Class Size and Students' Attitude to Learning Biology in Gombi Educational Zone of Adamawa State, Nigeria

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Abstract: The aim of the study was to establish the attitude of students to learning Biology, to examine the academic performance of students in Biology and to compare the attitude of male and female students towards class size. This study investigated the attitude of students to class size and learning Biology. It established the effect of class size on students' academic performance in Biology in Senior Secondary Schools in Gombi Educational Zone, Adamawa State. The study adopted survey design Three research questions and three hypotheses were postulated. The target population for the study comprised 17, 523 senior public secondary school students in Gombi Educational Zone, Adamawa State, and a sample size of 400 was selected by stratified sampling technique. The research instrument titled "Attitude of Students' to Class Size and Learning of Biology Questionnaire (ASCSLBQ)" was adapted from Omwirhiren & Faith, 2016. The instrument comprised of 46 items divided into 3 sections. The face and content validity of the instrument was established by two experts in Counselling Psychology and Test and Measurement in the Department of Science Education, Adamawa State University, Mubi. Test-retest method was used to carry out the reliability test and the reliability coefficient was 0.82. The data collected were analyzed using descriptive and inferential statistics which included percentages, mean, Standard Deviation, and Analysis of Variance (ANOVA). The findings revealed that classes are very rowdy because students are too many, making students not hearing the teacher well during lessons, students love Biology as a subject, because they feel at ease in Biology class, feels good when they solve Biology questions, and are willing to spend more time reading Biology books. There is no significant difference between male and female students attitude towards class size. There is significant difference between the male and female students' attitude towards the learning of Biology; and there is significant difference between male and female students' academic performance. Biology is a general subject offered by all senior secondary school students, but the classes allocated to them are too small, as a result the classes are overcrowded. Even though the students have keen interest in Biology, they cannot perform practical very well because the teachers cannot give individual attention to the large numbers of students, others cannot even hear him well during lessons because there are no public address systems. This factor could adversely affect students' academic performance in Biology. Based on this finding it was recommended that number of students in a class should be streamlined to at most 40 students. In addition, government should provide materials for teaching and learning Biology.

Keywords: Class size, attitude to learning; Biology; overcrowded; inattention.

INTRODUCTION

Biology occupies a unique position among various subjects offered at the senior secondary school level. The study of Biology involves pursuit of truth, a process that instills diligence, patience and objectivity in learners [1]. Biology learning develops the habits in students, which are transferable to other areas of life. Such habits involve non-reliance on superstition, use of critical thinking and respect for other people's opinion [2]. There is therefore the need to adopt efficient teaching and learning strategies that will enhance better achievement and retention of the subject matter by students [3].

Class size according to Ronald [4] refers to the actual number of pupils taught by a teacher at a particular time. Michael [5] defined class size as the number of students for whom a teacher is primarily responsible for during a school year. The class size could be large or small. However, Sparks [6] noted that class can be said to be large when the student number is more than 25. Studies have shown that class size is an important factor that affects student's performance in

Biology [7]. The development of student's positive attitudes regarding Biology as a school subject is one of the major responsibilities of every Biology teacher. Nevertheless, academic performance is directly a function of attitudes of the learners. It is expected that large classes reduce effective classroom control.

It thus has a potential to encourage distraction and disruptive behaviours amongst the students. Finn and Achilles [8] remarked that students in small classes display less disruptive behaviour than those in large classes. The relationship between class size and academic performance has been a perplexing one for educators. Discussing factors affecting students' academic performance will require us to look the concept of poor performance. According to Aremu [9], poor performance is a performance that is adjudged by the examiners and some significant individuals as falling below an expected standard. The interpretation of this expected or desired standard is better appreciated from the perpetual cognitive ability of the evaluator of the performance.

While, Bakare [10], as cited in Abdullahi [11] described poor academic performance as any performance that falls below a desired standard. Essentially, several factors have been shown to be responsible for students' academic performance. These factors include: lack of funds [11], lack of curriculum innovation [12] school structure and organization, teacher quality, curriculum, and teaching philosophies [13]. There is a close association between students' attitude and their achievements. Once the attitudes of students are known, suitable instructional methods can be devised to meet the interest of the students. Despite the awareness of the importance of Biology, in our daily lives, it is however sad to note that performance of students in secondary schools and students' attitude towards this subject leaves much to be desired.

The poor performance of secondary school students in NECO, WAEC and JAMB calls for proper investigation. Although, several scholars have proposed various factors responsible for the poor performance of students, such as economic background of the learner [14] and lately increase in class size. Studies have shown that Positive attitude towards a subject can lead to higher achievement [15]. The way a student perceives Biology influence his or her attitude towards it, and this attitude to Biology determines his or her performance. Class size also affects the level of understanding of the students since the teacher will not have full attention on every student in the classroom. This unpleasant trend in educational development has in turn affected teaching and learning in schools today.

Different researchers [16-18] have reported that large class sizes have negative effect on academic task. Idienumah [19] has included that class size ranks amongst the most important factors that have strong and direct influence on academic performance of schools. Similarly, Alebiosu [20] and Oderinde [21] have reported that students in small classes have greater achievement level than those in large classes.

When students enter a classroom, they likely have a preconceived notion of how the size of the class will determine the learning environment. Theory and research has supported the conclusion that active learning in higher education, with activities and discussions during which students must participate instead of being lectured to by instructors, can help students learn and remember information more effectively [22]. However, this type of learning is typically assumed to be easier to foster in smaller classes, with lower student: teacher ratios, classroom discussions, and activities involving more students, compared to larger classes. In regard to student preference of class sizes, research has found that overall students provide more negative evaluations of large class sizes [23] and prefer smaller class sizes [24], suggesting that they too might enjoy the active learning style often seen in smaller classes.

Kolawole [25] established an inverse correlation between class size and student's achievement concluding that the larger the class, the lower the student's achievement. Nevertheless, academic performance is directly a function of attitudes of the learners. It is expected that large classes reduce effective classroom control. It thus has a potential to encourage distraction and disruptive behaviours amongst the students. Finn, Gerber, Farber, and Achilles [26] remarked that students in small classes display less disruptive behaviour than those in large classes. Fischer and Grant [27] asserted that class size significantly affects the level of students' cognitive skills in the classroom. According to Finn and Achilles [8], small classes improved both the students' performance and learning behaviour as well as it yields fewer classroom disruptions and discipline problem. In view of the above, research has suggested that smaller classes are usually preferred by both instructors and students [28].

Olatunde [29] advised an educational policy of class sizes less than 30 while National Policy on Education [30] recommended the teacher-student ratio of 1:40. More so, students' engagement has been enlisted amongst key elements of educational success [31]. Evidences have shown that it affects pupils' achievement [32]. Meanwhile, Student engagement has been defined as the level of participation and intrinsic interest that a student shows in school [33]. It involves both behaviours and attitudes [34]. The author further made distinctions between these two terms. He classified persistence, effort and attention as behaviours

and enlisted motivation, positive learning values, enthusiasm, interest and pride in success as attitudes.

Pascarella and Terenzini [35] equated student's engagement to students' involvement and concluded that the greater it is, the greater is his or her level of knowledge acquisition and general cognitive development. It has also been reported that engaged students learn more, retain more, and enjoy learning activities more than students who are not engaged [36]. According to McKeachie [18], large classes are simply not as effective as small classes for retention of knowledge, critical thinking and attitude change. Since large class has been found more prominent in secondary schools, poor attitudinal change is expected. This may be due to ineffective classroom management and control by the teachers who are already inundated by the exploded learners' population. This may be the reason why Yusuf [37] remarked that teachers in public secondary schools feel no concerned about affective development of the students. Hence, the effect of class size on attitudes related to study is still opened for an in-depth and more decisive analysis. The foregoing differing findings, opinions and observations call for further investigation into the relationship between class size and student's attitude on academic achievement in Sciences, which this present study was out to do.

Statement of the Problem

In Nigeria, class size in public secondary schools is far above the recommended 30 or 40 students per classroom. Nigerian schools that have as many as 80 students per class have also been reported. These class sizes are considered to be too large for optimum academic achievement of students. This among other factors might have prompted Yusuf [37] to conclude that a number of things are wrong with the educational systems in Nigeria. The number of students in a class has the potential to affect how much is learned in a number of ways.

Exposure to a particular learning environment may affect learning over the time period of exposure, or it may have longer term or delayed effects (e.g., by increasing self-esteem or cognitive developments that have lasting effects). Large classes are simply not as effective as small classes for retention of knowledge, critical thinking and attitude change. Since large class has been found more prominent in secondary school, poor attitudinal change is expected. This may be due to ineffective classroom management and control by the teachers who are already inundated by the exploded learners' population. For these reasons, changes to the class size are considered a potential means of changing how much students learn. Hence the reason for the researchers' interest in examining the effect of class size and senior secondary school students' attitude to learning Biology in Gombi Educational Zone of Adamawa State.

Objectives of the Study
The objectives of the study are to:
- Determine the attitude of students towards class size
- Establish the attitude of students towards learning of Biology
- Examine the academic performance of students in Biology
- Compare the attitude of male and female students towards class size
- Differentiate the attitude of male and female students towards learning of Biology
- Distinguish the academic performance between male and female students in Biology

Research Questions
1. What is the attitude of students towards class size?
2. What is the attitude of students towards learning of Biology?
3. What is the academic performance of students in Biology?

Research Hypotheses

HO$_1$ There is no significant difference between male and female students' attitude towards class size

HO$_2$ There is no significant difference between male and female students' attitude towards learning of Biology

HO$_3$ There is no significant difference between male and female students' academic performance

RESEARCH METHODOLOGY
Research design
The study adopted the survey research design This design is chosen because Fajonyomi [38] says that survey is used for descriptive, explanatory an exploratory purpose, and of course this survey is descriptive in nature and therefore is more appropriate for this study. Descriptive survey research design is considered appropriate because it allows for collection of data from a group of people at the same time for the purpose of describing phenomena under study. Descriptive study also allows the investigator to discuss the phenomenon under study as it exists at the time of the study.

Population and Sample
The target population for the study comprised of senior public secondary school students in Gombi Educational Zone, in Adamawa State. The population of students in the educational zone was about 17,523. The sample size of 400 was chosen from four secondary schools by stratified sampling technique using age, sex and class as strata.

Instrument for Data Collection

The research instrument titled "Attitude of Students to Class Size and Learning of Biology Questionnaire" (ASCSLBQ) was adapted from Omwirhiren & Faith [15]. The instrument comprised of 46 items divided into 3 sections. Section A contained the demographic characteristics of the respondents which constituted age, sex, class, name of school and Local Government Area. Section B contained 20 items that assessed attitude of students towards class size. Section C contained 20 items which measured the attitude of students towards learning of Biology.

Validity and Reliability of Instrument

Table-1: Attitude of Students towards class size using mean and standard deviation

Item	N	Mean	Standard Deviation	Remarks
The laboratory is always filled to capacity during practical	400	3.92	.567	Accepted
The laboratory equipment are not always sufficient for practical because of too many students	400	2.69	.133	Accepted
The Biology teachers don't give individual attention to students during practical because of large class size	400	2.34	1.133	Rejected
The seats in the laboratory for practical are inadequate for students due to our large number	400	2.56	.089	Accepted
Many of the students are not involved in Biology practical because of inadequate equipment to practice	400	2.97	.671	Accepted
Students always struggle to get essential apparatus during Biology practical because of the inadequacy	400	1.96	.633	Rejected
Biology laboratory during practical is always noisy and rowdy because of a large class	400	2.56	1.935	Accepted
I love to attend Biology practical but the unconducive situation always put me off	400	3.21	.323	Accepted
Students always suffer a great deal during Biology test practical tests and examination due to insufficient laboratory equipment	400	2.74	.981	Accepted
The Biology laboratory is always hot and unpleasant to stay in the afternoons because of too large number of students	400	2.67	.637	Accepted
My class is always attractive to me	400	2.55	.637	Accepted
I feel convenient writing my notes in class	400	2.31	.782	Accepted
I hate coming to school because the class is not comfortable for me	400	2.45	.453	Rejected
My class is large and spacious	400	1.77	1.234	Rejected
It is very difficult to move around in the class due to lack of space	400	2.85	.453	Accepted
I have been missing classes due to inability to secure a seat	400	2.43	.433	Rejected
My class teacher is not bothered about our sitting arrangement	400	3.44	.922	Accepted
My class is very crowdy because we are too many	400	3.36	.123	Accepted
Many of my class mates have no space to put their seats	400	2.43	.343	Rejected
It is not convenient to write test and examination in my classroom because we are too many	400	3.47	.443	Accepted

*Accepted ($\bar{x}$ = 2.5 and above); Rejected ($\bar{x}$ = less than 2.5)

The face and content validity of the instrument was established by two experts in Counselling Psychology and Test and Measurement in the Department of Science Education, Adamawa State University, Mubi. The reliability of the instrument was carried out in Adamawa State University Demonstration School using test-retest reliability method. First test was administered on 30 students, while the second test was administered on the same set of students after two weeks. The reliability coefficient of 0.82 was obtained.

Data Collection and Analysis

The researchers administered and collected data on the spot. Thus the retrieved data were analyzed using descriptive and inferential statistics such as percentages, mean, Standard Deviation, and Analysis of Variance (ANOVA).

RESULTS

Research Question 1: What is the attitude of students towards class size?

Table-1 reveals that the laboratory is always filled to capacity during practical ($\bar{x}$ = 3.92), the laboratory equipment are not always sufficient for practical because of too many students ($\bar{x}$ = 2.69), the Biology teachers don't give individual attention to students during practical because of large class size ($\bar{x}$ = 2.34), the seats in the laboratory for practical are inadequate for students due to our large number ($\bar{x}$ = 2.56), many of the students are not involved in Biology practical because of inadequate equipment to practice ($\bar{x}$ = 2.97), students always struggle to get essential apparatus during Biology practical because of the inadequacy ($\bar{x}$ = 1.96), Biology laboratory during practical is always noisy and rowdy because of a large class ($\bar{x}$ = 2.56), students love to attend Biology practical but the unconducive situation always put me off ($\bar{x}$ = 3.21), students always suffer a great deal during Biology test practical tests and examination due to insufficient laboratory equipment ($\bar{x}$ = 2.74), the Biology laboratory is always hot and unpleasant to stay in the afternoons because of too large number of students ($\bar{x}$ = 2.67), class is always attractive to students ($\bar{x}$ = 2.55), students do not feel convenient writing my notes in class ($\bar{x}$ = 2.31), student don't hate coming to school because the class is not comfortable ($\bar{x}$ = 2.45), class is large and spacious ($\bar{x}$ = 1.77), it is very difficult to move around in the class due to lack of space ($\bar{x}$ = 2.85), students do not miss classes due to inability to secure a seat ($\bar{x}$ = 2.43), class teacher is not bothered about our sitting arrangement ($\bar{x}$ = 3.44), classes are very crowdy because students are too many ($\bar{x}$ = 3.36), many students have no space to put their seats ($\bar{x}$ = 2.43), and it is not convenient to write test and examination in my classroom because we are too many ($\bar{x}$ = 3.47)

Research Question 2: What is the attitude of students towards learning of Biology?

Table-2: Attitude of Students towards Learning of Biology using mean and standard deviation

ITEMS	N	Mean	Std. Deviation	Remark
Biology is fascinating and fun	400	2.67	.881	Accepted
I really like Biology	400	2.51	.333	Accepted
Biology is very interesting	400	2.73	.993	Accepted
I feel at ease in Biology class	400	1.94	.611	Rejected
I like Biology than any other subject	400	2.56	.343	Accepted
I feel good when I solve Biology questions	400	2.87	.222	Accepted
I am willing to spend more time reading Biology books.	400	3.69	.553	Accepted
Biology makes me feel secure and at the same time its stimulating	400	3.27	.865	Accepted
Biology is a subject in school that I enjoy studying	400	2.97	1.234	Accepted
Biology is useful for solving everyday problems.	400	2.53	.932	Accepted
I feel a definite positive reaction towards Biology.	400	2.67	1.089	Accepted
I dislike Biology	400	2.10	.013	Rejected
I do not like Biology and it scares me to have to take it	400	2.45	.081	Rejected
My mind goes blind and am unable to think clearly when working Biology	400	2.65	.321	Accepted
I feel a sense of insecurity when attempting Biology	400	1.97	.321	Rejected
I am always under a terrible situation in a Biology class	400	2.29	1.083	Rejected
Biology is a better subject for boys to study than girls	400	1.77	.963	Rejected
Biology makes me feel uncomfortable and impatient	400	2.49	.555	Rejected
Biology is boring	400	2.33	.241	Rejected
Biology makes me feel as though I am in a jungle of formulae or equations and can't find my way	400	1.63	1.993	Rejected

*Accepted ($\bar{x}$ = 2.5 and above); Rejected ($\bar{x}$ = less than 2.5)

Table-2 shows the students develop positive attitude to learning Biology. Biology is fascinating and fun ($\bar{x}$ = 2.67), students really like Biology($\bar{x}$ = 2.51), Biology is very interesting ($\bar{x}$ = 2.73), students feel at ease in Biology class($\bar{x}$ = 1.94),students like Biology than any other subject ($\bar{x}$ = 2.56), students feel good when they solve Biology questions ($\bar{x}$ = 2.87), students are willing to spend more time reading Biology books($\bar{x}$ = 3.69), Biology makes students feel secure and at the same time its stimulating($\bar{x}$ = 3.27), Biology is a subject in school that students enjoy studying($\bar{x}$ = 2.97), Biology is useful for solving everyday problems($\bar{x}$ = 2.53), students feel a definite positive reaction towards Biology ($\bar{x}$ = 2.67), students do not dislike Biology($\bar{x}$ = 2.10), students like Biology and even if it scares them to have to take it ($\bar{x}$ = 2.45), My mind goes blind and am unable to think clearly when working Biology($\bar{x}$ = 2.65). Students do not feel a sense of insecurity when attempting Biology ($\bar{x}$ = 1.97), students are always not under a terrible situation in a Biology class($\bar{x}$ = 2.29), Biology is a good subject for all genders($\bar{x}$ = 1.77), Biology never makes students feel uncomfortable and impatient($\bar{x}$ = 2.49), Biology is not boring ($\bar{x}$ = 2.33), and Biology does not make students feel as though they are in a jungle of formulae or equations and can't find their way ($\bar{x}$ = 1.63). From the responses in Table 4.1.2, it can be seen that Biology is very interesting, and students like the subject very well.

Research Question 3: What is the academic performance of students in Biology?

Table-3: 2016/2017 Summary of Academic Achievement of Senior Secondary School Students in Biology

School	Class	First Term	Second Term	Third term	Cumulative Score	Average (%)
School 1	SS 1	43	50	46	141	47%
School 2	SS 1	38	41	41	120	40%
School 3	SS 1	53	44	42	139	46%
School 4	SS 1	37	33	34	104	34%
School 1	SS 2	46	44	54	144	48%
School 2	SS 2	52	57	55	114	55%
School 3	SS 2	47	40	40	127	42%
School 4	SS 2	41	41	42	124	41%

Table-3 is 2016/2017 summary of academic achievement of senior secondary school students in Biology. SS 1 students from school 1 had a cumulative score of 141 and an average of 47%, while their counterparts from School 2 had a cumulative score of 120 and average of 40%, and students from School 3 had a cumulative score and an average of 46%. SS 1 students from School 4 had a cumulative score of 104 and an average of 34%.

SS 2 students from school 1 had a cumulative score of 144 and an average of 48%, while their counterparts from School 2 had a cumulative score of 114 and average of 55%, and students from School 3 had a cumulative score and an average of 42%. SS 1 students from School 4 had a cumulative score of 104 and an average of 41%.

Based on the cumulative scores and the average of scores of students from the four schools, it shows that students' academic performance in Biology is below average.

Hypothesis 1: There is no significant difference between male and female students attitude towards class size

Table-4: Difference between Male and female Students Attitude towards class size

Source of Variable	Sum of Squares	Df	Mean Square	F-cal	F-crit	Remark
Between Groups	2.800	1	2.800	3.433	3.87	Accepted
Within Groups	273.636	398	.918			
Total	314.437	399				

*Not Significant: P < 0.05

From Table-4, the f-value of 3.433 obtained is lower than the critical f-value of 3.87 at P < 0.05 level of significance. Therefore, the null hypothesis is accepted. Hence, there is no significant difference between male and female students attitude towards class size.

Hypothesis 2: There is no significant difference between male and female students attitude towards learning of Biology

Table-5: Difference between Male and Female Students' Attitude towards learning of Biology

Source of Variable	Sum of Squares	df	Mean Square	F-cal	F-crit	Remark
Between Groups	29.872	1	29.872	42.134	3.87	Rejected
Within Groups	211.274	398	.709			
Total	241.147	399				

*Not Significant: P < 0.05

From Table-5, the f-value obtained which is 42.134 is greater than the critical f-value obtained which is 3.87. Therefore, the null hypothesis is rejected, and the alternative accepted. Hence, there is significant difference between the male and female students attitude towards the learning of Biology.

Hypothesis 3: There is no significant difference between male and female students academic performance

Table-6: Difference between Male and Female Students Academic Performance

Source of Variable	Sum of Squares	Df	Mean Square	F-cal	F-crit	Remark
Between Groups	4.526	1	4.526	5.310	3.87	Rejected
Within Groups	254.020	398	.852			
Total	258.547	399				

*Not Significant: P < 0.05

From Table-6, the f- calculated value of 5.310 is greater than the f-critical value of 3.87. Therefore, the null hypothesis is rejected and the alternative accepted. Hence, there is significant difference between male and female students academic performance in Biology.

DISCUSSION

This study found out that classes are very rowdy because students are too many, making students not hearing the teacher well during lessons, thereby leading to low academic achievement of students. This finding is in agreement with the findings of Adelaya [16] who found in her study that a large class is not conducive for serious academic work, and the findings of Yara [39] found out that the performance of students in large classes was very low (23%) compared to those of smaller classes (64%). However, it contradicts the findings of Pong and Pallas [40] who found that students do better in large classes. They hypothesised that this could be because more experienced teachers are given larger classes to teach.

This study found out that students love Biology as a subject, because they feel at ease in Biology class, feel good when they solve Biology questions, and are willing to spend more time reading Biology books. There is no significant difference between male and female students attitude towards class size. This is in agreement with Gobena [41] who found out that there was no significant mean difference between male and female disposition towards class size.

This study also found out that there is significant difference between the male and female students attitude towards the learning of Biology. This is in agreement with Rajakorpi [42] who found out significant differences between the interest levels towards learning of Biology are in favour of male students, that the female students' personal interest level towards learning of Biology is insignificantly different from male students' interest levels indicates that women position in the field of Biology may increase. Zhu [43] indicated that female and male students may have different learning of Biology styles which he found that girls preferred to learn in a conversational style and collaborative activity, and work with concrete objects. Boys, on the contrary, liked to learn through argument and individual activity, and tended to use more abstract thinking.

This study also found out that there is significant difference between male and female students academic performance. This is in agreement with the findings of Okereke and Onwukwe [44] which revealed that the male students achieved better than female students.

CONCLUSION

Biology is a general subject offered by all senior secondary school students, but the classes allocated to them are too small, as a result the classes are overcrowded. Even though the students have keen interest in Biology, they cannot perform practical very well because the teachers cannot give individual attention to the large numbers of students, others cannot even hear him well during lessons because there are no public address systems. This factor could adversely affect students' academic performance in Biology.

RECOMMENDATIONS

Based on the findings of this study, the following recommendations are made:
- Number of students in a class should be streamlined to at most 40 students per class by the school heads as it will reduce rowdiness in classes.

- Teachers should encourage students in their study of Biology as the findings has shown that students are interested in studying Biology by making Biology classes as lively as possible.
- Government should provide adequate materials that will be enough for teaching and learning of Biology.
- The school authority should provide more instructional materials which includes public address system so that students in a large class could be instructed as appropriate.

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