EFFECT OF INSTRUCTIONAL SCAFFOLDING ON STUDENT' ACHIEVEMENT IN COMPUTER STUDIES IN SECONDARY SCHOOLS IN NSUKKA EDUCATION ZONE

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ABSTRACT

The study is on the effects of instructional scaffolding on students' achievement in Computer Studies in secondary schools in Nsukka education zone. Three research objectives guided the study which are to ascertain the effect of instructional scaffolding strategy on students' mean achievement in Computer Studies in secondary schools in Nsukka education zone of Enugu State, ascertain the effect of scaffolding instructional strategy on the mean achievement of male and female students in Computer Studies in secondary schools Nsukka education zone of Enugu State and determine the interaction effects of instructional strategies and gender on students' mean achievement in Computer Studies in secondary schools in Nsukka education zone. Three research questions were used to elicit important information for the study. Literature was reviewed to not only serve as a guide to the researcher but also as an insight to works that have already been carried out by other researchers in related areas. The design of the study was quasi-experimental research design and the area of the study was Nsukka education zone of Enugu State. The population of the study comprised two thousand (339) junior secondary school two (JSS II) students drawn from 4 public secondary schools in Nsukka education zone. The instrument used for data collection was Computer Studies Achievement Test, data were analyzed using mean and standard deviation for all research objectives/questions. The findings of the study revealed that the mean achievement scores of the students (JSS II) in the 4 secondary schools in Nsukka education zone being taught Computer Studies using instructional scaffolding was higher than the mean achievement scores of those being taught Computer Studies using conventional methods.

The findings of the study also revealed that female secondary school students being taught Computer Studies using instructional scaffolding obtained higher mean scores than male students. From the findings, it was observed that gender treatment has significant interaction on students' achievement in computer studies respectively. This implies that male and female students react differently in the treatment in terms of their academic achievement in computer Studies using instructional scaffolding. Based on these findings, the researcher recommended that Computer Studies teachers should re-assess their classroom instructional practice because there is a need for them to shift from instructional practice, which makes learners passive listeners to the practice that engages learners actively in the instructional processes.

INTRODUCTION

Background to the Study

The word 'computer' according to Singh (2021), is derived from a Latin word "computer" which means to "to calculate", "to count", "to sum up" *or* "to think together". So, more precisely the word computer means a **"**device that performs computation**"**. Technically, this implies that a computer means to calculate or electronic programmable machine. In addition, He maintains that a computer is programmed device with a set of instructions to perform specific tasks and generate results at a very high speed (Singh, 2021).

Computer studies equips students with reasonable skills that will prepare them for gainful employment. This is substantiated with the fact that in the present day living, one cannot do without computer because the world is in a computer age, (Azih and Nwosu, 2021). The whole world has become a global village in the sense that one can be in his or her room discussing with somebody in any part of the world with the aid of computer and computer applications. In computer age, nobody want to be left behind and that is why the knowledge of science and technology especially computer studies inevitable and can never be overemphasized. One of the most important advantages of this machine is in the field of science for research and development (Oak, 2018). It has played a major role in most of what we know about ourselves and the universe. The satellites, the telescopes, and almost all the research tools use it in some or the other way. The huge calculations required for space science, safe communication between scientists, storage of all the gathered information, etc., are some of its uses in science and technology. Computers have brought about a revolution across all industries. They have changed the face of society. They are no longer specialized tools to be used by specially trained people. They are ubiquitous and used in almost every sphere of life. Computers are the best means for storage and management of data; they can serve as huge knowledge bases and can be harnessed for all sorts of financial transactions owing to their processing power and storage capacities. As computers are a daily utility, they have gained immense importance in day-to-day life. Their increasing utility has made computer education the need of modern times.

Despite the usefulness and relevance of computer to national development and man's daily activities, students still record poor achievement in the subject. Analysis of Chief Examiner's report on junior secondary school certificate examination results in Enugu State shows that in 2014, 59% failed to pass the subject with credit, in 2015, 62% failed while in 2016, 2017 and 2018, it was recorded that 42% failed, 66.3% and 60.1% respectively of the total number of candidates that sat for Computer studies external examination failed to pass the subject with credit pass. Lamenting on the poor achievement in Enugu State, the Chief Examiner's report on the performance of students in Computer studies

examination in the July 2018 said "the performance is generally poor". It was disheartening to see the degree of ignorance among candidates of Computer studies as they failed to list the components of computer", (Enugu State Examination Development Centre, 2018).

Computer studies educators had attributed the low level of students' achievement to a number of factors. For instance, Alake and Ogunseemi (2021) attributed it to teachers' incompetency, non-availability of instructional materials and improper selection and wrong uses of instructional methods in Computer studies classroom activities. Others pointed accusing finger to poor teaching methods involving selection and application of orthodox or traditional methods in Computer studies classroom (Aditi, 2017). The traditional methods employed by computer studies teachers have been identified as one of the major causes of students' poor academic achievement in the subject. This has given rise to a renewed call for better teaching approaches. The demonstration methods and project methods have been used but have failed to impact the necessary knowledge and skills to the students. Azih and Nwosu (2021) assert that these methods of teaching are not challenging enough to the needs of the students in the present computer age. Since many educators believed that the use of traditional methods in teaching and learning of Computer Studies is responsible for students' poor achievement in their academics, there is a need for the use of scaffolding instructional strategy as a strategy that may offer solution to students' poor achievement in their academics in Computer Studies since the strategy focuses mainly on making students to go beyond the content given by their teacher in the classroom and accept responsibility for their own learning. Lending support to the above view, Mbakwe (2018) for example is of the view that proper application of scaffolding instructional strategy in teaching and learning of Computer Studies will encourage skills acquisition and development of values.

Scaffolding is an instructional support by which more advanced individual help less experienced students maximize their potential (Vygotsky, 2021). It is provided through Computer interaction with peers and teachers within a student's zone of proximal development, which is defined as the difference between students' potential and actual developmental levels. Teachers can use scaffolding strategies in various forms, for instance, by monitoring student progress and participation, providing feedback, and encouraging students to seek necessary help. Then, teachers gradually withdraw their provision of scaffolding when students can perform tasks independently (Woolfolk, 2023). Therefore, teachers' use of scaffolding strategies is critical for optimal learning, particularly in teaching and learning environments, in which many students often find Computer interaction challenging. As instructional scaffolding refers to strategies intended to promote learner-teacher and learner-learner interactions in contexts such as Computer Studies classroom exercise, individual learning, and group collaboration as well as how computer teachers use scaffolding strategies to promote learner-teacher interactions by participating in discussions, posting regular messages, encouraging students to ask questions, proactively monitoring student progress, recognizing students' contributions to the course and setting minimum rules for interaction, monitoring students' interactions, and posing prompt questions.

Emphasizing further on the need for learner-centered instructional strategies in computer studies classroom activities, Barr (2021) asserts that students' inability to comprehend is due to the fact that teachers over dominate the teaching and learning process by talking too much thus, assuming the centre-stage-role. The burden of learning should be placed in where it rightly belongs, that is teaching and learning situations should be students-centered. In addition, when classroom instructions become students-centered and students are permitted to learn through active participation in the teaching and

learning process, they are more likely to retain information to acquire and to apply them to new situations. Scaffolding strategy should therefore, be an integral part of every teacher's instructional method since it promotes self-esteem, positive self-perception and instills in the students the essential skills and basis to accept responsibility for their own learning (Borich and Hao, 2021).

Teo (2006) asserts that scaffolding instructional method involves students in making connections between new and already known ideas or facts, engaging in dialogues in which hypotheses are formed, predictions are made, doubt expressed, uncertainties subsequently clarified and the orthodox/traditional views modified by new ideas. Unfortunately, some Computer studies teachers fall back to orthodox/traditional instructional methods as means of delivering Computer studies instruction in the classroom and this does no good to the teaching and learning of the subject as it may impede academic achievement of secondary school students in Computer studies. Based on these, lead to the aim to assess the effects of instructional scaffolding on students achievement in computer studies in secondary schools in Nsukka Education Zone of Enugu State.

Statement of the problem

The teaching of computer studies in the Nigerian secondary schools has been with the use of the traditional method of instruction (lecture method). However, the achievement of students in the subject especially at the junior secondary school level has consistently remained poor. This may imply that students are not learning from the use of this method of teaching. This study therefore, is to determine the effects of instructional scaffolding on students' achievement in computer studies in secondary schools in Nsukka Education Zone of Enugu State.

Purpose of the Study

The main purpose of this study is to determine the effects of instructional scaffolding on students achievement in computer studies in secondary schools in Nsukka Education Zone of Enugu State. Specifically, the study is designed to:

1. Ascertain the effect of scaffolding instructional strategy on students' mean achievement in Computer Studies in Nsukka education zone of Enugu State.
2. Ascertain the effect of scaffolding instructional strategy on the mean achievement of male and female students in Computer Studies in Nsukka education zone of Enugu State.
3. Determine the interaction effects of instructional strategies and gender on students' mean achievement in Computer Studies in Nsukka education zone.

Significance of the Study

The findings of this study are significant because it provided Government, Ministry of Education and Curriculum planners with empirical evidence to tackle Computer Studies pedagogical problems. School administrators and supervisors will no doubt fall back on the findings of this study as a guide for effective delivery of Computer Studies instruction by teachers in the classroom.

The findings of this study would guide Computer Studies teachers and students to in the use of scaffolding instructional strategy in secondary schools and to appreciate the importance of scaffolding in improving instructional delivery and students' achievement.

The result of the study will provide the interested scholars with information on the effect of scaffolding instructional strategy on secondary school students' achievement in Computer Studies in the study area. The society, at large will benefit from the findings of this study as the problems related to the use of scaffolding instructional strategy in teaching Computer Studies will be critically examined.

Research Questions

Three research questions guided the researcher in conducting this study. They are:

1. What is the effect of instructional scaffolding strategy on junior secondary school II students' mean achievement in Computer Studies in Nsukka educational zone?
2. What is the effect of instructional scaffolding strategy on the mean achievement of male and female students in Computer Studies in Nsukka educational zone of Enugu State?
3. What are the interaction effects of instructional scaffolding strategies and gender on students' mean achievement in Computer Studies in Nsukka education zone of Enugu State?

Hypotheses

The following null hypotheses were formulated and will be tested at 0.05 level of significance to guide the study.

Ho_1: There is no significant difference in the mean achievement scores of junior secondary school students taught computer studies using instructional scaffolding method and those taught using conventional (chalk and talk) methods.

Ho_2: There is no significant difference in the mean achievement scores of male and female students in Computer Studies using instructional scaffolding.

Ho_3: There are no significant interaction effects of instructional strategies and gender on students' achievement in Computer Studies.

Methodology

In this chapter, the researcher presents the methods and procedures employed in carrying out this study. These methods and procedures was presented under the following sub-headings; design of the study, area of the study, population of the study, sample and sampling techniques, instrument for data collection, validation of the instrument, reliability of the instrument, experimental procedures, control of extraneous variables, strategy of data collection and strategy of data analysis.

3.1 Design of the Study

This study adopted quasi-experimental research design, involving a pre-test and post-test. According to Ajaja (2011), quasi-experimental research design is used when the research work lacks the basic procedures required in pure experimental research that has to do with laboratory test. The design is suitable because the study set to determine the effects of instructional scaffolding on students' achievement. The design is represented thus;

$$-- \quad \frac{Ya \times Yb}{Ya \approx x \, Yb}$$

Where

Ya = Pretest

Yb = Posttest
X = Treatment
≈x = Control

Area of the Study

This study will be carried out in all secondary schools in Nsukka Education Zone of Enugu State. Enugu State is geographically bounded to the east by Ebonyi State, to the west by Anambra State, to the north by Kogi and Benue States while to the south by Imo State The researcher chose to the area because the topic for the study are in the J.S.S. II curriculum of the federal ministry of education and she is familiar with the area and can adequately monitor and supervise the experiment.

Population of the Study

The population of this study comprise all students in Junior Secondary school II (JSS II) in Nsukka education zone. JSS II classes was used for the study because this is the class among which Computer Studies is offered as a subject. The researcher decided not to use JSS I students since at that level of class, students were only exposed to introductory aspects of Computer Studies which cannot contribute to the research at hand and JSS III students will not also be chosen because this category of class is purely an examination class and so cannot be expose to rudiments of experimental research design. The researcher's choice of JSS II students for this study stemmed from the fact that Junior Secondary School II students have been exposed to the basic processes and procedures of Computer Studies as a subject of instruction and is not examination classes.

Sample and Sampling Techniques

The simple random sampling technique was used to select four (4) Upper Basic schools of which the number of class 2 students available in the schools in Nsukka Education Zone was used for the study. Out of the four schools, two schools were assigned to the treatment group while the remaining two schools were assigned to the control group using simple random sampling technique by balloting. Both male and female students in the selected schools in the area of the study was studied.

Instrument for Data Collection

The instrument used for data collection in this study was Computer Studies Achievement Test (COSAT) constructed by the researcher to aid successful completion of the study. The COSAT is made up of two major sections thus; Section A and Section B. Section A contain information on the personal data of the respondents while Section B carries information on the Computer Studies Achievement Test questions with multiple-choice items which have option A-D to aid achievement of the purpose of the study.

Validation of the Instrument

The Computer Studies Achievement Test (COSAT) was first presented to the researcher's supervisor who correct the instrument in terms of proper wording and the adequacy of the instrument in addressing the research questions. It was face validated by two experts from Computer Science Education and one specialist in Measurement and Evaluation, all in Ebonyi State University, Abakaliki for relevance, clarity, proper wording and adequacy of items in addressing the objectives of the study.

Reliability of the Instrument

The instrument was treated to a determination of reliability using Kinder Richardson 20 (KR-20) statistic and JSS II students was selected from another education zone (Government Technical College, Enugu) to test the reliability of the study. The responses from the students was subjected to the analysis, a reliability coefficient 0.7 was obtained which showed internal consistency of the instrument, thereby make the instrument suitable for use for the study.

Experimental Procedure

Two instructional approaches (instructional scaffolding approach and lecture method) was used for the study. The instructional scaffolding approach was used in teaching the treatment group while the conventional approach was used in teaching the control group. The researcher used the computer studies teachers in the schools for the study. The teachers was trained on how to use the methods. At the onset of the treatment a pre-test was administered to both the treatment and the control groups. The various computer studies teachers in the sample schools were used to conduct the teaching in their respective schools and classes.

The experiment was carried out during the normal school hours using the timetable. At the end of the experiment which last for six weeks, the teachers administer the post-test to the students in both treatment and control groups. The scores that was generated from pre-test and post-test were used in answering the research questions and testing of the null hypotheses.

Control of Extraneous Variables

Extraneous variables was controlled through the following ways;

1. Teacher Variables

In order to minimize errors that arise because of teacher difference, the researcher organized a pre-experimental training for the teachers that was used for the study. Separate conferences were organized for the teachers of the two groups (treatment and control). This is to ensure a uniform standard of teaching and uniform approach. A manual that contain the specifications of the packages was made available to the teachers of the treatment group. The researcher with help of research assistants monitors the teaching to ensure that the teachers perform according to specified procedure.

2. Inter-Group Variable

Intact classes was used for this study. As such, it implies that initial equivalence cannot be achieved for the research subject in the two groups and even within a group. For the control of errors that may arise as a result of the non-equivalence, the researcher employ analysis of co-variance (ANCOVA) for data analysis.

3. Subject Interaction

The treatment and control groups was not selected by the researcher from the same school. This is to ensure that the students in the treatment and control groups do not share ideas and information. This helped to reduce errors that may arise from interaction and exchange of ideas among the respondents in the two groups.

4. Test Sensitization

The effect of test sensitization is eliminated by re-arranging the test items and using different colours of paper to administer the pre and posttest.

Method of Data Collection

At the beginning of the experiment 'COSAT' was administered to both treatment and control groups as pre-test. The class teachers performed this in the classroom. At the end of the test, scores of the students on the pre-test was recorded and kept. The same instrument was administered to the students at the end of the experimental period.

Method of Data Analysis

Mean and standard deviation was used to answer to the research questions while the analysis of co-variances (ANCOVA) was used to test the null hypotheses at an alpha level of 0.05.

RESULTS

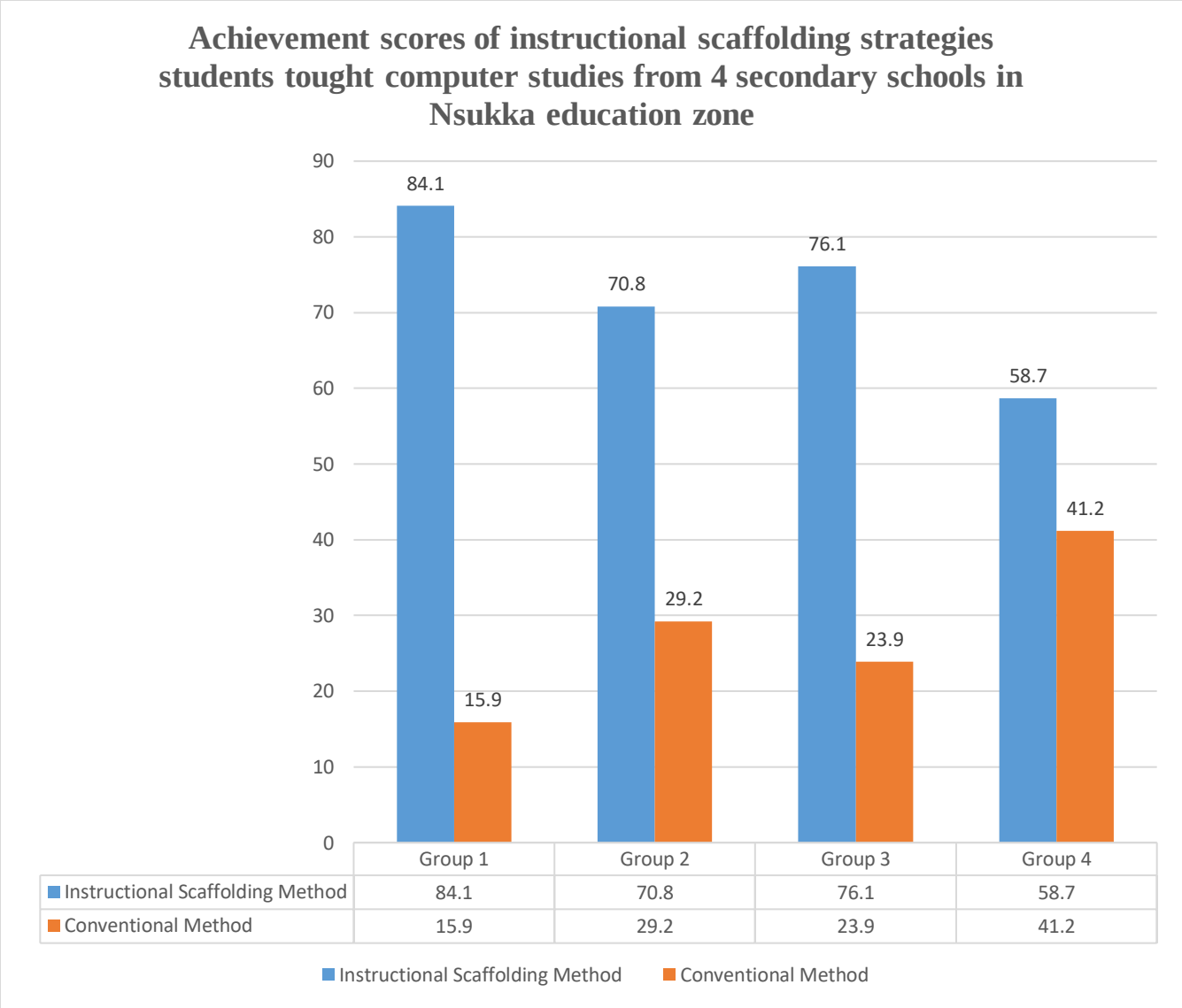
Table 1: Socio-demographic characteristics of the respondents

Category	Socio-demographic Variables	No of Respondents	Percentage
Students (n=339)	**Sex**		
	Boy	132	38.9
	Girl	207	61.1
	Age (years)		
	9–11	114	33.6
	12–14	156	46.0
	15–17	69	20.4
	Mean ±SD	12.6±2.2	
	Students Class Level		
	JSS II	399	100
	Mother's highest educational status		
	No formal education	31	9.1
	Completed primary education	98	28.9
	Secondary education	167	49.3
	Tertiary education	43	12.7

Findings as relate to demographic characteristics of the students in the four selected secondary schools in Nsukka Education showed that out of the 339 students in this study, greater percentage of them (61.1%) were girls, while 132(38.9%) of them were boys. Most of them 156(46.0%) were aged 12-14years, while 114(33.6%) of them were aged 9-11years, and 69(20.4%) of the students were aged 15-17 years. The mean age of students were 12.6years with standard deviation of 2.2years. Most of the students in this study 399(100%) were in JSS II. Most of the students' mothers 167(49.3%) had secondary education, 98(28.9%) completed primary education, 43(12.7%) of them had tertiary education, while 31(9.1%) of them had no formal education.

Research Question 1: What is the effect of instructional scaffolding strategy on junior secondary school II students' mean achievement in Computer Studies in Nsukka educational zone?

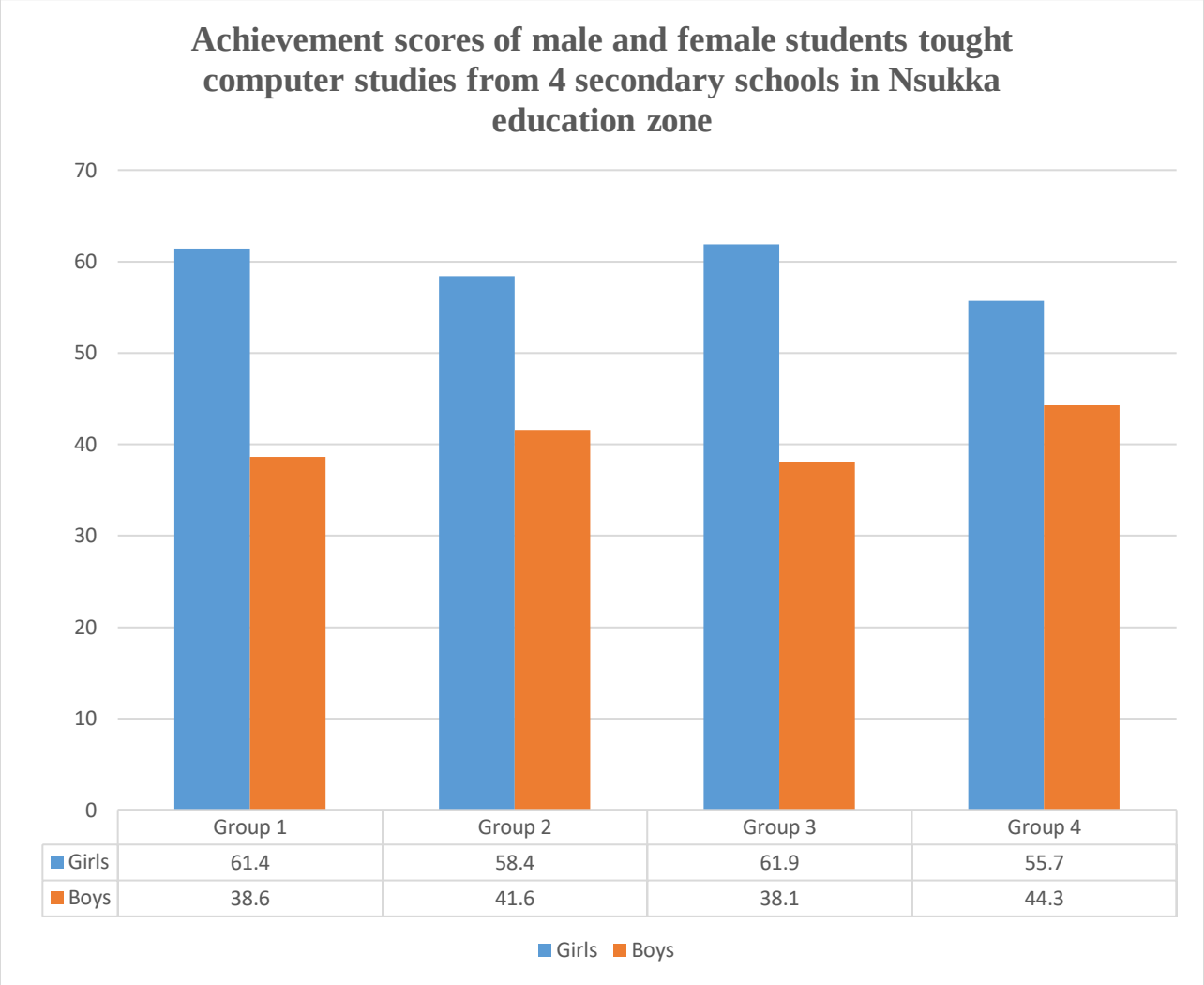
Figure 1: Effect of instructional scaffolding strategy on junior secondary school II students'



The results illustrated in figure 1 above shows a significant increase ($p<0.05$) among students who made use of instructional scaffolding strategies among the 4 groups (representing the 4 schools chosen) (group 1: 84.1%, group 2: 70.8%, group 3: 76.1% and group 4: 58.7%) when respectively compared with those of the conventional method.

Research Question 2: What is the effect of instructional scaffolding strategy on the mean achievement of male and female students in Computer Studies in Nsukka educational zone of Enugu State?

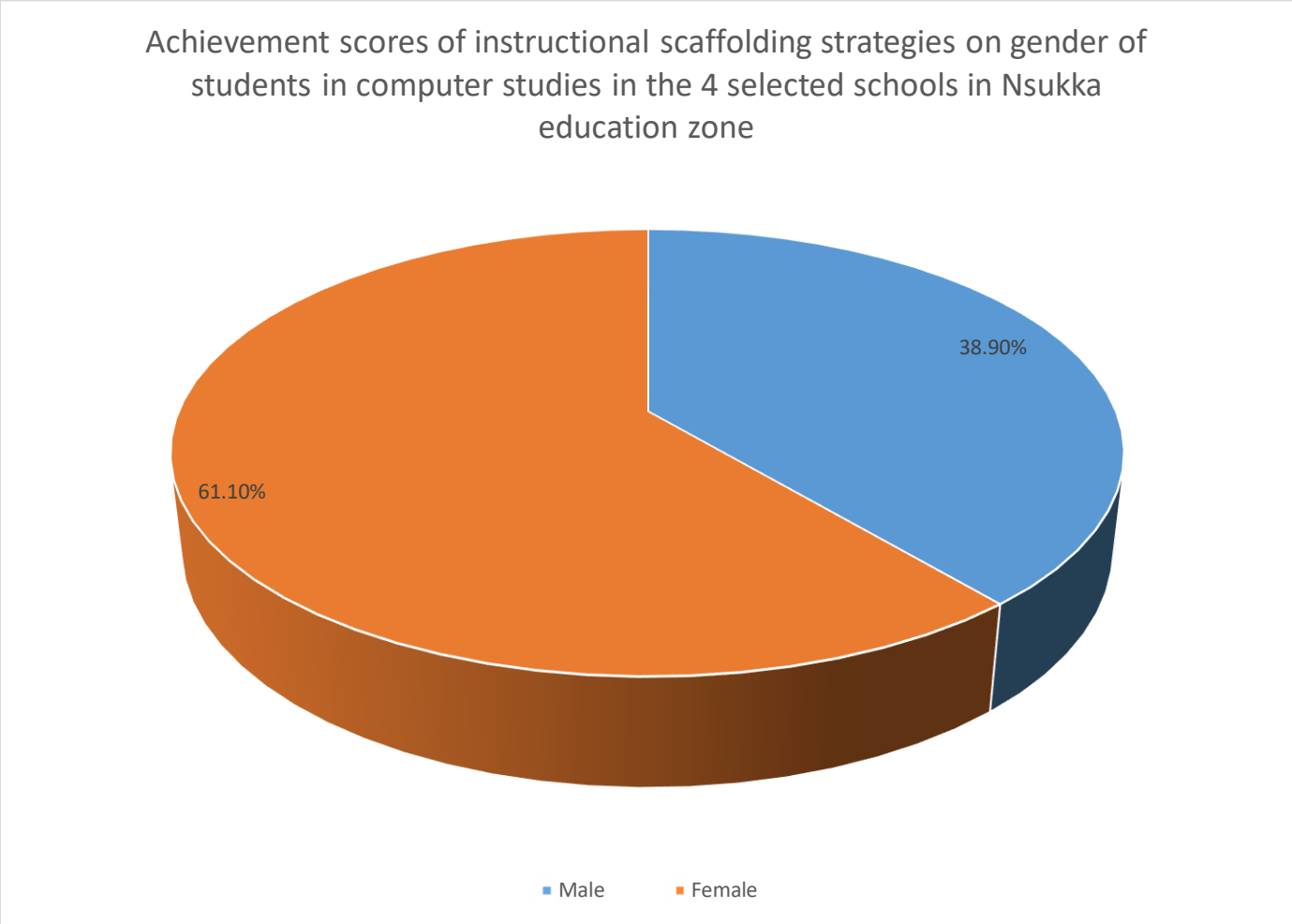
Figure 2: Effect of instructional scaffolding strategy on the mean achievement of male and female students in Computer Studies



From figure 2 above, the achievement score of male and female students taught computer studies from the 4 selected secondary schools in Nsukka education zone shows that male student are 38.6%, 41.6%, 38.1% and 44.3% respectively while the scores of female students are 61.4%, 58.4%, 61.9% and 55.7% respectively. From the gain scores, the female students taught Computer Studies with instructional scaffolding has higher gain scores than their male students counterparts taught computer Studies using instructional scaffolding.

Research question 3: What are the interaction effects of instructional scaffolding strategies and gender on students' mean achievement in Computer Studies in Nsukka education zone of Enugu State?

Table 2: Interaction effects of instructional scaffolding strategies and gender on students' mean achievement in Computer Studies



Based on the above analysis (figure 3) shows the interactions effects of instructional scaffolding strategies and gender on students' scores achievement in Computer Studies in the 4 selected schools in Nsukka education zone of Enugu State. However, it was observed that gender treatment has significant interaction on students' achievement in computer studies (Male; 38.90% and Female; 61.10%) respectively. This implies that male and female students react differently in the treatment in terms of their academic achievement in computer Studies using instructional scaffolding.

Discussion of Findings

It was observed in the study as relate to objective one (research objective 1) shows that the achievement scores of secondary school students (JSS II) from the 4 selected secondary schools in

Nsukka education zone taught Computer Studies using instructional scaffolding strategies was higher than the achievement scores of those taught Computer Studies using conventional methods (figure 1 above). The finding showed that there is a significant difference between the achievement scores of secondary schools students taught computer studies using instructional scaffolding strategy and those taught using conventional lecture method (CLM) in favour of instructional scaffolding strategy among the groups. The students among the groups who made use of instructional scaffolding performed better than those in conventional lecture method group because student instructional scaffolding strategy is a learner- centered, more practical-oriented teaching approach where the students were given opportunity to exercise their mastery over the content of the learning materials and to ensure they were able to make progress in each phase of learning based on the established knowledge they have in the previous phase. Instructional scaffolding strategy help the learners develop in them appropriate mastery skills that will enable them successfully migrate from one level of knowledge to the other, that is the Zone of Proximal Development (ZPD) in a given learning process thereby improving their achievement in the subject matter. This finding agreed with the work of Nzewi and Ibeneme (2021), and states that just as scaffolds helps worker to complete difficult jobs, instructional scaffolding helps students to build solid understanding of challenging academic tasks. Also, Adit (2022), found out that students exposed to instructional scaffolding strategy developed a positive attitude towards science generally.

However, from the analysis as relate to objective two (research question 2) of the study revealed that female secondary school students taught Computer Studies using instructional scaffolding obtained higher mean scores than male students taught Computer Studies using instructional scaffolding (Figure 2 above). These shows that sex/gender were also significant in the achievement scores of students based on the instructional approach. There was significant difference in the achievement scores of male and female student who were taught computer studies using scaffolding instructional approach. The finding of the study is contrary to that of Okereke and Okigbo, (2021) whose study revealed that gender is not a factor in students' achievement in computer studies when instructional scaffolding approach is applied in teaching.

More so, the findings of the present study as relate to objective three (research question 3) revealed that there were significant interaction effects between instructional strategies and gender in the 4 selected secondary schools students' achievement in Computer Studies (figure 3 above). The interaction effect of teaching approaches and gender was examined on achievement of the students in computer studies. It was observed that gender treatment has significant interaction on students'

achievement in computer studies. This implies that male and female students react differently in the treatment in terms of their academic achievement in computer Studies using instructional scaffolding. In other words, the teaching strategies used in the study imparted differently on male and female students based on their academic achievement in computer studies.

Conclusion

Conclusion Based on the findings, it was concluded that the use of instructional scaffolding strategies in teaching computer studies was more effective than the use of conventional lecture method. However the use of instructional scaffolding strategies was gender bias since it favour females more than males in learning of computer studies.

Recommendations

From the findings of the study, it was recommended that:

1. The school authorities, those in business of education and professional bodies should organize seminars and workshop from time to time for in-service computer studies teachers to acquire skills in the use of innovative teaching strategies such as instructional scaffolding strategies so as to ensure effective computer studies curriculum delivery.

2. Teachers of computer studies should adopt the use of instructional scaffolding strategies in teaching to improve students' learning outcomes.

3. Teacher Education Institutions should include and introduce the use of instructional scaffolding strategies in teaching computer studies in the class.

4. Teachers should incorporate scaffolding strategies such as gradual release of responsibility, visual aids and peer support, to support students learning (JSS II) in secondary schools.

5. Regularly monitoring students progress can help teachers identify areas where instructional scaffolding strategies is needed and adjust their strategy of learning accordingly.

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