
EFFECTS OF THINK-PAIR SHARE INSTRUCTIONAL METHOD ON ACADEMIC ACHIEVEMENT OF COMPUTER EDUCATION STUDENTS IN PROGRAMMING CONCEPTS IN UNIVERSITIES IN GOMBE STATE

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Abstract

This study investigated the effect of think-pair share Instructional Method on academic achievement of Computer students in programming concepts in Universities in Gombe State. Two research questions guided the study while three null hypotheses were tested at .05 level of significance. Quasi experimental research design was adopted for the study. The population for the study comprised 156 year-two undergraduate students from Gombe State University and Federal University of Kashere, Gombe State. No sampling was made due manageable number of students. The instrument for data collection was Programming Achievement Test (PAT) which was developed by the researchers and validated by three experts. Kuder-Richardson 20 (K-20) formula was used to determine the reliability of the instrument which yielded a reliability index of .82. Mean and standard deviation were used for answering the research questions while Analysis of Covariance (ANCOVA) was used to test the null hypotheses. The findings of the study showed that students who were taught programming concepts using think-pair share strategy had improved academic achievement than their counterparts who were taught using lecture method. It was also found that male students had improved academic achievement than their female counterparts when exposed to think-pair share strategy. In line of the findings, the study recommended among others that lecturers should implement the think-pair-share strategy more widely in teaching programming concepts, and consider integrating it into other areas of the curriculum where applicable.

Keywords: Academic Achievement, Lecture Method, Programming Concepts, Think-Pair-Share Strategy.

Introduction

As educational paradigms shift to meet the demands of a rapidly evolving society, the exploration of innovative teaching methodologies has become increasingly vital. The promotion of skills development globally cannot be overemphasized. This necessitated the efforts of international organizations such as the International Labor Organization (ILO) and United Nations Educational, Scientific, and Cultural Organization (UNESCO) and educational bodies like Technical Vocational Education and Training (TVET) towards promoting functional knowledge and skills in discipline like Computer education, Agricultural education, Industrial and technical education, Business education among others, for the global workforce (UNESCO & ILO, 2002; FRN, 2013; Obadiaru, 2020).

Computer programming is the set of instructions given to a computer, written in programming languages like Python, Java, or C++, that translates human language into machine-readable format (Sebesta, 2012; Zelle, 2016). This process is not easy and it needs sufficient knowledge in algorithms, data structures, and control which form the foundational concepts in programming. Programming concepts are the foundational principles that guide the development and execution of software applications. Many algorithms provide step-by-step problem-solving instructions. Encapsulation, inheritance and polymorphism, are the three key concepts of object-oriented programming (OOP), which increase code modularity and reusability (Stroustrup, 2013). Loops, along with conditional statements important control structures allow developers to powerfully guide the flow of program execution (Sebesta, 2012). Programmers manage memory, an important programming aspect, by allocating and deallocating specific resources to optimize many application performances (Grune et al., 2012). Different approaches to solving problems are offered by programming models, such as functional, procedural, as well as declarative programming. Reliable and accurate software requires thorough debugging and testing throughout the software development lifecycle (Pressman, 2014).

A solid understanding of programming concepts is vital for creating efficient, reliable, and scalable software solutions. It provides a systematic approach to problem-solving through the application of algorithms, data structures, and control structures. This knowledge equips programmers with the ability to adapt to various programming languages and technologies, fostering versatility and innovation across diverse fields such as software development, artificial intelligence, and data science.

In spite of the goal of Computer Education in producing skilled graduates for labour force Computer Education students exhibit poor academic achievement in computer programming owing to several factors such as teaching method (Nwankwo, 2025, large class sizes (Eke, 2021), inadequate infrastructure (Obadiaru, 2020) and motivation (Ukeh, 2023). Moreover, available records gotten from the examination officers from three public universities in North-East showed that from 2021-2025 academic sessions, a total of 573-year two computer education students sat for Computer programming course. The record revealed that, out of 100% of students', 41% is on the average performance of pass. These factors are associated with the traditional method or lecture method of teaching and learning. Interestingly, the lecture method is the most common teaching method adopted by Computer Education lecturers in teaching computer programming, as observed in many studies focusing on computer programming (Olelewe & Agomuo 2016; Almassri & Zaharudin, 2023).

The choice of instructional approach frequently emerges as a significant element influencing the academic success of computer education students, primarily due to the prevalent use of teacher-centric methods by computer educators. Moreover, numerous higher institutions of learning in Nigeria face challenges related to inadequate facilities and infrastructure, which hinder effective teaching and learning, thereby compromising the comprehensive grasp of programming concepts (Ukeh & Nwankwo, 2023). Additionally, even institutions where these facilities are available record a very low level of use (Obadiaru & Achuonye, 2020). Also, studies have indicated that lecturers in higher institutions mostly use lecture method in lesson delivery (Agwamba, 2014; Ogbu, 2018, Eke, 2021). As cited by Alibo and Tolowdun, (2024), the traditional method of teaching is still in use, as it offers the opportunity for teachers to pass across lots of information to the students and is useful for routine memorization. This lecture method is effective for delivering a large volume of information and is particularly suitable for managing large classes. However, despite its advantages, it does not foster students' creativity, critical thinking, inquiry, or scientific attitudes. Instead, it often promotes rote memorization, which can lead to rapid forgetting (Ogbu, 2018). To address these limitations, the lecture method, as a traditional instructional approach, can be enhanced by incorporating the think-pair-share strategy, which promotes active participation and collaborative learning among students.

The "Think-Pair-Share" strategy is a collaborative learning technique often used in classrooms to engage students in active learning and promote deeper understanding of the material. Think-Pair-Share (TPS) is a cooperative learning strategy that encourages students to work together to pair- share, just as the name goes. TPS involves the students thinking about challenging academic tasks given by the teacher individually, pairing with other students to exchange ideas and sharing the idea with the larger class. Eke (2021), is of the view that think-pair-share also called multi-mode discussion is a learning technique that provides processing time and builds in wait-time which enhances the depth and breadth of thinking. The general idea of think pair share technique is having the students to independently think or solve a problem quietly, then pair up and share their thoughts or solution with someone else. In the think-pair-share classroom, every student is an active learner. This strategy incorporates wait-time, verbal rehearsal, discussion, and cooperative learning. According to Usang and Okoli (2021), the implementation of the think-pair-share instructional strategy has been shown to positively correlate with increased academic achievement among students across various subjects.

Academic achievement refers to the measurable outcomes of learning and educational progress attained by students within an academic setting. These achievements can include various aspects such as grades, standardized test scores, completion of assignments, projects, presentations, research publications, awards, scholarships, and other recognitions related to academic pursuits. Existing research revealed that students taught using Think-Pair-Share had a higher academic achievement gain score than those taught using lecture method Azlina (2010), Eke (2021), and Egbai et al. (2022). A study conducted by Usang and Okoli (2021), revealed that there was significant difference in the mean academic achievement scores of the students taught using think-pair-share and those taught using conventional method in favour of think-pair share strategy. Although academic achievement is frequently viewed as a marker of individual success, studies consistently highlight subtle differences in educational outcomes between genders.

Gender encompasses the roles, behaviours, activities, and attributes that a society deems appropriate for men, women, and individuals with diverse identities. It also refers to the condition of being male or female, as described by Suzanne (2010). Educational practices and instructional strategies can either be gender-sensitive, promoting inclusivity, or exhibit gender biases that affect learning outcomes. Research findings have highlighted disparities in academic performance between genders, particularly in science-related courses. For instance, Egbai et al. (2022) found that male students outperformed their female counterparts when exposed to the think-pair-share strategy. Against this backdrop, the present study investigated the effect of the think-pair-share instructional Method on academic achievement of students in programming concepts in Universities in Gombe State.

Statement of the Problem

The objectives of computer education are to prepare graduates for employment in computing-related firms produce professionals with practical knowledge and skills to develop applications for instructional delivery, produce teachers with theoretical and practical experience to take up teaching jobs and leadership positions in secondary schools, technical colleges, colleges of education, and universities. It is expected that during the teaching and learning process, prospective graduates should engage and acquire computer programming knowledge and practical coding skills. The goals can only be achieved by creating a conducive learning environment, implementing innovative technology and using creative teaching techniques to enhance student engagement and academic performance, particularly in developing nations like Nigeria. It suffices to say that Computer education graduates remain

unemployed due to inadequate computing programming skills, suggesting that the Computer Education programme is yet to accomplish its goal. This could be blamed on traditional/conventional teaching and learning method currently being adopted by computer educators which result in low engagement and low motivation by computer education students in a computer programming courses, thus suggesting that the training received is insufficient to produce graduates who are competent and self-reliant in the field of computer programming. Moreover, available records gotten from the three public universities in North-East showed that from 2021-2025 academic sessions, a total of 579 year-two computer education students sat for Computer programming course. The record revealed that, out of 100% of students', 41% is on the average performance of pass. These factors are associated with the traditional method or lecture method of teaching and learning.

The lecture method/traditional method is predominantly used by Computer Education lecturers. Lectures employ the lecture method to transfer technical knowledge, principles, concepts, and ideas with practical applications to the students. This approach is predicated on the conventional view of the lecturer as a master of knowledge who imparts knowledge to the student in a passive manner. Students rarely, get the chance to actively participate in creating and contributing to the educational process, this prevents the students from acquiring the skills necessary to tackle real-world problems during lectures.

To improve this passive instructional delivery method a more engaging method think-pair-share method is proposed. As a result of the above this offers students the chance to work on real-world problems that can improve their level of achievement in computer programming concept and they learn to address difficulties in the real world.

Purpose of the Study

The purpose of this study was to determine the effect of the Think-Pair-Share instructional strategy on the academic achievement of Computer Education students in programming concepts in universities in Gombe State. Specifically, the study sought to determine:

1. the difference in the academic achievement of Computer Education students taught programming concepts using the Think-Pair-Share instructional strategy and those taught using the lecture method;
2. the influence of gender on the academic achievement of Computer Education students taught programming concepts using the Think-Pair-Share instructional strategy; and

3. the interaction effect of instructional method and gender on students' academic achievement in programming concepts.

Research Questions

The following research questions guided the study:

1. What are the mean achievement scores of Computer Education students taught programming concepts using the Think-Pair-Share instructional strategy and those taught using the lecture method?
2. What are the mean achievement scores of male and female Computer Education students taught programming concepts using the Think-Pair-Share instructional strategy?
3. What is the interaction effect of instructional method and gender on students' academic achievement in programming concepts?

Hypotheses

The following null hypotheses were tested at .05 level of significance:

1. There is no significant difference in the mean achievement scores of Computer Education students taught programming concepts using the Think-Pair-Share instructional strategy and those taught using the lecture method.
2. There is no significant difference in the mean achievement scores of male and female Computer Education students taught programming concepts using the Think-Pair-Share instructional strategy.
3. There is no significant interaction effect of instructional method and gender on students' academic achievement in programming concepts.

Methodology

Quasi experimental research design was adopted for the study. Nworgu (2015), described a quasi-experimental research design as one where it's not feasible to randomly allocate participants to both experimental and control groups. The population for the study comprised 156 year two undergraduates' students from Gombe State University and Federal University of Kashere, Gombe State. No sampling was done due to the manageable number of students. The instrument for data collection was Programming Achievement Test (PAT) which was developed by the researchers and validated by three experts, two from Department of Computer & Robotics Education, University of Nigeria Nsukka and one from Department of Science Education, Federal University of Kashere. Kuder-Richardson 20 (K-20) formula was

used to determine the reliability of the instrument which yielded a reliability index of .82. Mean and standard deviation were used for answering the research questions while Analysis of Covariance (ANCOVA) was used to test the null hypotheses.

The experiment was carried out in two Universities in Gombe State, the Gombe State University was the control group while Federal university of Kashere was the experimental group. The lecturers in the experimental group were briefed by the researcher before the treatment process on how to effectively use Think-Pair-Instructional Strategy, while the lectures in the control group was given topics with the lesson plans and then asked to teach the students as usual. Before the commencement of the experiment, both the experimental and control groups took a pretest as part of the pre-testing and familiarization phase. At the end of the test, the question papers and answers were collected from the students by their lectures. The pretest papers were marked and scored by the researcher. In the second phase, teaching commenced on the programming concept by their regular lectures for six weeks. After the teaching, posttest was administered to the subjects by their regular computer education lecturers. The test was again marked and scored by the researcher. The aim of the posttest was to find out if there was any gain in knowledge that might have arisen as a result of the treatment. The data obtained from each group on the computer programming Achievement Test (PAT) was analyzed using mean and standard deviation to answer the research questions and ANCOVA to test the hypotheses at 0.05 level of significance. The choice of ANCOVA for testing the hypotheses was based on its ability to control the initial group difference. The decision rule for the hypotheses was that whenever the probability value (p-value) is less than or equal to the significant value of 0.05, the null hypothesis is rejected, otherwise the null hypothesis is not rejected.

Results

Research Question 1

What are the mean achievement scores of Computer Education students taught programming concepts using the Think-Pair-Share instructional strategy and those taught using the lecture method?

Table 1 presents the mean achievement scores and standard deviations for students taught programming concepts using two different methods: think-pair share strategy and lecture method. The experimental group, taught with think-pair share, had a mean pre-test score of 32.09 and a mean post-test score of 34.56, with a mean gain of 2.47. The control group, taught

with the lecture method, had a mean pre-test score of 31.45 and a mean post-test score of 32.85, with a mean gain of 1.40. The standard deviations for both groups on both tests are also provided. The findings of the study showed that students who were taught programming concepts using think-pair share strategy had improved academic achievement than their counterparts who were taught using lecture method.

Table 1: Mean achievement scores and standard deviations of students taught programming concepts with think-pair share strategy and those taught using lecture method

Groups	Number	Pre-test		Post-test		
		Mean (X)	Standard Deviation	Mean (X)	Standard Deviation	Mean Gain
Experimental	65	32.09	4.60	34.56	5.20	2.47
Control	91	31.45	4.43	32.85	5.09	1.40
Mean Difference						1.07

Research Question 2

What are the mean achievement scores of male and female Computer Education students taught programming concepts using the Think-Pair-Share instructional strategy?

Table 2: Mean achievement scores and standard deviations of male and female students taught programming concepts using think-pair strategy

Gender	Number	Pre-test		Post-test		
		Mean (X)	Standard Deviation	Mean (X)	Standard Deviation	Mean Gain
Male	109	31.06	4.42	34.58	5.42	3.52
Female	47	30.44	4.11	33.44	4.67	3.00
Mean Difference						0.52

This table presents the mean achievement scores and standard deviations of male and female computer studies students who learned programming concepts through the think-pair-share method. The data reveals that there were 109 male and 47 female students in the study. Before instruction, the average pre-test score for males was 31.06 with a standard deviation of 4.42, while females scored 30.44 with a standard deviation of 4.11. After the instruction, the mean post-test scores were 34.58 for males (standard deviation: 5.42) and 33.44 for females (standard deviation: 4.67). Finally, the table shows a mean difference of 0.52 in post-test scores between males and females, indicating a slight advantage for male students.

Hypotheses

Ho1: There is no significant difference between the mean achievement scores and standard deviations of computer education students taught programming concepts using think-pair share strategy and those taught the same topic using lecture method in both pre-test and post-test.

Table 3: Analysis of Covariance on the mean achievement scores of computer studies students taught programming concepts using think-pair share strategy and those taught using lecture method

Source	Type III Sum of Squares	df	Mean Square	F	Sig	Decision
Corrected Model	43.80	2	21.90	3.44	.020	Rejected
Intercept	31.11	1	31.11	9.06		
Pretest						
Intercept	44.06	1	44.06			
Pretest						
Group	53.67	1	53.67	4.56	.020	
Error	172.64	155	.940	8.54		
Total	345.28	157				
Corrected Total	371.45	156				

The analysis presented in Table 3 indicates that there is a significant difference in the mean achievement scores of computer studies students taught programming concepts using the Think-Pair-Share strategy compared to those taught via the lecture method. The F-value of 4.56 with a significance level of .020 suggests that the null hypothesis (Ho1), which posits no significant difference between the two teaching methods, is rejected. The corrected model's significance at .020 reinforces the effectiveness of the Think-Pair-Share strategy in enhancing student achievement in programming concepts. These results imply that instructional strategies significantly impact students' learning outcomes, with collaborative approaches yielding better performance than traditional lectures.

Ho2: There is no significant difference between the mean achievement scores and standard deviations of male and female computer studies students taught programming concepts with think-pair share strategy.

The analysis of covariance (ANCOVA) presented in Table 4 indicates that there is a significant difference between the mean achievement scores of male and female computer studies students taught programming concepts using the think-pair-share strategy, as evidenced by the F-value

of 6.51 and a significance level (Sig.) of .00. This result leads to the rejection of the null hypothesis (Ho2), which posited no significant difference in achievement scores based on gender. Additionally, the corrected model shows a significant overall effect, with an F-value of 3.14 and a significance level of .00, further supporting the conclusion that gender influences achievement in this educational context. Therefore, it can be inferred that teaching strategies such as think-pair-share may yield different outcomes for male and female students in computer studies.

Table 4: Analysis of Covariance on the mean achievement scores of male and female computer education students taught programming concepts using think-pair share Instructional Method

Source	Type III Sum of Squares	Df	Mean Square	F	Sig	Decision
Corrected Model	36.98	2	18.49	3.14	.00	Rejected
Intercept	11.01	1	11.01	3.09	.00	
Pretest						
Intercept	14.42	1	14.42			
Pretest						
Gender	13.36	1	13.36	6.51	.00	
Error	704.84	154	5.26	5.09	.01	
Total	780.61	156				
Corrected Total	791.56	157				

Ho3: There is no interaction effect of gender and method (think-pair share strategy) on students' academic achievement in programming concepts.

Table 5: Analysis of Covariance on the interaction effect of gender and method (think-pair share Instructional Method) on computer education students' achievement in programming concepts

Source	Type III Sum of Squares	df	Mean Square	F	Sig	Decision
Corrected Model	37.36	2	18.68	6.09	.00	
Intercept	20.49	1	20.49	4.54	.00	
Pretest						
Method*Gender	16.56	1	16.56	5.11	.01	Rejected
Error	910.89	154	3.81			
Total	985.30	155				
Corrected Total	991.45	157				

The Type III Sum of Squares for the interaction between method and gender is 16.56, with a corresponding F-value of 5.11 and a significance level of 0.01, indicating a statistically significant interaction effect. Since the null hypothesis (H_0) states that there is no interaction effect, the results lead to its rejection, suggesting that the combination of gender and teaching method significantly influences students' academic performance. Therefore, educators should consider these factors when implementing instructional strategies to enhance learning outcomes in programming concepts.

Discussion of Findings

Findings from the study show that students taught programming concepts using with think pair share instructional strategy obtained a higher mean gain than those taught using direct instruction method, on testing the hypothesis, there is a significant difference in the mean achievement scores of computer studies students taught programming concepts using the Think-Pair-Share strategy compared to those taught via the lecture method. This finding aligns with the research of Usang and Okoli (2021), Eke (2021), and Egbai et al. (2022), who asserted that students utilizing the think-pair-share method demonstrated greater academic success than their lecture-taught peers. Furthermore, the results support Andrew and Alexandria's (2015) conclusion that implementing the think-pair-share approach significantly enhances students' academic performance. The consistent improvement in achievement among students taught using TPS suggests that interactive and student-centered teaching methods can be more effective than traditional approaches, particularly in programming concept, where conceptual understanding and problem-solving skills are essential.

The study also revealed that male students exhibited superior academic achievement compared to female students when engaged with the think-pair-share strategy, on testing the hypothesis, 4 indicates that there is a significant difference between the mean achievement scores of male and female computer studies students taught programming concepts using the think-pair-share strategy. This opinion is consistent with the findings of Egbai et al. (2022), who noted that male students outperformed their female counterparts academically.

The finding on the hypothesis which state that no interaction effect of gender and method (think-pair share strategy) on students' academic achievement in programming concepts, revealed that there is no interaction effect, the results lead to its rejection, suggesting that the combination of gender and teaching method significantly influences students' academic performance. Therefore, educators should consider these factors when implementing instructional strategies to enhance learning outcomes in programming concepts. This opinion

is consistent with the findings of Egbai et al. (2022), who noted that the combination of gender and teaching method significantly influences students' academic performance.

Conclusion

The study's findings indicate that the think-pair-share strategy significantly enhances students' academic achievement in programming concepts compared to traditional lecture methods. This interactive approach fosters collaboration and deeper understanding among peers, leading to improved learning outcomes. As teachers seek effective teaching methods, incorporating strategies like the think-pair-share can be instrumental in engaging students and promoting better academic performance. These results highlight the importance of innovative teaching techniques in the evolving landscape of education.

Recommendations

Based on the findings, the following recommendations were proffered:

1. Lectures should implement the think-pair-share strategy more widely in teaching programming concepts, and consider integrating it into other areas of the curriculum where applicable.
2. The school administrators should emphasize collaborative learning environments where students of all genders can work together and learn from each other. Encourage group discussions, peer teaching, and collaborative projects that promote teamwork and mutual support.

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