and rural secondary school students in Biology in Ogoja Education Zone Cross River State, Nigeria

Research Design and Methodology

A pretest-posttest control group quasi-experimental non-randomised factorial design was adopted for this study, so that the researcher could evaluate the effect of the independent variable (School location) on the dependent variable (students' academic achievement in Biology in Food web and energy transfer). The population consisted of all senior secondary one (SS1) Biology

students in the 85 public secondary schools in Ogoja Education Zone (grouped into rural and urban areas). The sample for the study comprised 220 senior secondary one (SS1) Biology students drawn from six secondary schools through a simple random sampling technique. There were 118 from urban locations and 102 from rural locations.

The instrument used for data collection in this study was the Biology Achievement Test (BAT) developed by the researcher to measure students' achievement in food web and energy transfer. The BAT comprised 50 multiple-choice test items, which focused on all areas taught. The BAT was designed to measure students' achievement after treatment, and the test items were distributed among the six intellectual levels of Bloom's taxonomy. The instrument was subjected to face and content validity.

Sample Distribution of Students

Schools	Number of Students	Sample Selected	Percentage ratio
A (Urban)	280	42	15%
B (Urban)	200	30	15%
C (Urban)	258	38	15%
D (Rural)	227	34	15%
E (Rural)	267	36	15%
F (Rural)	213	40	15%
Total	1,472	220	

The reliability coefficient obtained using the Kuder Richardson Formula (KR-20) was 0.88. The sample distribution is shown in Table 1.

Results and discussion

There is no significant difference in the mean achievement scores of urban and rural secondary school students in Biology.

Independent variable: School location (urban and rural)

Dependent variable: Academic achievement in Biology

Statistical tool: Independent t-test



The result in Table 2 revealed that the calculated t-value (t-cal) is greater than the critical t value (t-tab) = 1.96, df = 218; $p < 0.05$. Hence, the null hypothesis was rejected. This implies that there is a significant difference in the mean academic achievement scores of students in urban and rural

secondary schools, achievement is in favour of students from schools located in urban areas (with a mean score of 65.02), which is greater than that of their counterparts in schools located in rural areas (having a mean score of 58.65)

Table 2: Independent t-Test analysis of academic achievement of students in schools located in urban and rural areas

Groups/Variables	n	X	SD	Df	t-cal	Remark
Urban	118	65.02	6.41	218	8.20	
Rural	102	58.65	220			

Critical t = 1.960

This finding agrees with that of Okorie and Eze (2016), whose study showed a significant influence of school location on the academic achievement of students. The findings of this study are also in line with those of Anamezi (2018), which showed that school location had a significant influence on the academic achievement of Biology students in favour of urban schools. Similarly, Ella and Ita (2017) found a statistically significant difference in science students' achievement in favour of urban schools as compared to rural schools.

Furthermore, in separate studies by Ugwu (2021) and Oluseye (2018), they found a significant relationship between school location and students' academic achievement in physics. These findings are in line with the findings of the present study, which concludes that the location of schools has a significant effect on the academic achievement of students in Biology. On the contrary, the findings of this study disagree with the findings of Abamba (2021), whose results showed no significant difference between rural and urban students' achievement when taught using the 5E learning cycle. Also, the findings of this study are in disagreement with the findings of Soliu et al. (2020), who found a statistically significant difference in the achievement of senior school

students in WASSCE physics examinations based on school location in favour of rural schools.

Conclusion

The findings of this study have established that school location has a significant effect on the academic achievement of Biology students taught Food web and Energy transfer in favour of schools located in the urban areas. Based on this finding, it is concluded that students in the urban areas performed academically better than their rural counterparts.

Recommendations

Based on the research findings that urban students performed better than rural students, and to close the urban-rural performance gap and ensure equitable education opportunities for all students, the researchers recommend that;

1. Schools in rural areas should be provided with necessary learning facilities, such as well-equipped laboratories, for effective teaching and learning of the subject Biology in the area.
2. Education board, Directors and all Heads of schools in the state should ensure that teachers are posted to the rural areas to ensure curriculum implementation in such areas.
3. Government and stakeholders in the education sector should invest in modern classroom



facilities, libraries and science laboratories in the rural schools to create a conducive learning environment.

4. Policy makers should introduce rural allowances for teachers posted to rural schools to encourage teachers to accept transfers to rural schools.
5. Education stakeholders should partner with technical companies to provide affordable digital devices for rural students.
6. Government and Biology educators should focus more attention on necessary facilities and pedagogy in schools located in rural areas for them to have the same opportunities as their counterparts in the urban school location areas and to enhance students' academic achievement in Biology, irrespective of the geographical location of the school.

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