Effect of Class Size on the Teaching and Learning of Mathematics in Senior High Schools

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Abstract: This study sought to determine the extent to which large class sizes influenced the manner in which teaching and learning were mediated in senior high schools. To achieve this, a survey design was employed. 192 students were purposively selected from four senior high schools in the Asutifi North and South Districts. A questionnaire with a reliability coefficient of 0.791 was used to obtain data from the respondents. Quantitative data analysis was performed using Statistical Products and Service Solutions (SPSS). Both descriptive and inferential statistical tools were used in order to analyze the data and also answer the research questions. To find out the influence of class size on the teaching and learning of mathematics in SHS, the mean, standard deviation, multiple linear regression, and Pearson's product moment correlation were used to perform the analyses of the data collected. According to the study, large class sizes have an impact on students' academic performance as well as their learning opportunities. It was again revealed that classroom interactions had a great influence on the students' academic performance. It has been recommended that since small class sizes and good classroom interactions enhance performance, therefore, teachers and head teachers should make sure they conform to the required teacher-to-student ratio of 1:40 set by the Ghana Education Service. Teachers should create an enabling environment for students to participate in classroom activities. Furthermore, the study showed that students performed better in smaller classes with good classroom interaction. Therefore, the government should employ more teachers and build more classrooms to solve the problem of large class sizes in the senior high schools in Ghana.

Keywords: Large Class Size, Classroom Interactions, Academic Performance, Senior High Schools

1. INTRODUCTION

The quality of education has been a major concern in the educational development of every country in the world. The level of quality education depends on, among other things, the number of students in the class and the teaching and learning activities that take place. The student population has seen a rise since the introduction of the free senior high school policy and all the other educational intervention programs that have been implemented. This has, however, contributed to the increased class size in the various schools. Due to this, several educational reforms were administered to reduce the number of large class sizes in the various Senior High Schools. The major objective of the school system, as designed by the Ghana Education Reform Programme of 2017, is to make education more relevant to the socio-economic realities of the country, so that the Ghanaian children will be able to live a productive and meaningful life. According to Osei-Mensah (2012), the size of class increases as the school population increases and this has effects on the teaching and learning and also on the academic performance of the students.

According to De Grauwe (2017), every developing country has the priority of improving the quality of schools and enhance students' academic performance. Barro (2019), also stated that learning outcomes depend mainly on the quality of education given to students. He further emphasized that higher level of quality in education strengthened economic growth and development. However, Lockhead & Verspoor (2021), stressed that the quality of education partially relies on

how trained teachers are and the number of students they preside over in class since they are the essential processes to education delivery. It has been a concern of the stakeholders in this country in emphasizing the need of the people to access high quality education. This has, however, resulted to large class size in various school and that aspect of education has seen less attention from the stakeholders.

Class size affects the teaching and learning of many subjects, including mathematics. Mathematics, however, is a pillar of almost all the streams in the academic sector. It plays a very vital role in basic, secondary, and tertiary education and also in most careers. Due to its importance in education, the National Policy on Education has made mathematics one of the core subjects that every student must take in addition to his or her specialties at the secondary level. The policy made mathematics a must-pass core subject, which will enable a student to offer arts or science in higher education. The implication of the compulsory nature of mathematics demands much, especially from the teacher. Despite the importance of mathematics, it has seen a generally low performance from students in examinations, for which class size has been identified as one of the causes of this low performance.

In many ways of providing good education to students all over the world, several considerations have been suggested as being accountable for the falling standard of education. One of these factors includes issues with large class size and its relation to the teaching and learning. As the country's students' population grows each year, pressure is been mount on the existing deteriorating public Senior High Schools facilities. Since the introduction of the Free Senior High School Policy, the population in the various schools keep on increasing each academic year. However, there are not enough classroom to accommodate the students, and the only way to accommodate them is to increase the class size more than the required number. This research then intended to check if the overcrowded students in classes has effect on the teaching and learning of mathematics.

In general, the situation of having a large class size has not only been a challenge for developing countries, it is also a challenge for developed countries as well. Since Achilles and Finn (2016) proclaimed that small class sizes should be the foundation of educational policy, educational institutions all over the world have adopted this strategy by venturing into class size reduction projects. This strategy was adopted by many countries including China and Netherlands. The UK government also joined when they were prompted by the concerns of large classes and its implications on students, and this resulted to the introduction of a maximum of 30 to a class for children in schools. In view of this, the Ghana Education Service also introduced a teacher to students' ratio of 1:40, with the focus of intensifying the effectiveness of teaching and learning procedures in class.

According to Adeyeni (2020), the impact of class size on the quality of output in Senior High Schools indicated that schools with an average class size of 35 or less achieved better results in West Africa Secondary School Certificate Examination (WASSCE) than schools having more than 35 students per class. Earthman (2022) stated that comfortable classroom conditions and smaller class sizes boost teachers' effectiveness and also lay out opportunities for students to ask more question, receive individual attention, partake fully in discussions, lessen indiscipline problems and perform better that student in larger class size. The large class size makes it difficult for teachers to manage and teach effectively, since some of the students neither pay attention to nor participate in class activities, but only add to the numbers (Yelkpeiri et, al. 2012).

Since the introduction of the Free Senior High School Policy and its relation to the high intake of students in schools, it is obvious to find about 55 to 70 students in a class in the various schools in Asutifi North and South Districts. This has been a concern for teachers as to how to manage such a population. As cited by Akoto-Baako (2018), at the annual general meeting of the Headmasters' Conference held in July 2015 at the University of Ghana, the speakers lamented the increasing number of students and the inadequate facilities, teachers, and other dwindling resources in schools. However, the increase in student population has not resulted in infrastructure development in the various schools. This also indicates that the occurrence of large class sizes could lead to poor classroom management, which includes issues of utilization of classroom rules, inadequate instructional materials, and a lack of desire for students to learn.

Seda (2020), Eathman (2022), Adeyemi (2020), Akoto-Baako (2018), just to mention a few, are some of the researchers who have investigated the relationship of large class size and its consequences on the students' academic performance. This study emphases on the relationship of how the class size influences the teaching

and learning of mathematics. In the light of the above statement, my study focused in finding out the effects of class size on the teaching and learning of mathematics in Senior High Schools.

The purpose of this study was to link the relationship between class size and its effects on teaching and learning of mathematics. This study looked at the values and benefits as well as the disadvantages of larger class size on the performance of students and the extent to which it influences the manner in which teaching and learning of mathematics is mediated in Schools.

2. MATERIALS AND METHODS

Research Design

Quantitative study is an umbrella term that encompasses many research designs, including survey, correlational study, causal comparative study, and experimental study. The designs may have some related features and differences, but out of these, the survey was chosen for the purpose of investigating the current status on how large class sizes influence teaching and learning and also on students' academic performance.

According to Ary, Jacobs and Razavieh (2021), survey studies are designed to obtain information concerning the current status of phenomena. Seidu (2019) described survey as the study of existing condition, prevailing view points, attitudes, on-going processes and developing trends in order to obtain information that can be analyzed and interpreted to come up with a report of the present status of subject or phenomenon under study. This design was found suitable because it gives an in-depth description of the phenomena in their existing setting and economical in collecting data from a large sample with high data turn over **.**

Gay (2019) contended that survey determine and report just the way things are. He further indicated that they are directed towards the determination of the nature of situation as they exist, as at the time of the study. Fraenkel and Wallen, (2016) stated that obtaining answers from a large group of people to a set of carefully designed and administered questions lie at the heart of survey research. Thus, the researcher employed survey in his research because it focuses on opinions that people have on how large class size influence the teaching and learning of mathematics and also the impact it has on students' academic performance in Asutifi North and South District.

For this study, the researcher chose cross-sectional survey because he collected the data at a limited time. For example, the researcher surveyed the views of students on how large class size influenced teaching and learning and how the situation can be managed. From the view of Sheperis, Young and Daniels (2010**)**, using cross sectional survey design, the researcher is able to collect data quickly and generate research results in a timely manner. Again, they further stated that the design provides information about participants' present-day state of their classroom environment. With this, the data obtained can quickly be used to make decision about current situation of large class of students in Ghana.

Hennekens and Buring, (2017) also outlined the strengths and weaknesses of cross-sectional survey. The strengths are relatively quick and easy to conduct, data on all variables are collected only once, ability to measure prevalence for all factors under investigation, multiple outcome and exposures can be studied, well for descriptive analysis and for generating hypothesis. The weaknesses are difficulty to determine whether the outcome followed exposure in time or exposure resulted from the outcome, it measures prevalence rather than incident cases, associations identified may be difficult to interpret, susceptible to bias due to low responses and misclassification due to recall bias. Since the researcher was working with a limited time, cross sectional survey was appropriate in helping to relatively conduct and collect data within a shorter time.

Population

According to Best and Kahn (2020, p.13), population is defined as "a group of individuals who have one or more characteristics in common that are of interest to the researcher". Population is, thus, the group to which a researcher would like to make references from. For this study, the researcher chose students from the PSHSs, in the Asutifi North and South District.

Sample and Sampling Technique

There are many sampling strategies used in qualitative research. Qualitative samples tend to be purposely selected rather than randomly selected. According to Denzin and Lincoln (2016), "purposeful sampling is used as a strategy when one wants to understand something about certain select cases without needing to generalize to all such cases". In a sample survey, data is collected from a sample of a population to determine the incident distribution, and connectedness of events and conditions. This is a non-representative subset of some

larger population and is constructed to serve a specific need and purpose.

Regarding the size of the sample, Patton (2021:184) suggests that "there are no hard and fast rules for sample size in qualitative researches, it all depends on what you want to know, the purpose of the inquiry, and what can be done with the available time and resources". The sample strategy in this study was designed to complement the larger number of participants in the questionnaire with the more in-depth interview of a smaller group of participants. This way I could both gauge the diverse range of views from the larger group and gain insights of a selected smaller group with the time and resources available. It was vital to avoid getting grid-locked into rigid designs that eliminate responsiveness and pursue new parts of discovery as they emerge. To this end I selected purposeful sampling and use of the case study or bounded system because it is "information rich" and illuminative, that is, it offers useful manifestations of the issue at hand. Homogenous sampling in this case is aimed at unraveling insights about the phenomenon, not imperial generalization from a sample to a population. It focuses, reduces variation, simplifies analysis and facilitates group interviewing and observation. The sampling techniques used are the purposive and the simple random sampling.

The population for this study was first year students belonging to two distinct groups under study; the small and the large class size group of two different classes. For logistical and cost reasons, the gathering of data for this study was restricted to two classes only. The researcher purposefully selected Business and Agricultural Science classes (which has small class size throughout these four school) and also two classes from General Arts (which are the most populated classes observed in the four schools. The participants were specifically selected from the two extremes of each of the two classes. Through random sampling, 12 students were selected from each class. This implies, forty-eight (48) respondents were selected in total from each of these four schools.in all, a sample size of 192 were obtained for the study.

Research Instruments
In an attempt to elicit relevant information for the study, the researcher employed questionnaire as data collection instrument. A self-developed questionnaire was employed for the study. The instruments were developed in line with the literature. Four point Likert-type scales were used to register the extent of

agreement or disagreement with a particular statement of attitude, beliefs or judgment. The four Point Likert-type scale will be scored as: "Strongly Disagree" =1, "Disagree" =2, "Agree" =3, and "Strongly Agree" =4.

The questionnaire was divided into four (4) main sections and contains thirty (30) items. Section A (1-6) elicited background information on the various schools and respondents. They include: name of institution, gender, age, program of study, and number of students in class. Section B elicited information on how class size influences the manner in which teaching and learning of mathematics are mediated in a public senior high school. Section C dwelled on how class size affected students' performance in public senior high schools. Section D covered how large class sizes can be managed to enhance good students' academic performance in public senior high schools. It was important to craft items of the questionnaire around issues that were central to the research because, according to Bell (2020), they enable the researcher to gather the relevant data to answer the research questions and achieve the objectives of the study. Mock examination scores for Core Mathematics were obtained from the schools as a measure of students' performance.

Data Collection Procedure
In conducting research, Creswell (2020) instructed researchers to seek or obtain permission from the authorities in charge of the site of the study because it involves prolonged and extensive data collection. In order to deal with ethical issues like confidentiality, anonymity, consent, and debriefing, the researcher applied for ethical clearance from the Institutional Review Board at the Catholic University College of Ghana. An introductory letter was also collected from the Department of Education to grant the researcher access to the study and to seek permission from the headmasters and mistresses of all sampled PSHS to carry out the study in their schools. When permission was granted, a questionnaire was sent to students at the schools. The researcher was personally present at each of the schools to administer the questionnaire. Administering the questionnaire personally offered the researcher the opportunity to explain to the respondents in detail how to respond to the items on the questionnaire.

Data Processing and Analysis
The demographic variables from the questionnaire were primarily analyzed using descriptive statistics where frequency and central tendency of respondent'

responses were measured. Univariate analysis was conducted to gain descriptive statistics on each of the variables in this study. Descriptive statistics (frequencies and percentage) were calculated for age, gender, religion and type of school. The second section of the questionnaire was analyzed using means and standard deviations for research questions and the hypothesis were tested using Pearson product moment correlation. The analysis was calculated using an alpha level of 0.05 to achieve statistical significance. The Statistical Package for the Social Science (SPSS) for Windows (2010) was the computer program used to analyze data for this study.

3. RESULTS AND DISCUSSION

Bio-Data of Respondents

In all, 192 questionnaires were distributed to students of the selected schools. The researcher ensured 100% return rate of the questionnaire. This presupposes that the entire 192 questionnaire that were distributed to the students were all filled and returned for analysis and discussion. The views of the respondents are presented in the section that follows.

Statistical Analysis of Demographic Data

This section of the questionnaire was designed to elicit the personal information of the students involved in the study. This included: their gender, age, and names of their various schools.
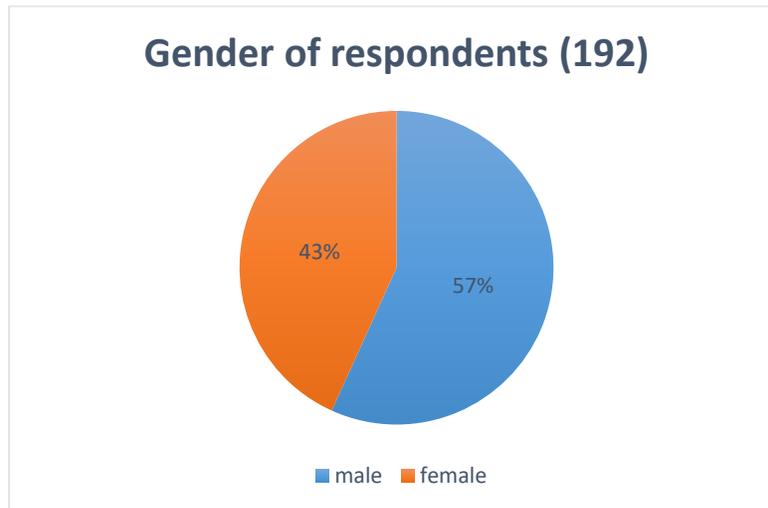

Figure 1: A pie Chart Showing the Sex of the Respondents
Source: Field Survey (2021)

Figure 1 presents the pie chart on the gender of the respondents. The results revealed that male students were 109 representing 57% and female students were 83 representing 43%. This showed that there were more male students who took part in the study than females.
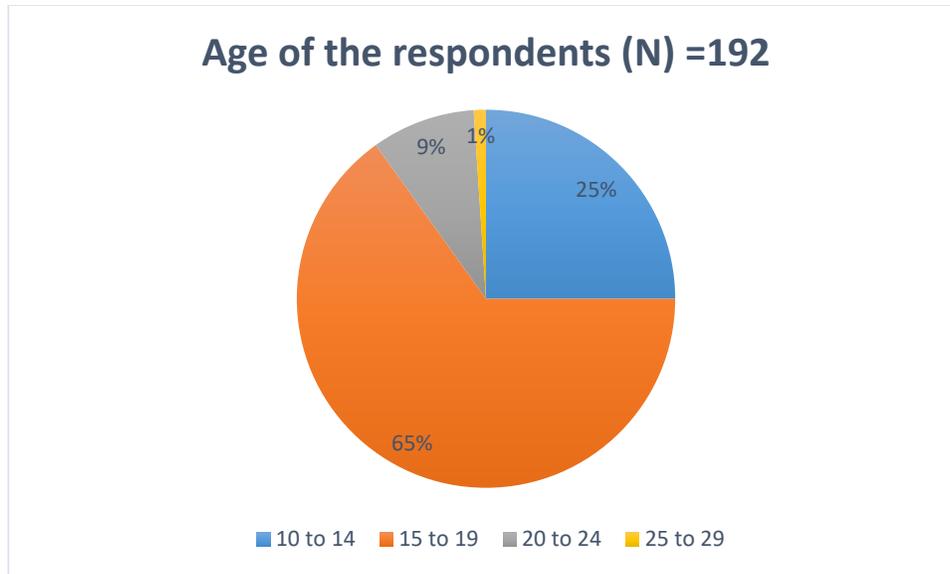
Figure 2: A Pie Chart Showing the Age of the Respondents
Source: Field Survey (2021)

Figure 2 also presents a Pie Chart of age distribution of the respondents. The figure shows that the majority of the students were within the age range of 15 and 19. That is 125 of them representing 65%. Those students within the age range of 10 and 14 were 48 representing 25% of the students. Seventeen of them representing 9% were within the ages of 20 and 24. Only 2 of them representing 1% were within the ages of 25 and 29.
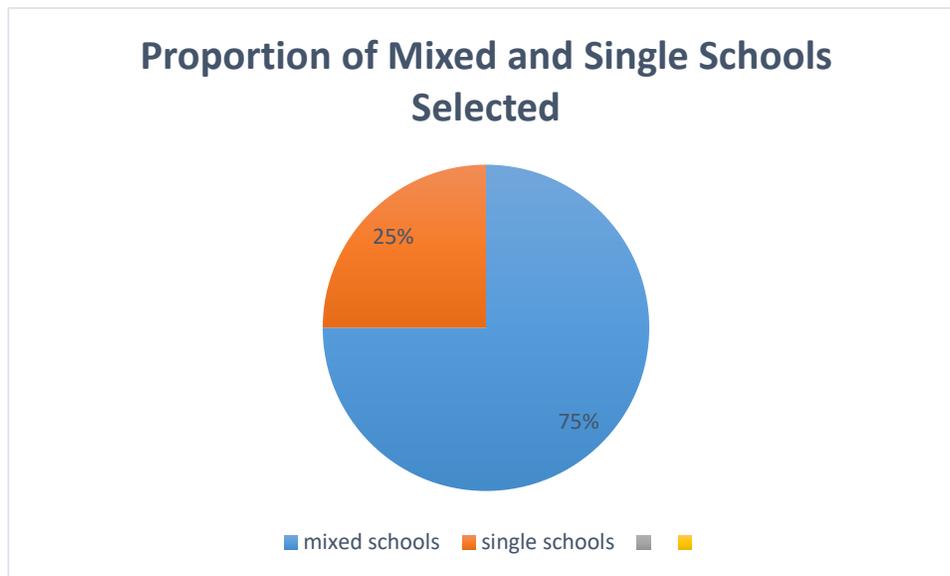

Figure 3: A Pie Chart Showing the Proportion of the Schools Selected
Source: Field Survey (2021)

Figure 3 presents the proportion of the mixed and single sex schools selected for the study. The results showed that there were more mixed schools than single schools that took part in the study.

Table 1: Estimated Population of PSHSs in Asutifi North and South District

Name of PSHSs	Estimated Students population
Hwidiem Senior High School	1,540

Acherensua Senior High School	1645
OLA Girls Senior High School	1432
Gyamfi-Kumani Senior High School	1665

Source: Field Survey, Boateng (2021)

The study was carried out among PSHSs in the Asutifi North and South District. In the Ahafo region of Ghana. There are four public senior high schools listed in these two Districts. The total population consists of Eight thousand Two Hundred and Eithy-two (6282) from the Four PSHSs in the two Districts. The targeted population are all these four school in the districts.

Statistical Analysis of the Main Data
To achieve the purpose of the research questions and hypothesis, Descriptive Statistics (Means and Standard Deviations) and inferential statistics (Pearson Product Moment Correlation coefficient and multiple regression) were deemed appropriate for the analyses.

The findings are presented below.

Research Question One: How do class size affect the teaching and learning of Mathematics in Senior High Schools?

Table 2: Means and Standard Deviation Results of how Class Size Influence the Manner in which Teaching and Learning is Mediated in Senior High Schools

s/n	Statement	N	Mean	Std. D
1	Class size affects the pace of the lessons in class	192	2.24	1.09
2	Teachers are able to identify students who have difficulties in understanding the main ideas of a lesson	192	2.52	1.11
3	Large class size increases the time teacher spent on handling non-instructional tasks.	192	2.23	0.837
4	Teachers spend a lot of time controlling students rather that teaching	192	1.99	0.713
5	Teachers are able to assess the instructional needs of students.	192	2.53	1.12
6	Teachers are able to assess the emotional need of students	192	2.52	1.11
7	Mean of Means/ Std. D	192	2.33	0.997

Source: Field Survey (2021)

The objective of this research question was to find out whether class size influenced the manner in which teaching and learning were mediated in the public senior high schools. To realize this objective, means and standard deviations were computed for the items. The responses from the students produced a mean score of (mean = 2.33, SD = 0.997, n = 192), which means that class size and the psychological classroom environment did not influence the manner in which teaching and learning were mediated in the selected senior high schools.

From Table 2, response to item whether class size affects the pace of the lessons in class, the results show that (mean=2.24, SD=0.704, N=192) large the class size does not promote effective flow of lessons in class. On the issues of whether teachers are able to identify students who have difficulties in understanding the main

ideas of a lesson, the data (mean=2.52, SD=1.11, N=192) shows that teachers are been able to identify students who have difficulties during lessons. Also, on whether large class size increase the time teacher spent on handling non-instructional tasks (mean=2.23, SD=0.837, N=192), which is less that the test value of 2.5, confirms the fact that teachers spent more time on handling non-instruction tasks rather than focusing on the instructional activities.

Table 2 further shows that teachers spend a lot of time controlling students rather that teaching in class. To confirm this, the item produces a mean of (mean=1.99, SD=0.713, N=192) which showed that large class size influences the teacher in spending more time controlling students rather than teaching. The data (mean=2.53, SD=1.12, N=192) and (mean=2.52, SD=1.11, N=192) show that teachers are able to assess the instructional

needs of students and also teachers are able to assess the emotional need of students respectively.

The findings are consistent with the findings of Miller and Cunningham (2011) that teachers who run respectful classrooms are in turn more respected by their students, and students believe that these teachers also hold higher learning expectations. Teachers are encouraged to focus more on the learning task than on the outcome or grade assigned at the end of the task, although this becomes much more difficult if the emphasis in education is placed on accountability and high-stakes testing.

Kobina (2021) asserted that smaller class size influences the way and manner a teacher will be able to deal with the psychological needs of students. Because with smaller class the teacher will be able to concentrate on the needs of students that is; personal, emotional and social aspect of the student. In support of this statement, Agyemeng (2009) believed that a smaller class size can help students to perform well academically than students in large classes where arrangement in class causes distress to them. A qualitative study by Owusu-Ansah (2014) suggested that teachers struggle as class sizes escalate which affect student academic performance in classroom.

Research Question Two: How do class size influence students' performance in mathematics in Senior High Schools?

Table 3: Means and Standard Deviation Analysis of How Class Size Affects Students' Academic Performance in Mathematics in Senior High Schools

S/n	Statement	N	Mean	Std. D
1	Large class size limits my ability to listen to daily instruction from my teacher.	192	2.63	1.48
2	Large class size limits my ability to participate in classroom activities.	192	2.59	1.12
3	Large class size affect my academic performance.	192	2.57	1.22
4	Large class size limits my learning opportunities.	192	2.64	1.43
5	Mean of Means/Std. D	192	2.64	131

Source: Field Survey (2021)

On a four-point Likert scale, the students were asked to indicate their levels of agreement or disagreement with statements concerning how class size influenced student' academic performance. A mean score of 2.50 and above indicate positive responses while a mean of 2.49 and below indicate students" negative responses. The test value was computed by adding all the scores on the Likert scale. That is Strongly Agree was scored as 4, Agree as 3, Disagree as 2 and strongly Disagree as 1. The test value was obtained by adding all the scores together (4 +3+2+1=10) and was divided by the four-point Likert scale (10/4=2.5).

The purpose of this research question was to investigate and find out how class size influenced students' academic performance in a public senior high school. The overall mean score (mean=2.64, SD=1.316 n=192) provided evidence that class size had an impact on students' academic performance. The responses on the item "large class size limits my ability to listen to daily instruction from my teacher" produced a (mean =2.63, SD=1.48, n=192) which is greater than test value of 2.5.

On the issue of whether large class size limited the student's ability to participate in classroom activities, the (mean =2.59, SD=1.126, n=192) shows that indeed class size limited students' ability to participate in classroom activities.

The results further gave evidence that large class sizes influenced students' academic performance. The data (mean = 2.57, SD = 1.22, n = 192) showed that students' academic performance was influenced by the large class size. Finally, on the learning opportunities of the students, the results show that large class sizes limited their learning opportunities. The fact that the mean was 2.76, SD was 1.43, and n was 320, which is more than the test value of 2.5, gives evidence to those effects.

The findings of the present study confirm the work of Blatchford, Bassett, Goldstein and Martin, (2020); Blatchford, Russell, Bassett, Brown, and Martin, (2018); Cakmak (2009) and Finn and Achilles, (2016) who also found out that larger class sizes resulted in less time being utilized for instruction due to more instances of student misbehavior and off-task behavior and this leads

to low academic performance of students. Also, the study is in line a with study of Blatchford al et., (2018) who argued that large class limited students' ability to participate in classroom activities and a lack of adequate physical space with which to control student behavior and to implement non-traditional instructional strategies is also a problem in large classes and leads to low academic performance of students.

Kornfeld (2010) findings showed that large class size had a critical influence on students' academic achievement, because there were significant differences between students who were educated in classes nearly

twice as large as other classes. Kornfeld (2010) concluded that there was a difference in terms of academic achievement with the exception of 10th grade Maths scores, students in smaller classes performed better than students in larger classes. Agyemeng (2009) agreed that teacher quality and the teacher-student relationship impact noted on students' achievements. Agyemeng (2009) study showed that students in the smaller class improve teacher quality include: high quality professional development; regular and focused teacher collaboration and strong supervision of students in class. All schools can deliberately foster strong relationships between teachers and students

Research question 3: How can class size be managed to enhance good performance in mathematics in Senior High Schools?

Table 4: Means and Standard Deviation Results of How Class Size can be Manage to Enhance Good Performance in Mathematics in Senior High School.

S/n	Statement	N	Mean	Std. D
1	By the support teachers give to students	192	2.78	1.29
2	Through professional development of teachers	192	2.52	1.11
3	Through the enhancement of reduced class size	192	2.52	1.11
4	Employing more teachers in the class to reduce the workload of a regular teacher	192	3.00	2.22
5	Enrolling according to the space that can hold the number of students in the class	192	2.52	1.11
6	Teachers making it a priority to give students time to work together when the teacher is not directing them	192	2.78	1.29
7	Mean of Means/Std. D	192	2.69	1.36

Source: Field Survey (2021)

This research question sought to find out how class size can be managed to enhance good performance in mathematics in senior high schools. The overall mean score of 2.69 (mean = 2.69, SD = 1.36, n = 192) gives the indication that there are many factors that can be put in place to help enhance and manage class sizes in schools. A few of them, such as the support teachers can give to students, were reported (mean = 2.78, SD = 1.29, n = 192). This shows that the support teachers give to students can serve as one of the key factors that can be put in place to enhance students' performance in schools.

Furthermore, the results showed that employing more teachers in the class to reduce the work load of a regular teacher can help in managing large class size in schools. The item produced (mean=3.00, SD=2.22, n=192) confirming the fact that it can serve as a measure to manage large class size in schools. With regards to the

item whether teachers making it a priority to give students time to work together when the teacher is not directing them (teaching strategies) can help in enhancing students' performance in schools. The mean score (mean=2.78, SD=1.29, n=192) which is more than the test value of 2.5 gives evidence to that fact that it is one of strategies to manage class size.

Qaiser and Ishtiaq (2014) concluded that proper arrangement of classroom plays a remarkable role in making instructional process more effective and establishes an atmosphere favorable and encouraging to learning. The quality of the physical classroom setting significantly affects academic achievement of the students. Physical facilities in classrooms ensure effective and successful teaching learning process. Students get more information from their teachers in well facilitated classrooms and consequently they show good performance. On the other hand, if students feel

uncomfortable in classroom, then they will fail to get more information from their teachers.

Analysis of the Research Hypothesis

The hypothesis was designed to test whether there is a significant relationship between class size and teaching and learning of mathematics.

Table 5: Correlation between Classroom Interaction and Academic Performance

Variables		Classroom Interaction	Academic performance
Classroom Interaction	Pearson Correlation	1	0.749*
	Sig. (2-tailed)		0.000
	N	192	192
Academic Performance	Pearson Correlation	0.749*	1
	Sig. (2-tailed)	0.000	
	N	192	192

*Correlation is significant at the 0.05 level (2-tailed)

Source: Field Survey (2021)

The researcher sought to determine the relationship between large class sizes and teaching and learning (classroom interaction). To realize this, a correlation was deemed appropriate to test the hypothesis that there is no statistically significant relationship between class size and classroom interaction. Therefore, Pearson's product-moment correlation was computed between the two variables (large class size and classroom interaction). The general results from the findings reveal that large class sizes correlate with classroom interaction, and the results prove there is a statistically significant relationship between the variables. That is r =.749, n = 192, p 0.05, sig. =.000, 2-tailed). That is to say, large class sizes are highly correlated with students' academic performance in the selected schools.

The findings from the present analysis complement the studies of Blatchford et al., (2018), Cakmak, (2009), Finn and Achilles (2016). In their studies, class size was found to highly correlate with students' academic performance. To further support the empirical evidence with the present study, the finding is consistent with that of Blatchford et al., (2018) and Deutsch (2020). In their study it was concluded that lack of physical space to separate disruptive students and to use different types of instructional activities had influence on students' academic performance. They further asserted that larger student populations prevented teachers from being able to interact with their students as much as they would in smaller populations. The studies of Egelson et al., (2017), Finn et al., (2020), and Halback et al., (2017) findings also confirm current findings that large classroom size serves a factor that contribute to an increase in classroom management issues

Table 6: Model Summary of the Variables

Model	R	R square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R square Change	F Change	df1	df2	Sig. F Change
1	0.807	0.652	0.648	10.492	0.652	197.01	3	316	0.000

a. Predictors: (Constant), Classroom interaction and large class size

b. Dependent Variable: performance

Table 6 also contains three SPSS model summary for the correlations. It is clear from the above correlations that R =0.807, R Square =0.652, and Adjusted R Square = 0.648. Three of the independent variables are statistically significant that is, (p-value = 0.000) with a df. of 316. This clearly shows that the greatest best predictors of   the dependent variable are classroom interaction and large class size.

Table 7: Multiple Regression Analysis of the Variables

Model	Unstandardized Coefficients		Standardized Coefficients		
	B	Std. Error	Beta	t	Sig.
Constant	30.722	3.237		9.491	0.000
Large Class Size	-0.555	0.171	-0.112	-3.236	0.001
Classroom Interaction	0.731	0.096	0.307	7.621	0.000

a. Dependent Variable: Performance

Source: Field Survey (2021)

Table 7 presents the SPSS Coefficients Model for the different variables. It also contains the correlations for the independent variables (large class size and classroom interaction). The two independent variables are statistically significant: Large class size (p-value = 0.001) and Classroom Interaction (p-value = 0.000). When evaluating the standardized beta values, the greatest influences upon the dependent variable are in the following order: Classroom Interaction (beta = 0.307) and Large Class size (beta=-0.112). The findings lend support to the evidence of Heshong Mahone Group's (2020). Their study found that many factors affect classroom environment, however, large class size have much influence.

4. CONCLUSIONS

Educational leaders need effective academic strategies to increase student academic performance. Effective education depends on the class size and classroom interactions that students are experiencing. Reduced class sizes and providing good classroom interactions are one method that some previous researchers have suggested as being able to increase student academic performance (Smith, Molnar, & Zahorik, 2020). However, the study revealed that smaller class sizes and good classroom interactions were found to be effective ways of increasing students' academic performance. For instance, its supervisors and teachers have time to provide good educational delivery such as class exercises, assignments, and good interaction between teachers and students. On the side of students, the study found that when students were in a stress-free classroom, they were able to concentrate and form groups for discussion, which improved their academic performance. In relation to the class size, it is concluded that teachers found it difficult to control or handle non-instructional tasks of students to maximize the teaching and learning of mathematics in class. The results of the hypothesis showed that there was a positive correlation between large class size and student interaction in the classroom. That is to say, large class sizes are highly correlated with classroom interaction (teaching and learning) in the selected schools. Further results gave ample evidence that among the two variables (classroom interaction and large class size), classroom interaction had more influence on pupils' academic performance (beta = 0.307) than large class size (beta = -0.112).

5. RECOMMENDATION

Based on the findings of the study, the following recommendations have been made:

For Practice:

1. The study revealed that small class size and good classroom interactions were better for academic performance and so teachers and head teachers should make sure they conform to the required teacher to student ratio of 1:40 by the Ghana Education Service.
2. Teachers should create an enabling environment for students to participate in classroom activities.
3. Teachers should emphasize learning as a process instead of learning being product during instructional periods.

For Policy:

1. The finding of this study showed that students perform well in smaller class size and good classroom interaction. With this, the government should employ more teachers and build more classrooms to solve the problem of large class size in senior high schools in Ghana.
2. The monitory division of Ghana Education Service should put measures in place to ensure that schools do not admit more than their facilities can contain.

Author Contributions

The authors confirms being the sole contributor of this work and approved it for publication.

Conflict of Interest Statement

The author declares that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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