



Influence of Parental Educational Level and Family Size on Secondary School Students Academic Achievement in Biology

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Abstract

The study investigated the influence of parental educational level and family size on senior secondary school students' academic achievement in Biology in Nsukka Local Government Area of Enugu State. Two research questions and two hypotheses guided this ex post facto study. The population was 2,514 SS2 Biology students; 345 were sampled from four public schools. The instrument was a researcher-constructed proforma, which recorded students' existing Biology scores (the achievement measure), and a demographic form on parents' educational qualification and family size. Mean and standard deviation described Biology scores in each group. Hypotheses were tested using ANOVA. The findings revealed that family size had no significant influence on students' Biology achievement while parents' educational level had a significant influence. The study concluded that students whose parents have high educational level achieve higher than those whose parents have low educational level. Schools should support students whose parents have low educational level.

Keywords: Parents' educational level, Family size, Academic achievement, Biology, Secondary school students

Introduction

Students' learning outcomes and experiences are shaped by different factors. Family size and parents' educational level could be potential factors. While some studies have reported significant influence of parental educational level on students' academic achievement (Nja et al., 2022; Odionye & Ibeh, 2023), others found no significant relationship between parental education and family size on students' achievement (Alsaleh et al., 2021; Darko-Asumadu & Sika-Bright, 2021). These inclusive findings in science subject particularly Biology, gave room for this study.

Biology is a natural discipline that studies living things and their processes. Biology promotes the development of science and technology for the betterment of human life and animals and enables individuals to know more about themselves (Mardonov, 2019). It also aids in understanding the scientific picture of the world and provides the scientific basis of agricultural production, fishery, forestry, biotechnology, environmental protection, and modern industries (Mardonov, 2019). The attainment of the objectives of Biology education can be assessed through the evaluation of students' academic achievement as observed in their external examinations. Academic achievement of students is simply the progress made towards attaining the academic aims and objectives of any educational institution (Mbaegbu & Osuafor, 2023). It is a major part of the learning process, which informs

educators of students' talents and progress towards achieving educational aims. Despite the importance of Biology, there are problems militating against the effective transfer of this knowledge to students. There are indications that learning Biology appears to be a persistent struggle for Nigerian secondary school students, as reflected in their poor performance in external examinations such as the West African Senior School Certificate Examination (WASSCE) and the National Examinations Council's Senior School Certificate Examination (SSCE). For more than twenty years, the Chief Examiners of the West African Examinations Council (WAEC) and the National Examinations Council (NECO) have described candidates' performance in Biology as unsatisfactory, declining, and characterized by persistent failure (Piwuna & Mankilik, 2023). The trend is still visible in recent data. Mbaegbu and Osuafor (2023) further noted that, although the percentage of candidates obtaining credit passes in Biology rose in some periods, the year-to-year differences were small when compared with the number of candidates who sat the examination. Such inconsistency in Biology achievement over the years warrants closer attention from educators, researchers, and policymakers to the factors that contribute to it. The factors that contribute to poor academic achievement in Biology include but are not limited to apathy from the student, the school's physical condition and environment,

the number and teaching methods of teachers (Mbaegbu & Osuafor, 2023), family influence and the economic conditions the students find themselves in, which affect their study habits and relationships in and outside the family (Nja et al., 2022), and the health and nutrition of students (Adam et al., 2024). Many researchers have tried to solve this problem and found that the provision and use of instructional materials, the practice of different innovative instructional methods, and students' interest and motivation (Mbaegbu & Osuafor, 2023; Usman, Ali, & Ahmad, 2023) are some of the major reasons for it. However, poor achievement in students' performance in Biology still recurs. It is therefore necessary to consider factors like parents' educational level and family size to ascertain their influence on students' achievement.

The educational level of the parents determines the interest, involvement, and attitude of the parents toward their children's academics (Davis-Kean et al., 2021). Davis-Kean et al. (2021) stated that individuals with higher levels of schooling have children who also attend higher levels of schooling. According to Odionye and Ibeh (2023), there exists a difference between children of educated parents and children whose parents only completed primary school. The authors further stated that children of parents with university degrees perform considerably well and get the highest score in the examination. Parents' educational level can be described in terms of the formal levels of schooling in Nigeria: primary (First School Leaving Certificate, FSLC), secondary (School Certificate), and tertiary, which includes the National Certificate in Education or Ordinary National Diploma (NCE/OND), the Higher National Diploma or university degree (HND/Degree), and postgraduate qualifications (Masters/Ph.D). This study therefore classified parents' educational level into these five levels, because earlier studies found differences in children's outcomes between parents with different levels of schooling (Davis-Kean et al., 2021; Odionye & Ibeh, 2023). However, parents' educational level is not the only factor that may shape students' achievement the number of people in the home, which affects how parental time and resources are shared, may also matter.

Family size simply means the number of family members, the parents, and the children. According to Onyiorah (2023) family size as the total number of people in a family, consisting of the parents and their children. Studies group family size in different ways. Ene (2021) used three categories (small, medium and large), while Sanni (2025) grouped families as 2-4, 5-7 and above 8 members. In this study, family size was classified as small (1-3 persons), moderate (4-6 persons) or large (above 6 persons). Ene (2021) treated family size in categories of small, medium and large. The family size is determined by some factors such as cultural beliefs of the society, religion, and demographic factors (Akinyemi & Odimegwu, 2021). The family size may affect the economic conditions of the family, which may influence the academic achievements of the students. This is mostly common among families with large members due to the difficulties in the provision of essential needs. Larger

family size can place a strain on financial resources. This can result in less individualized support for each child's academic needs, as parents may struggle to allocate sufficient time to help with homework, provide educational guidance, or engage in academic discussions (Uddin et al., 2023). However, the relationship may not be simply linear, as a large international study found it to be nonlinear and moderated by family wealth (Guo et al., 2026).

In the same Nsukka Local Government Area, Odionye and Ibeh (2023) found that parental educational qualification significantly influence Biology achievement among senior secondary students. However, their study did not consider family size, which the present study includes. This is the gap the present study intends to fill by including family size as another family factor that may influence the academic achievement of students in Biology.

Theoretical Framework

This study is anchored on Walberg's (1981) theory of educational productivity, which holds that students' psychological characteristics and their immediate psychological environments influence educational outcomes (Reynolds & Walberg, 1992). The theory identifies nine factors, including the home environment, which parents' educational level and family size may shape (Nja et al., 2022; Walberg, 1984). Walberg (1984) grouped the nine factors into three sets: student aptitude (ability or prior achievement, development, and motivation), instruction (quantity and quality), and the psychological environment (classroom climate, home environment, peer group, and mass media). Aptitude and instruction are the main factors for learning. The environmental factors also affect learning, partly by shaping students' aptitude and how well they respond to instruction. The factors influence one another, and the environmental ones can be changed, so they are useful targets for improving achievement (Walberg, 1984).

The home environment covers parental involvement, support, expectations, and learning resources at home. Parents' educational level is linked to the interest and involvement parents show in their children's schooling (Davis-Kean et al., 2021). Family size affects how parental time and resources are shared among children (Uddin et al., 2023). The theory therefore supports the view that both variables may influence students' achievement in Biology, which is why they were selected. The other factors in the theory are outside the scope of this study. The theory guides the choice and interpretation of the variables, and the study does not test the whole model

Research Questions

The following research questions guide the study,

1. What is the influence of parents' educational level on the academic achievement of students in Biology?

2. What is the influence of family size on secondary school students' academic achievement in Biology?

Hypotheses

The following null hypotheses will guide the study

Ho1: parents' educational level has no statistically significant influence on secondary school students mean achievement scores in Biology.

Ho2: family size has no statistically significant influence on secondary school students mean achievement scores in Biology.

Method

Ex-post facto design also called causal comparative was used for the study. According to Cohen et al. (2018), ex-post facto design investigates possible cause-and-effect relationships by observing an existing condition and searching back in time for plausible causal factors, since the independent variables, which are parents' educational level and family size, are existing features of the students' homes that were already in place before the study and cannot be manipulated by the researchers. Given the sensitive nature of parents' educational level and family size and the ethical concerns that arise when manipulating these variables, an ex-post facto design was used to analyze existing data on academic achievement, allowing the relationship between parents' educational level, family size and academic achievement to be explored without manipulation. The area of the study is Nsukka local government area of Enugu state. The area was chosen due to the recurrent poor academic achievement of students in Senior Secondary School Examination (SSCE). The population of the study comprises 2,514 SS2 students offering Biology in the 32 public senior secondary schools in Nsukka LGA. The sample size was of 345 SS2 students

determined from the population of 2,514 SS2 Biology students using Taro Yamane's formula at a 5% margin of error (Yamane, 1967). A multistage sampling technique was used. First, four of the thirty-two public senior secondary schools in Nsukka L.G.A. were purposively selected for a more targeted and specific approach to data collection, because families with different educational backgrounds and sizes are usually found in public schools. Then two SS2 classes were randomly selected from each of the four schools by balloting with replacement, so that every class had an equal chance of being selected. The instrument for data collection was a researcher-constructed proforma, and a demographic form for students' personal information. The proforma was used to record each student's existing Biology scores for the first, second and third terms, along with the average of the three, which served as the measure of academic achievement. For the demographic form, the students were requested to tick the options that applied to them: the highest educational qualification of their parents (FSLC; School Certificate; NCE, OND, HND, First Degree, Masters, and Ph.D.) and their family size (1-3, 4-6, or above 6 persons). Face validity was used to validate the instrument by two experts in Measurement and Evaluation field of study and one expert in Biology from Department of Science Education, University of Nigeria Nsukka. The instrument for the study does not require reliability because the study used proforma to collect data on students' existing academic records and demographic data in Biology. Data were analyzed using Statistical Package for Social Science (SPSS - 25). The data were analyzed using mean and standard deviation to answer the research questions. Hypotheses were tested using Analysis of Variance (ANOVA) at 0.05 level of significance. ANOVA was considered appropriate for the testing of the hypotheses because the independent variable has more than two categories.

Results

Research Question One: What is the influence of educational level of the parents on the academic achievement of senior secondary school students in Biology?

Table 1: Mean and Standard Deviation Achievement Scores of Students in Biology based on their Educational Level of the Parents (Qualifications)

Students'-Parental-Education level(Qualifications)	N	Mean	SD
FSLC	22	53.23	33.24
School Cert	42	53.33	15.09
NCE	31	48.00	6.95
OND	73	47.12	6.97
First Degree	35	59.33	23.49
HND	61	59.05	23.42
Masters	29	71.87	7.70
Ph.D	52	72.90	7.68

FSLC=First School Leaving Certificate, NCE=National Certificate in Education, HND=Higher National Diploma, Ph.D= Doctor of Philosophy

Table 1 shows that students whose parents had FSLC had mean achievement scores of 53.23 with

standard deviation of 33.24 and for students whose parent's maximum qualification was School Certificate

had mean achievement score of 53.33 with standard deviation of 15.09. For those with NCE, the mean achievement and standard deviation scores were 48.00 and 6.95 respectively. Similarly, for the students whose parents' qualification were OND had mean achievement score of 47.12 with standard deviation of 6.97. In other hand, students with parents who educational qualification were HND and First Degree had mean achievement scores of 59.33 and 59.05 with standard deviation scores of 23.49 and 23.42 respectively. Students whose parents' highest qualification were Masters and Ph.D had mean

achievement scores of 71.87 and 72.90 with standard deviation scores of 7.70 and 7.68 respectively. The students whose parents had Masters and Ph.D had the highest mean achievement score followed by HND and Degree. The least mean achievement score was obtained by students whose parents were NCE and OND holders and followed by FSLC. Whether educational qualification had significant influence on students' academic achievement in Biology was further tested in Table 2 below.

Hypothesis One: There is no significant influence of educational background of the parents on the academic achievement of senior secondary school students in Biology

Table 2: ANOVA for the Influence of Educational Background on Academic Achievement of Senior Secondary School Students in Biology

	Sum of Squares	df	Mean Square	F	Sig.	Eta Squared	Decision
Between Groups	37462.95	7	5351.85	18.22	0.001	0.23	Significant
Within Groups	98716.80	336	293.80				
Total	136179.75	344					

Results on **Table 2** indicate that parental qualification had significant influence on students' achievement in Biology ($F(7,245) = 18.22, p < 0.001, \eta^2 = 0.23$). Since the associated probability value was lower than the 0.05 level of significance stated for testing the null hypotheses, the null hypothesis one (H_01) which state that parents' educational level has no statistically significant influence on secondary school students mean

achievement scores in Biology was therefore rejected. Furthermore, the effect size ($\eta^2 = 0.23$) indicates that 23 percent variance in students' achievement in Biology was attributed to the students' parental qualification. Consequently, the inference drawn is that parents' qualifications were significant determinant of secondary school students' achievement in Biology.

Research Question Two: What is the influence of family size on the academic achievement of senior secondary school students in Biology?
Table 3: Mean and Standard Deviation Achievement Scores of Students in Biology based on their Family Size

Students' Family Size	N	Mean	SD
1-3 persons (Small Family Size)	83	58.19	19.08
4-6 persons (Moderate Family Size)	154	57.26	18.32
Above 6 persons (Large Family Size)	108	55.72	21.21

Table 3 shows that students with small family size had mean achievement score of ($M = 58.19, SD = 19.08$) against the mean achievement scores of ($M = 57.26, SD = 18.32$) and ($M = 55.72, SD = 21.21$) recorded by students in moderate and large family sizes respectively. However, the standard deviation scores of 21.21 obtained by large family size group indicated that their achievement scores differed from their mean score when compared to small and moderate family sizes. The

moderate family size had the least variation of their scores from the mean as evidence in smallest standard deviation score of 18.32. The students in small family size had the highest mean achievement score followed by moderate group. The least mean achievement score was obtained by students in large family size. Whether family size had significant influence on students' academic achievement in Biology was further tested in Table 4.

Hypothesis Two: There is no significant influence of family size on the academic achievement of senior secondary school students in Biology

Table 4: ANOVA for the Influence of Family Size on Academic Achievement of Senior Secondary School Students in Biology

	Sum of Squares	df	Mean Square	F	Sig.	Eta Squared	Decision
Between Groups	211.02	2	105.51	0.28	0.76	0.002	Not Significant
Within Groups	128635.43	341	377.23				
Total	128846.45	344					

Results on Table 4 indicate that family size had no significant influence on students' achievement in Biology ($F(2,247) = 0.28$, $p = 0.76 > 0.05$, $\eta^2 = 0.002$). Since the associated probability value of 0.76 was higher than the 0.05 level of significance stated for testing the null hypotheses, the null hypothesis two (H_{02}) which state that family size has no statistically significant influence on secondary school students mean achievement scores in Biology was therefore not rejected. Furthermore, the effect size ($\eta^2 = 0.002$) indicates that only 0.2 percent variance in students' achievement in Biology was attributed to the students' family size. Consequently, the inference drawn is that family size was not a significant determinant of secondary school students' achievement in Biology.

Discussion

In this study, it was found that the educational level of parents had a significant influence on the academic achievement of students in Biology. That is, the higher the educational level of parents, the more the children achieve. This may be because students see their parents as role models for academic achievement, and parents with higher educational level may be better in helping their children with homework and schoolwork, have higher expectations for their children, and provide access to educational resources to meet up with such expectations.

This finding is in line with Nwanwukwu and Asiyai (2024), who concluded that parents' level of education predicts students' academic achievement; Khan et al. (2015), who reported a significant positive relationship between parents' educational level and students' academic achievement at the secondary level; and Davis-Kean et al. (2021), who explained that parental educational attainment shapes the interest, involvement and support that parents give their children. Contrary to the finding of this study, Darko-Asumadu and Sika-Bright (2021) found no significant influence of parents' education but rather a relationship between parental involvement and academic achievement, and Alibraheim and Taifour (2023) reported no proven relationship between parents' educational level and children's academic performance. This may be because parents' qualification does not always translate into time spent with their children and involvement in their studies. This finding is also consistent with Walberg's (1981) theory of educational productivity, on which this study was anchored. The theory identifies the home environment, which includes parental involvement, support,

expectations and the availability of learning resources, as one of the factors that influence students' educational outcomes (Reynolds & Walberg, 1992). Parents' educational level shapes this home environment, which may explain why it significantly influenced students' achievement in Biology.

The findings also revealed that family size had no significant influence on the academic achievement of students in Biology, although students in small family size had the highest mean achievement score and those in large family size had the least. This could be because the influence of family size may be mediated by other factors such as the quality of the home environment, which may provide access to resources for students in large family size. Students in large family size may have more competition for resources and attention but may also have more support and opportunities to learn from siblings. The finding is in support of Alsaleh et al. (2021), who found no significant effect of family size on academic achievement, but contradicts Ene (2021), who revealed that family size and family type have significant influence on the academic achievement of students, and Egunsola and Isani (2014), who reported that family size significantly influenced students' performance. A possible reason for these differences is that those studies involved different subjects and class levels, whereas this study used students' existing Biology scores. The finding is also consistent with Walberg's (1981) theory of educational productivity, which places the influence of the home environment on its quality, such as parental involvement, support and learning resources, and not on its structure (Reynolds & Walberg, 1992). Family size alone may therefore not produce a difference in achievement.

Conclusion

The study concluded that students whose parents have high educational level achieve higher than students whose parents have low educational level. Family size was not a determinant of academic achievement of senior secondary school students in Biology, as the differences in scores were not significant. However, parent's educational level was a major factor that determined the academic achievement of senior secondary school students in Biology. The educational implication of the findings is that educators should identify students whose parents have limited formal education and provide them with additional academic support, such as remedial lessons, mentoring and guided study sessions, since such students may receive less academic help at home.

Recommendation

- Educators should promote diversity and inclusivity within the school environment. Create an inclusive atmosphere that values all students, regardless of their background or family size.
- Schools should offer workshops and resources to parents on effective ways to support their children's education. These resources may cover strategies for assisting with homework, managing time, and advocating for their child's educational needs.

Ethical Considerations

Permission to collect data was obtained from the management of the four participating schools, who granted it as gatekeepers. The researchers presented an introductory letter from the Head of the Department of Science Education, Faculty of Education, University of Nigeria, Nsukka. The study used students' existing school records and a brief demographic form that collected no names, and it posed minimal risk to participants. The Biology teacher, who served as research assistant, entered the students' first-, second- and third-term scores on the proforma. The students then supplied information on their parents' educational qualification and family size on a separate demographic form. Each student was identified by an identification number only, which was used to match the scores to the demographic information. The students' records and demographic information were used only for the purpose of this study and were kept confidential.

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