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Teachers' Instructional Strategy versus Students' Academic Performance in Senior High School Mathematics

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Abstract:

The purpose of the study was to determine the level of effectiveness of the use of scaffolding strategies in the selected topic in second year Mathematics based on the Mathematics the performance of the second year high school students, City of Cape Coast. The study made use of the experimental design, specifically the pretest – posttest. Two sections of the second year high school students were the participants of the study. Simple random sampling technique was used to select a school and the participants for the study. A total of 24 students were involved in the study. The instrument used to gather the data was the Mathematics Achievement Test (MAT), containing 20-items pretest-posttest. SPSS was used to analyse the data. The test statistics was paired sample t-test to estimate the mean scores, where the three hypotheses for the study were tested at 0.05 level of significance. Data were subjected to statistical analyses using the mean, standard deviation and t-test. Findings showed that: there was no significant difference between the performances of the two groups in the pre-test, significant difference existed between the performances of the two groups in the post-test, and there was a significant difference in the performances of the experimental group from pre-test to post-test. Wherefore, scaffolding (inquiry-based)

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strategy of teaching SHS mathematics is most efficient to yield long term learning. Thus based on our findings, the following recommendations were drawn: 1. Teachers should use scaffolding strategy in combination with conventional strategy in teaching mathematics. 2. Teachers should continue to working for innovative changes and the integration of instructional technology in the mathematics classroom. Hence, the researchers highly recommend further studies to be undertaken with scaffolding strategy which involve intensive and extensive use of the strategy.

Keywords: Academic Performance, Scaffolding Teaching Strategy, Conventional Teaching Strategy,

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1. Background to the Problem

"For serious long-term learning, one does not learn facts, one acquires a culture" (Jones, n.d., Mathematics Education Reform). Truly, should people be asked to recall concepts in mathematics that they were taught, most of them would likely emphasize that they were taught by rote learning, and so cannot recall any of such concepts. Doubtlessly, some students unquestionably lack a math culture. Many at times, students are not able to conceptualise; what they need to know, and the why they need to know it. Most common questions students in mathematics class frequently ask is "how do I know this?" or "why do I need to know it?" or "when will I ever use it?" or "how do I use it if I need to?" The answer to the question "need to know" is coined to term as *inquiry.* Inquiry looks into something much deeper, and for which its result could be coined as a *discovery.* Inquiry coined to discovery provides more insight into thoughtful investigation, formulation of new concepts, leading to the development of new understandings (Diggs, 2009). Such method of teaching strategy is termed as scaffolding teaching strategy (Bruner 1975). Later study on this was carried out by Wood and Ross (1976), and was then supported by Vygotsky (1978). Instructional Strategy or Teaching Strategy is a process by which an instruction module, instruction phase, or an entire course is delivered, and it takes the form of conference, demonstration, discussion, lecture, etc. That, an Instructional Strategy can be described as a sequence of teaching/learning modes designed to promote the attainment of a particular type of objective. Educational research findings have consistently brought to the fore the outstanding learning strategies that characterize effective teaching (Hartman, 2002).

The method of teaching mathematics that do not allow much questioning, investigating into ideas, or development of such new ideas leading to new understanding, is term as traditional/conventional teaching method/strategy. Traditional method of teaching strategy works in the short term; thus, students can identify and solve a problem within this short term, but cannot do so during long term (Ferguson, 2010).

Teaching and learning mathematics by memorization comes with both positive and negative repercussions on the education system and on the child as well, where the negatives outweigh the positives. The people on the front lines of mathematics education, the classroom teachers, can attest to this fact. Students are unmotivated and dispirited with mathematics instruction. This is evident in recent West African Senior High School Certificate Examination (WASSCE). Owusu, Okyere, and Adjei (2019), stated clearly that mathematics performance recently has been abysmal for the last in most SHS for years now. The recent WASSCE mathematics written by one of the Senior High Schools in the Volta region in 2018/2019 academic year, where 232 number of candidates sat for core mathematics examination and out of this, only two students had A1, one student had B2, seven had B3, five had C4, seven had C5, thirteen had C6, nineteen had D7, thirty-nine had E8, and 138 students had F9. The percentage of candidates who qualified grades (A1 – C6) to enter tertiary education was only15.1 (i.e. 15.1%).

While it is a fact that there were some Ghanaian students who have won internal math competitions, the overall students' mathematics performance results from WASSCE is still not encouraging (Owusu, Okyere, & Adjei, 2019) in our school and even globally. This in turn calls for the need to find effective ways to improve the teaching and learning of mathematics; ways of teaching that engage students and encourage them to reflect and construct their own big ideas that will eventually result in increased conceptual knowledge, retention and more connections of mathematical ideas. The researchers believe that it is only through research that a teacher could really understand, evaluate and find possible solutions that work for educational problems. Addressing educational concerns especially those that are associated to students' performance should definitely start from the classroom. Therefore, it is in the hand of the teacher to innovate or find effective antidotes by exploring variety of teaching strategies to inculcate mathematics culture into students. Thus the present study examined to two: Scaffolding/Guided Instructional Teaching Strategy, and Traditional/conventional Teaching Strategy

2. Statement of the problem

The poor academic achievement especially in mathematics in Ghana with its attendant problems has been a great thing of worry to all stakeholders, such as parents, teachers, educational psychologists, counsellors, government and the society at large. Students' poor performance in internal and public examinations in Mathematics have been attributed to teachers' strategy of teaching, students' attitudes, unavailability of learning materials among others (National Mathematical Centre, 2009). Further, the obsolete teaching methods and inadequate use of instructional materials in the teaching of Mathematics have also been identified as the main reasons for poor performance in public examinations; if, as the adage says, "teachers teach the way they have been taught", we need to ask ourselves: what type of mathematics teaching have our and past generations been exposed to? Most mathematics lessons follow a pattern of whole-class lecturing and "show and tell" style of teaching (Fleener, Craven & Dupree, 1997).That work in small groups is not common and students do not participate actively. Teacher questioning emphasizes right or wrong answers and students are often allocated to passive seatwork. Too much emphasis is given to rote learning, procedures, and facts. It was also found that excess teacher talk dominates in classroom communication and desks usually are arranged to face the teacher's desk. In sum, this pattern of lessons in American classrooms can be characterized as traditional oriented. Furthermore, the Third International Mathematics and Science Study (TIMSS) identified a similar pattern in Ghanaian classrooms, "one of what might be called 'traditional approaches' dominating classroom instruction particularly in relation to lesson sequencing and types of activities undertaken" (Fleener, Craven & Dupree, 1997). Based on the above arguments it is possible to suggest that the educational system may act as a vehicle to reproduce traditional mathematical strategies. Teachers seem to pass on these strategies in subtle ways in school classrooms. By the time candidates take their WASSCE enroll in a teacher education program, these ideas are so solidified and entrenched in their personal philosophy that they will carry them for the rest of their life and then pass on to the next generation. Teachers often develop instructional methods or strategies that they thought is appropriate for teaching each topic in their lessons, with the aim of attaining the desired change in behaviours of learners but fail to realize that instructional strategies can be designed in a fashionable manner such that, students interest in mathematics can be stimulated and sustained. This done will culminate in students' high performance in mathematics.

This study, therefore, focused on whether or not scaffolding instructional strategy will address the poor performance of students in mathematics at the Senior High School (SHS) level.

3. Research Objectives

The following objectives guided the study:

i. The extent to which students taught mathematics with scaffolding strategy perform significantly better than those with only traditional method,
ii. The relationship that exists between the levels of performance of the experimental group.

4. Research Hypotheses

The following research hypotheses were tested based on the research questions raised:
Hypothesis One: There is no significant difference between the performances of the two groups in the pre-test.
Hypothesis Two: There is no significant difference between the performances of the two groups in the post-test.
Hypothesis three: There is no significant difference between the performances of the experimental group in the pre-test and the post-test.

5. Review of Related Literature

Several studies have focused on whether scaffolding teaching strategy or traditional teaching strategy is effective in teaching-learning mathematics classroom. In the study of Ferguson (2010), students' scores in class A and class B were compared and the results indicated that class A recorded greater improvement in scores both in pre-test and post-test. That, inquiry (scaffolding teaching) model of teaching mathematics increased the interest level of students compared to the traditional strategy. In his analyses, there was a non-significant interaction between test and class, indicating that there was no significant difference between classes A and B in their improvement from the pre-test to post-test scores. But there was a significant difference between the two classes in their post-test; a class with inquiry model performed better their counterparts with traditional model. Thus, concluded that inquiry-based teaching of mathematics was more effective that traditional model. Similar studies were concluded that scaffolding teaching strategy is advisable (more effective) as far as teaching-learning mathematics is concern (Aslam *et al.,* 2017; Uduafemhe, 2015; Machmud, 2011; Daniels, 2001; Simmons, Chard, & Dickson, 1993; Rosenshine & Meister, 1992).

5.1. Philosophy of teaching mathematics

Constructivism has been claimed as the most valued philosophy of math instruction. It enables educators determine the mental competence of the students and efficiently organize the right tasks for them to perform. It is one of the solutions to the mismatch on how educators teach and how students learn by addressing students' needs and capitalize their abilities. It challenges the learners understand concepts, transfer their learning and connect to the real world. In short, the ultimate academic goal in constructivism educational philosophy is to train students to become independent lifelong learners. One type of constructivism that is applicable in classroom situation where there is interaction is the social constructivism. In social constructivism, students learn concepts or construct meaning about ideas by interacting with others and interpreting their real world through exposure to active and interactive activities. It recognizes that social interaction plays a fundamental role in cognitive development. (Selden, J., n.d., Constructivism in Mathematics Education---What Does it Mean?). Social constructivist teaching practices are necessary for students' understanding and constructing meaning from Mathematics concepts learned. Such classroom practices include, but not limited to, "dialogue, prior knowledge, mathematical modelling, multiple solutions, students' preconceptions, problem solving, problem posing, and the importance of context for building understanding" (Kim, 2001).

Lev Vygotsky's Zone of Proximal Development (ZPD) is a concept under the social constructivism. Vygotsky (1978) believed that learners construct knowledge through social interaction with more capable peers. Unlike true constructivists, he insisted that social agents, such as adult tutors or more skilled peers, are certainly essential to a child's cognitive development. According to Vygotsky (1978), academic tasks fall into one of three categories: those that the student can do alone, those that the student can perform with the help from others, and those that the student cannot possibly do no matter how much help he/she is given. It is in the second category that instructional support is worthy. Vygotsky (1978) called this state when the learner is ready to grow cognitively as the zone of proximal development or ZPD.

Vygotsky (1978) defined ZPD as the "distance between the actual development level as determined by independent problem solving and the level of potential development as determined through problem solving under adult guidance, or in collaboration with more capable peers" (Zone of Proximal Development, n.d., para. 2). It is a gap between what a learner has already mastered and what he/she can achieve with the guidance of more capable others; it can be the teacher or a more skilled peer. The implication of Vygotsky's theory on ZPD for teaching is that students need many opportunities to learn with the teacher and more skilled peers. 1n addition, the concept of *progressive* instruction is associated with a socio-constructivist view of teaching and learning mathematics. Socio-constructivism, which for the sake of brevity will be called just constructivism, gives recognition and value to new instructional strategies in which students are able to learn mathematics by personally and socially constructing mathematical knowledge. Constructivist strategies advocate instruction that emphasizes problem-solving and generative learning, as well as reflective processes and exploratory learning. These strategies also recommend group learning, plenty of discussion, informal and lateral thinking, and situated learning (Handal, 2003). In turn, Teachers serve as facilitators and guides; more capable peers serve as tutors. Students develop new cognitive abilities when a teacher leads them through task-oriented interactions. A teacher will lend various levels of assistance over various iterations of task completion depending on the cognitive level of the student (Winne & Hadwin, 2001).

5.2. ***Instructional Strategies***

The guidance that the teacher extends to the learners is termed as scaffold and the act of giving guidance is scaffolding. It is assumed that through scaffolding, students can become independent learners. Scaffolding is a teaching strategy that was named as such because it has the same function as the physical scaffolds used in construction sites. Scaffolding techniques a teacher could use are clarifying doubts, inviting responses, focusing on task, reinforcing important facts and evaluating students' works. The instructor initially provides extensive instructional support, or scaffolding, necessary to help students build their own understanding of new concepts or skills (Simmons, Chard, & Dickson, 1993). Once the students can cognitively comprehend the part where they initially had a hard time dealing with, they assume full responsibility to complete the task. The temporary scaffolding provided/ designed by the instructor is withdrawn to reveal the impressive permanent structure of student understanding (Rosenshine, 1992).

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On the other hand, Conventional/traditional teaching strategy places emphasis on teaching more than learning with less attention to the process of learning. Existing research shows that the conventional teaching strategy in most Ghanaian classrooms is more teacher-centered than learner centered. This is a setback to students' creativity and innovativeness which is prerequisite for one to function in today's work environment (Hartman, 2002).

6. Materials and Methods

6.1.Research Design

This study employed the true experimental research design particularly the pretest-posttest. Instructional Strategies are in two folds: (Scaffolding strategy and traditional strategy). This study sought to obtain information about the difference between the levels of performance of the two groups of participants in the pre-test, the difference between the levels of performance of the two groups of participants in the post-test, and the relationship between the levels of performance of the experimental group. The control variable which was the basis in the selection of participants of the study was the average of the first and second grading Math grades of the students. This study also made use of a descriptive co-relational research design. This kind of design was chosen because in considering the purpose of the study, testing of the research hypothesis and the size of the target population, it was the most appropriate design which ought to lead the researchers to achieve the purpose of the study and draw logical conclusion from the study.

*6.2. **Respondents and Location of the Study***

There are ten administrative regions in Ghana. The study was carried out in Central region which is where the capital city, Cape Coast, is located. It is the third most densely populated region in the country. It has the highest number of Senior High Schools in Ghana. People from different clans and different socio-economic status are found there. Furthermore, the inhabitants of each of the other regions are from one or two clans. For these reasons, Cape Coast region was considered to be suitable for this study.

Twenty-four (24) second year high school students, 14 female and 10 male, from the two classes (2A and 2B) of the University Practice Senior High School, City of Cape Coast, University Practice were taken as participants of the study. The two classes were randomly assigned as experimental and control groups. 2A was assigned as experimental group and 2B was assigned as control group. To ensure that the respondents are of equal level (they are comparable), the significance of the difference of the means of the math grades for the first two grading periods was tested using t-test. The computed t-value was 0.0701 which is lesser than the tabulated t-value of 1.72. Thus there exists no significant difference between the two group means. This means that the two groups are comparable in terms of their averages.

6.3. Study Population

The target population for this study was the students from a selected Senior High School in Cape Coast Metropolis. Due to the scope of this study, the school (population) was represented by 120 form two students. These formed the basis for the sample of the study. Form two students were selected because they have covered enough topics in the form two mathematics syllabus and were exposed to different teaching methods from their mathematics teachers. Therefore, they provided useful information for this study.

6.4. Sample and Sampling Technique

Simple random sampling technique was used to select a school for the study in the Cape Coast Metropolis. In this sampling, the probability that a school among the populated schools will be chosen for the sample is the same as the first chosen. The names of schools were written on pieces of paper and put it into a container and shook to reshuffle. A paper was picked without looking into the container to select a school.

Again, the simple random sampling method was employed to select the participants according to their gender to ensure that each group was fairly represented as much as academic performance and attitude was concerned. This method provided both the male and female participants with equal opportunity to be randomly selected. Numbers 1-30 were written on pieces of paper including blank papers for the SHS two students in the school to pick. All those who picked the first twenty-four (24) numbers formed part of the sample.

6.5. Research Instruments

For the purpose of this study, data were collected using one instrument. This was: the Mathematics Achievement Test (MAT), on the selected topics in second year Math. The MAT comprised 20 theoretical questions each under the selected topics in mathematics prepared according to the contents and the set behavioural objectives. Each question attracted 5 marks. The instrument was validated by lecturers of Mathematics Education in the Department of Science and Mathematics Education, University of Cape Coast, Ghana. The questions were drawn from the West African School Certificate Examinations past questions and thus their validity and reliability is not a question.

6.6. Pilot Study

The researcher conducted a pilot study before the final collection of data. The purpose of the pilot study was to determine the validity and reliability of the instruments. It was carried out in three randomly chosen schools, which were not included in the main study. The pilot study was carried out to check the instrument as well as determining the difficulty of the test items. This enabled the researchers to update the research instruments by making corrections and adjustments based on observations made. This enhanced the validity of the instruments before their final administration. Before the classroom observations, three familiarization visits were made to minimize Hawthorne Effect. To determine the reliability of the instruments split-half technique was employed after which correlation between the two sets of data were determined by using Spearman's rank correlation coefficient formula. A correlation coefficient of 0.8 as considered to be high enough for the reliability of the instruments was obtained.

6.7. Data Collection Procedures

The study involved two phases: pre-experimental activities, and post-experimental activities. The first phase was the classroom observation followed by the administration of the pre-test on the selected topics in second year Mathematics. The second phase was the employment of the teaching strategies for the two groups of participants, scaffolding strategy to the experimental group and the conventional strategy to the control group. The experimental group was exposed to scaffolding techniques such as modeling, offering explanations, clarifying students' responses, use of scaffolding questions, cooperative learning (think pair-share technique), and guided practice. Twenty-four (24) students in the experimental group were placed in one row in preparation for the think-pair-share activities later on. The students were briefed on how to implement the think-pair-share technique before the start of the study. In the experimental group, twelve students having averages ranging from 50-70 were sequentially paired with other twelve students whose averages ranged from 75-95 percent for every activity with the think-pair-share cooperative learning technique. This was done based on the principle that *"more skilled students can be of help to the weaker ones".* Modeling is a teaching technique in which the teacher describes and models a math skill or concept. In the study, modeling was used to illustrate steps in problem solving or skills on the exploration of the selected topics for the study. Modeling was also used before the students tried by themselves the interactive activities. Whenever a student encountered a problem, the teacher explained for clarity and better understanding. The main aim was to get the students to understand the activity thoroughly, to generate possible strategies to a solution and to amplify explanations to students. The teacher also encouraged students' participation to further clarify the activity or doubts, to involve students actively in their learning and to get students to justify their solutions. The students had to justify their answers to cultivate reasoning skills and encourage students for active classroom participation. Scaffolding questions were also used to guide students' thinking, help them figure out correct answers on their own, dig out justifications for their answers, and determine students' difficulties and also to establish closer relationship. Some students were often engaged in off-task conversations during think-pair-share. The teacher constantly reminded the students of their work and asked them questions related to the task when he sensed that the students were on off-task. There was consistent evaluation of students' understandings and solutions. Guided practice was also used in combination with scaffolding questions usually more on one-to-one basis.

On the other hand, lecture method, board work, drill and worksheets were employed to the control group. The final phase of the study was the administration of the post-test after covering all the selected topics included in the study followed by the classroom observation. The experiment started on January 15, 2015 and ended on February 25, 2015. The whole experiment was programmed to cover 12 total contact hours for each group of participants of the study only but the researchers took six weeks to complete the study due to other school activities.

*6.8. **Ethical Considerations***

The researchers obtained a research permit from the existing Department of Science And Mathematics Education working now in the Central Region, UCC authorizing them to collect data from the University Practice Senior High School in the region. They then proceeded to visit the sample school to establish rapport and seek permission from the school headmaster to collect data from the said school. Similarly, consent to carry out research in the school was also sought from the headmaster and other respondents before the actual research. The researchers arranged with them the appropriate dates of visiting the school. This enabled them and the mathematics teachers concerned to select the right day and time on the school timetable when mathematics is taught to administer test instruments.

6.9. Data Analysis Plan

The data collected were organized and analyzed using both qualitative and quantitative methods. The results of the Mathematics Achievement Test (MAT) formed the basis of data analysis. The research hypotheses were tested by employing t-test. Mean, standard deviation and t-test were also used to analyze the data obtained from the study. All the analyses were at a significance cutoff of 0.05.

7. Results and Discussion

This research focused on some teaching strategies that influence secondary school students' performance in mathematics in Senior High Schools, Cape Coast. The results are presented and discussed in accordance with the research hypotheses in sub-section of the chapter one, starting with data analysis.

The data collected were organized and analyzed using both qualitative and quantitative methods. Hypotheses (1, 2 & 3) generated quantitative data and were analyzed and measured using descriptive statistics. The descriptive Statistics; mean, standard deviation and the t-test were used to determine the difference in the performance of respondents in the experimental and control group. For the qualitative description of the final grades of the respondents in Experimental group and Control group, the range below was used

Table 1: Range of Scoring

Range	Qualitative Description
49 and below	Poor
50-60	Satisfactory
65-75	Very Satisfactory
80-100	Outstanding

7.1. ***Pre-test Performance:*** Performance of experimental and control group in the pre-test.

The first research hypothesis which guided this study was "there is no significant difference between the performances of the two groups in the pre-test."

Table 2: Results for the Paired Samples t-test on the Pre-test scores.

Participants	N	Mean	Std. Deviation	df	α-level	t-value	Sig. (2-tailed)
Experimental	12	72.50	14.062				
Control	12	72.08	13.892	11	0.05	0.200	0.845

Table 2 shows the pre-test performance of the two groups. The experimental group had n=12, with mean score of 72.5 which indicates that their pretest performance was "satisfactory". On the other hand, the overall level of pretest performance of the control group, with n=12 and the baseline mean was 72.08 indicating that their performance was "fair". The two groups got a nearly similar rating on the pretest. This support the finding of Ferguson (2010); that there was a non-significant interaction between the performances tests of the two classes in the pre-test. This is due to the fact that part of the chapter on Quadratic Equations and Functions had already been discussed by their teachers' strategies of teaching mathematics.

The pretest mean performances of the two groups differ significantly by 0.42. This was shown by the computed p-value of 0.845 which is greater than the significant level of 0.05 with a t-value of 0.200. Thus, the hypothesis that there is no significant difference between the performances of the two groups of participants in the pre-test is failed to be rejected. This means that the experimental group is comparable to the control group in terms of entry characteristics and abilities. This further implies that the control variable of average mathematics grades of 50-95 percent for the first two grading periods was effectively mapped, and the random distribution of the participants into the experimental and control groups was also of equal chance.

7.2. ***Post-test Performance:*** Performance of experimental and control group in the post-test.

The second research hypothesis which guided this study was, "there is no significant difference between the performances of the two groups in the post-test."

Table 3: Results for the Paired Samples t-test on the Post-test scores.

Participants	N	Mean	Std. Deviation	df	α-level	t-value	Sig. (2-tailed)
Experimental	12	90.83	7.334				
Control	12	75.83	10.188	11	0.05	3.593	0.004

Table 3 shows the post-test performance of the two groups. The post-test performance of the experimental group had "outstanding" ratings of performance.

The statistics show that the experimental group considerably improved their pretest marks, whereas there was very little improvement of the participants in the control group. The overall performance of the experimental group was "outstanding," with a posttest mean score of 90.83 while the control group posttest performance level was "very satisfactory," with a mean score of 75.83.

The post-test mean scores of the experimental and control groups recorded 15.0 mean difference, and so differ significantly as proven by the computed p-value of 0.004 which is lower than the level of significance, α of 0.05, with the computed t-value of 3.593. This further proves that there was a significant difference between the post-test performances of the two groups under study. As such, the post-test given at the end of the study varied its result in each of the two groups. Thus, the hypothesis that there is no significant difference between the performances of the two groups of participants in the post-test is rejected.

From the result of the post-test performance of the two groups, one can easily say that there was a greater retention of the topic learned among the participants in the experimental group. These findings support that of Ferguson (2010), where in his studies proved that there was a greater improvement for the students who were taught by inquiry-based strategy compared to those taught by traditional strategy in their post-test. Hence, scaffolding techniques such as think-pair-share (cooperative learning technique) integration can boost learning among students as claimed by Soria (2005), Saldaña (1997) Maranes (2002) and Opeña (2006). The findings indicate that students learned better using non-traditional teaching strategy which is parallel to the findings of (Aslam *et al.,* 2017; Uduafemhe, 2015; Machmud, 2011; Daniels, 2001; Simmons, Chard, & Dickson, 1993; Rosenshine, 1992). That, the use of guided discovery method in place of conventional method will improve students' achievement and that teachers' predominant usage of conventional method of instruction cause of student failure in the subject matter.

7.3. *Performance of experimental and control group in the post-test and pre-test presented.*

The third research hypothesis which guided this study was "there is no significant difference between the performances of the experimental group in the pre-test and the post-test."

Table 4: Results for the Paired Samples t-test on the Post-test and Pre-test scores.

Experimental Group	N	Mean	Std. Deviation	df	α-level	t-value	Sig.(2-tailed)
Post-test	12	90.83	7.334				
Pre-test	12	70.50	14.062	11	0.05	3.773	0.003

Table 4 shows the pretest-posttest performances of the experimental group. The posttest-pretest mean performances of the experimental group differ significantly by 18.333. This was shown by the computed p-value of 0.003 which is less than the significant level of 0.05 with the computed t-value of 3.773. This further proved that there was a significant difference between pre- to post-test performance of the experimental group. As such, the post-test given at the end of the study varied its result in any of the test performances. Thus, the hypothesis that there is no significant difference between the performances of the experimental group in the pre-test and the post-test is rejected. This finding perfectly supports that of Ferguson (2010), where he concluded in his study that there a greater improvement (significant difference) of the class taught by inquiry approach in their post-test compared to that pre-test. From the result above, one may confidently say that the was a greater cognitively built knowledge of the participants by the scaffolding teaching strategy as compare to that of conventional teaching strategy.

7.4. Discussions

Statistics show that the participants from both groups improved upon their performances from pre- to post-test, but students taught by scaffolding teaching strategy had greater improvement in post-test than those taught under traditional approach. That is, the experimental group had a mean gain score of 18.33 (ie.90.83-72.5) while the control group was 3.73 (ie.75.83-72.08). Statistics further show that the scaffolding teaching strategy employed for the experimental group, and the conventional strategy employed for the control group resulted to a more improved performance in the post-test. This can be

affirmed by the results of the comparison made between pre-test and post-test performance of the two groups.
The pretest-posttest comparison resulted to a p-value of 0.003 in the experimental group which is far less than the significance value of 0.05, and a p-value of 0.545 in the control group which is also less than the significance value of 0.05. This signifies that the scaffolding strategy can enhance mathematics learning as reported by Kiong and Yong (2001). The progress can be a result of the combined scaffolding techniques such as the think-pair-share, modeling, guided practice and inquiry learning, which have been acclaimed by Allen (2007).

8. Conclusions and Recommendations

There was no significant difference between the performances of the two groups in the pre-test. In this finding, if students were taught by the same teaching strategy, both could stand relatively equal opportunity of performing on the same level.

There was also significant difference between the performances of the two groups in the post-test. This is an indication that when the same level of students were exposed to difference teaching strategies particularly in mathematics, students with more effective teaching strategy would stand to perform better than those without the effective teaching strategy.

There was further a significant difference between the performances of the experimental group in both the pre-test and post-test. The higher mean value of the experimental group in post-test showed that the scaffolding teaching strategy is more effective than the conventional teaching strategy.
In effect, scaffolding teaching strategy can help improve Mathematics performance of high school students. It can also result to meaningful personal connection with the teacher and peers in the classroom. The study found that the interactive strategy of teaching mathematics, which is core to improving students' holistic understanding of mathematical concepts and eventually enhance their performance in the subject, were almost absent in the mathematics classroom in Central region. The students felt that the subject is useful in their lives for their careers development hence they like the Mathematics. On the other hand they felt that mathematics is difficult to them, hence obscuring the significance of the subject. If the students like mathematics, then the mathematics teacher should use varied strategies to improve students' performance. This way we can say that mathematics is easy to learn. Unless this is done some students in Central region may have low academic ability in the study of mathematics and therefore may perform relatively poor in it. For this reason, the following recommendations were made.

The researchers formulated the following recommendations as drawn from the findings and conclusions made from the study:

i). Teachers should use scaffolding strategy in combination with some conventional methods in teaching Mathematics. But first, they need to re-conceptualize their role as facilitators in the development of the students' mathematical constructions rather than the sole source of mathematical knowledge while employing scaffolding in the classrooms.

ii). Teachers should continue on working for innovative changes especially on the development of interventions, materials and strategies, and the integration of instructional technology in the Mathematics classroom to help them explore and discover mathematical concepts on their own for better retention and development of higher appreciation and positivity toward Mathematics. iii). Since constructivism recognizes that students are at different levels of understanding and presents a variety of ideas, teachers should start encouraging more student-centered learning in their teaching methodologies like the use of scaffolding teaching strategy. Teachers are encouraged to attend seminars and trainings on the use of scaffolding strategy. Likewise, administrators should support and provide avenues for teacher advancement especially on the use of instructional strategies and software.

iv). Upshots of the scaffolding strategy may be best understood when studied quantitatively and qualitatively, since academic and non-academic achievements could be assessed. Hence, the researchers highly recommends further studies to be undertaken with scaffolding strategy which involves intensive and extensive use of the strategy.

9. Suggestions for further research

Further research should be carried out to cover the entire Senior High Schools in the Cape Coast Metropolis to ascertain the impact of this teaching strategy and other teaching strategies.

More so, other studies in this area should be carried out to cover more topics in time so as to get full attention of the respondents.

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