Three Instructional Strategies and Secondary School Computer Science Students' Performance in Oyigbo Local Government Area of Rivers State.

Ikechi, Chinwe
Department of Curriculum Studies and Educational Technology,
Faculty of Education,
University of Port Harcourt,
P.M.B5323 Choba, Port Harcourt, Rivers State.

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Dr. Arokoyu, Abosede Ajoke
Department of Curriculum Studies and Educational Technology,
Faculty of Education,
University of Port Harcourt,
P.M.B5323 Choba, Port Harcourt, Rivers State.

Abstract

This study investigated the effect of Three Instructional Strategies and Secondary School Computer Science Students' performance in Oyigbo Local Government, Area of Rivers State. The aim of this study is to find out if there was a difference in the academic performance of students taught with peer tutoring, think-pair-share, three-two-one (3-2-1) strategies, and those taught with chalk-talk instructional strategy. For the study quasi-experimental, pre-test, post-tests non-equivalent group design was adopted. three research questions and three null hypotheses guided the study. The population of this study comprised all the senior secondary school one students in mixed public schools in Oyigbo Local Government Area of Rivers State with a total of two thousand one hundred and eighty-nine students (2189). A sample of four schools was selected using a multistage sampling technique with a sample size of two hundred students. In each school, an intact class of 50 students was used. Data were collected from the four selected secondary schools using the Computer Science Performance Test. The test was administered as a pre-test and post-test. Both contained twenty multiple-choice items. Mean and standard deviation was used to answer the research questions while the hypotheses were tested using Analysis of Covariance at 0.05 level of significance. The results of the findings showed that students who were taught Computer Science using Peer Tutoring and the 3-2-1 strategy outperformed all their counterparts taught using Think-Pair-Share and chalk-talk strategies. The result revealed that there was no significant difference between male and female students' performance taught Computer Science using Peer Tutoring, Think-Pair-Share, 3-2-1, and chalk-talk instructional strategies. The study also revealed that there was no significant interaction effect between Peer Tutoring, Think-Pair-Share, 3-2-1, and chalk-talk instructional strategies and gender on students' performance in Computer Science.

Keywords*: Effect, Performance, Instructional Strategies, Computer Science, Peer- tutoring, Think-Pair-Share, 3-2-1*

Introduction

Currently, computers are seen on desks and tables of many homes, business centres, research institutions, organizations, banking industries, and educational institutions performing all different types of work. In education today, computers are used in extremely versatile ways to aid the understanding of a wide variety of subjects. The use and application of computers in promoting teaching, learning and enhancement of students' academic performance assumed a new dimension with the emergence of the 21st century. The developed and

New Industrial Countries (NIC) especially South East Asia have experienced tremendous improvement in their educational systems, especially in students' academic performance. This is because they introduced excessive use of computers in their classrooms. The performance of students in these countries sprang -up the interest of the government in other countries including Nigeria and has led to the introduction and use of computers in classrooms. The introduction of computers in schools has changed the landscape of education at large and Nigeria in particular.

Considering the influence of computers in changing the landscape of education and other areas of human life, it becomes imperative that every student should have at least some level of education in Computer Science. Computer Science is crucial in secondary schools because it is a springboard for technological advancement. It is important that students are taught Computer Science because it will enable them to learn how to use computers to improve their work and prepare for careers in a world where computers are synonymous with pen and paper. Computer Science will help the students to keep up while helping teachers by improving the way lessons can be planned and taught. Computer Science will provide efficient and better use of Information Technology by students. It will enhance secondary school students' creativity and thinking skills.

Computer Science is a peculiar and important subject due to its contribution to education and nation-building. Since Computer Science is an important subject, it is very vital that the students must be taught in the best way so that they can grab the key concept in computer science and for this to be achieved good instructional strategies has to be used. They are several instructional strategies: traditional and innovative strategies. The traditional strategies include lecture, field trip, demonstration, group project, debate strategies, and innovative teaching strategies include flip classroom, think-pair-share, peer tutoring, cloud computing, and 3-2-1 instructional strategies.

Peer-tutoring instructional strategy is also known as peer-assisted learning, peer education, child-teach-child, mutual instruction, and partner learning. Peer-tutoring instructional strategy as a pedagogical practice can reduce stress on teachers who are expected to teach large groups of multi-age and diverse students. Several methods can be used to set up a peer-tutoring instructional strategy in a classroom with a diverse student population in order to meet the learning needs of heterogeneous groups. Various students exist in a classroom while some can learn from a teacher, others can equally learn from their peers. (Nawaz & Reman, 2017) defined peer-tutoring as a "teaching strategy in which the class is organized in pairs of two students that may be of different abilities to act as tutor and tutee in the learning process in order to get maximum benefits from each other.

A Three-Two-One (3-2-1) instructional strategy is an instructional strategy that helps students structure their responses to a text, film, or lesson by asking them to describe three takeaways, two questions, and one thing they enjoyed. It provides an easy way for teachers to check for understanding and to gauge students' interest in a topic (Wager,2014). 3-2-1 instructional strategy is a strategy that aids reflection by providing a structure for students to summarize, organize and integrate what they are learning. When asked what they learned, students are often at a loss as to where to begin explaining their thinking. 3-2-1 helps by giving them prompts to jump-start the process of reflecting. The strategy may be used as admit or exit ticket. It may also be used to promote reflective dialogue among small groups of students (Garmston & Wellman, 2019). According to Honeycutt (2019), the 3-2-1 strategy is a that which helps teachers and students to identify not only what they learned in class, but also how the information fits into the knowledge they already have. And, it allows a way for students to share what they do not know which helps you make adjustments as needed. The strategy is called 3-2-1 because that is the structure of the feedback. In 3-2-1 by the end of class, the teacher asks students to share

i. 3 things they learned
ii. 2 things that confirmed what they already knew
iii. 1 question they still have

Advantages of the Three-Two-One (3-2-1) Strategy

i. Gives the teacher immediate feedback so you can make adjustments early in the course rather than waiting until the next class.
ii. Allows the students to share what they know and more importantly what they *do not know* so that they can provide more support before they fall too far behind.
iii. Creates a safe and open space for students to share feedback and know that it is great ideal to tell what they don't know. This can increase trust between the teacher and students because they know you care about their success.
iv. Decreases frustration since students are able to share their feedback immediately, and they know their feedback will be reviewed.
v. Gives students a voice in the process and pace of the class. With this strategy, students openly discuss or write what they already know and what they do not know so time is spent on the appropriate content.

In the 3-2-1 strategy, the teacher will not be spending too much time on content they know and not be moving too fast through the content they are struggling with.

vi. Allows the teacher an opportunity to look for patterns or trends related to students' understanding of the course material.

vii. Helps the teacher identify the "flippable moments" in the topic.

Disadvantages of Three-Two-One (3-2-1) instructional strategy

i. Time-consuming

ii. it can cause noise-making in the class

Think-pair-share is a cooperative learning strategy that includes three components namely: time for thinking, sharing with a share among pairs to a larger group. The use of the strategy unites the cognitive and social aspects of learning, promoting the development of thinking and the construction of knowledge. Think-pair-share strategy has many advantages over the traditional questioning structure. The "think time" incorporates the important concept of "wait time." It allows all students to develop answers, longer and more elaborate answers can be given, and answers will have reasons and justifications because they have been thought about and discussed. Students are more willing to take risks and suggest ideas because they have already "tested" them with their partners. Strategic steps of (Think-Pair-Share) posed some of the questions to the class about what has been explained about the activity or an issue or a task and then ask the students to think for a minute about this question alone with the prevention of talking or walking around in the classroom at the time of thinking, then the teacher asks students to split up into pairs to discuss and think together about a question or posed activity fora period of five minutes, finally, the teacher is required to participate by displaying what has been reached of solutions and ideas about the question or activity and it is characterized by giving the students an opportunity to reflect (with himself internally and externally with colleagues) and thinking and revision before answering (Zaitun, 2007 in Ogunyebi, 2018). If good instructional strategies are used in teaching computer science it will influence the academic performance of the students.

Academic performance is the measure of output and the main changes in knowledge, skill and attitude of individual acquire from school, where the use of grades in the examination could serve as predictive and criterion to measure. Even after testing the performance of students because the instructional strategies are effective students can retain that information with or without abstract.

Statement of the problem

Currently, the instructional strategies used in Nigerian secondary schools are based on behavioural learning theories which are content-driven, not learner-centred, and do not sufficiently give students the opportunities to participate in classroom instruction. Students taught with instructional strategies based on behavioural theories do not sufficiently retain their learning and apply it to new situations. Otukile (2018) stated that instructional strategies that are based on behavioural theories have long time influenced performance in class. He maintained that these instructional strategies are associated with top-down hierarchal pedagogy, and rote memorization, hindering retention and the development of higher-level cognitive skills. These strategies employed by teachers seem inadequate for equipping students in learning computer science education. Despite many years of behavioural learning theories for teaching, academic performance is on the decline with no sign of promoting interpersonal and group interactions The problem of this study was to determine the effects of think pair share, instructional strategy on academic performance of students in Computer Science in secondary schools in Oyigbo Local Government area.

Aim and objectives of the Study

The aim of this study is to investigate the think-pair-share instructional strategy and Secondary School Computer Science students' performance in Oyigbo Local Government Area Rivers State.

Specifically, the objectives of the study were to:

1. find out the effect of think-pair-share, peer tutoring, 3-2-1 and chalk–talk instructional strategies on students' performance in Computer Science.
2. Compare the effect of think-pair-share, peer tutoring, 3-2-1 and chalk-talk instructional strategies on male and female students' performance in Computer Science.
3. determine the interaction effect of methods and gender on students' performance in Computer Science.

1.4 Research Questions

Three research questions were raised and answered in this study.

1. What is the effect of peer tutoring, think-pair-share, 3-2-1 and chalk-talk instructional strategies on the mean performance scores of students in Computer Science?
2. What is the effect of peer tutoring, think-pair-share, 3-2-1 and chalk-talk instructional strategies on male and female students' mean performance scores in Computer Science?
3. What is the interaction effect of methods and gender on students' performance in Computer Science?

1.5 Hypotheses

Three null hypotheses formulated were tested at 0.05 level of significance.

1. There is no significant difference between the mean performance scores of students exposed to think-pair-share, peer tutoring, 3-2-1 and chalk-talk instructional strategies
2. there is no significant difference between the mean performance scores of male and female students taught Computer Science using think-pair-share, peer tutoring, 3-2-1 and chalk-talk instructional strategies.
3. there is no significant difference in the interaction strategies and gender on students' performance in computer science.

Significance of the study

This study will be of immense benefit to the government at all levels, curriculum planners, researchers, teachers, and students.

The research findings will help curriculum planners and educational administrators observe more clearly the conditions and circumstances under which the various models/theories of instruction can be used. This will therefore enhance effective teaching and learning.

To the researchers, it will provide basic research materials and methodology for other researchers who have an interest in the area of study. This study will help to induce other researchers into classroom instructional studies and thus filling some of the many gaps which will exist in our knowledge of the nature of instruction.

The findings of this study will be beneficial to the students since the findings will relate to the areas of teaching and learning thus generating principles that have functional value to teachers to teach well and under which all students learn as efficiently as their talents permit. It is hoped that the findings from this study will to a large extent reduce the psychological stress associated with learning.

The findings of this study will be very useful to computer science teachers who hope to foster great independence, seriousness and acquisition of skills of cooperative teaching/learning techniques in their students.

Methodology

Research Design
The design for the study is a quasi-experimental pre-test, post-test non -equivalent research design.

Population of the study
The population for the study comprised all senior Secondary School 1 (SS1) in mixed public schools in Oyigbo local government area of Rivers State with a total number of two thousand, one hundred and eighty-nine (2189) students.

Sample and Sampling Technique
A sample size of 200 students from four schools was selected from the wards that make up Oyigbo Local Government Area. Multistage sampling technique was used in selecting the four senior secondary schools from Oyigbo Local Government Area of Rivers State.
Stage 1: Stratified random sampling was used to group Oyigbo local government into ten strata, each stratum representing the electoral wards.
Stage 2: Simple random sampling was used in selecting four schools from the stratified wards
Stage 3: Simple random sampling was used in selecting one intact class from each selected school. The four schools were assigned to treatment and control groups with a sample size of four hundred students.

Research 1nstrument
The instrument used for data collection was Computer Science Performance Test (CSPT)

Computer Science Performance Test (CSPT): the CSPT consists of 20-item multiple-choice objectives tests and was scored 5 marks for the correct answer while any wrong answer attracts no mark. The maximum score for the data was 100 marks. The CSPT was used for both pre-test and post-test, and it was designed to measure students'" performance in computer input and output device lessons. Specifically, the questions were drawn from' Computer input and output devices".

Validity of the Instrument

The content and face validity of the instrument used for collection name CSPT and lesson plans were done by two experts in the field of Computer Science and measurement and evaluation in the Faculty of Education, University of Port Harcourt. A copy of the instruments was given to the experts and their contributions and corrections were incorporated into the final copy. The instrument consists of 20 multiple choice objectives test items and covered Remembering, Understanding, Applying, Analysing, Evaluating, and Creating

Reliability of the Instrument

A pilot test using 50 SS1 students from another school of the same background was not part of the study but was an equivalent sample of the group for which the instrument was developed and had covered the lesson on the topic chosen by the researchers. The pilot test was done by administering the CSPT to the 50 students in an intact class. The scripts were marked and the scores recorded. To estimate the reliability of the instrument, data collected from the CSPT was subjected to a reliability test and analysed using the Kuder Richardson Formula 20 (K-R20) reliability coefficient. Reliability indexes mean of 0.86 was determined.

Method of Data Collection

A pre-test was administered to both the experimental and control groups before the commencement of treatment to determine the baseline knowledge of the sample. After the pre-test, the experimental group was taught using peer-tutoring, think-pair-share, and 3-2-1 instructional strategies while the control group was taught using the chalk-talk instructional strategy. The teaching lasted for a period of four weeks. After the four weeks of training, the post-test was given to both experimental and control groups. Regular computer science teachers (research assistants) regulated treatment variables in their various schools.

Method of Data Analysis

The research questions were answered using mean and standard deviation while the hypotheses were analysed using Analysis of Covariance (ANCOVA).

Results and Analysis

Research Question1: What is the effect of peer tutoring, think-pair-share, 3-2-1 and chalk-talk instructional strategies on the mean performance scores of students in Computer Science?

Table 1: Mean academic performance scores of students taught Computer Science using peer tutoring, think-pair-share, 3-2-1 and chalk-talk instructional strategies

SN	Strategy	Adjusted Mean	SD	n
1	Peer Tutoring strategy	61.00	13.96	50
2	Think-Pair share strategy	59.90	13.46	50
3	3-2-1 Strategy	60.51	14.48	50
4	Chalk-talk strategy	58.20	15.64	50

The results in Table 1 indicate that Peer tutoring has a higher mean performance in computer science, followed by 3-2-1, and the think-pair-share strategy.

Research Question 2: What is the influence of peer tutoring, think-pair-share, 3-2-1 and chalk-talk instructional strategies on male and female students' mean performance scores in Computer Science?

Table 2: Mean academic performance scores of male and female students taught Computer Science using peer tutoring, think-pair-share, 3-2-1 and chalk-talk instructional strategies

SN	Strategy	Gender	Mean	SD	N
1	Peer Tutoring strategy	Male	68.00	15.42	30
		Female	56.33	10.82	20

2	Think-Pair share strategy	Male	58.27	15.36	26
		Female	61.67	11.10	24
3	3-2-1 Strategy	Male	62.14	14.24	28
		Female	59.55	15.58	22
4	Chalk-talk strategy	Male	56.91	15.96	34
		Female	60.94	15.08	16

The result of data analysis in Table 2 shows that peer tutoring and 3-2-1 strategies favoured male students more than their female counterparts in enhancing performance in computer science. On the other hand, the females fared better with the think pair share strategy and the conventional strategy.

Research Question 3: What is the interaction effect of methods and gender on students' performance in Computer Science?

Table 3: Interaction effect of method and gender on students' means performance scores in computer science

SN	**Strategy**	**Gender Categories**	
		Male	Female
1	Peer Tutoring Strategy	68.00	56.33
2	Think-Pair share Strategy	58.27	61.66
3	3-2-1 Strategy	62.14	58.33
4	Chalk-talk Strategy	56.91	60.94

The result of data analysis in Table 3 indicates that the peer tutoring and 3-2-1 strategy are superior in enhancing performance in Computer Science at the two levels of gender to the think-pair-share strategy and the Chalk-talk strategy.

Hypotheses

Hypothesis 1: There is no significant difference between the mean performance scores of students exposed to peer tutoring, think-pair-share, 3-2-1 and chalk-talk instructional strategies

Table 4. Analysis of Covariance for students' overall computer science performance scores by instructional strategies and interaction

Source of variation	**Sum of squares**	**df**	**Mean square**	**F cal.**	**f-probability**
Covariates (Pretest)	27763.149	1	27763.149	451.053	.000
Main Effects	953.997	4	238.499	3.875	.005
Method	952.420	3	317.473	5.158	.002
Gender	4.939	1	4.939	.080	.777
2-way Interactions: (Method and Gender	285.990	3	95.330	1.549	.203
Explained)	29003.136	8	3625.392	58.900	.000
Residual	11694.854	190	61.552		
Total	40697.990	198	205.545		

Table 4 shows that the level of significance (0.05) is greater than the F-probability value (.000). The decision rule is to reject the null hypothesis when the level of significance exceeds the given probability level. Since the level of significance is greater than the f-probability value, the null hypothesis was rejected. It can be concluded that there is a significant difference between the mean performance scores of students exposed to peer tutoring, think-pair-share, 3-2-1 and chalk-talk instructional strategies.

Hypothesis 2: there is no significant difference between the mean performance scores of male and female students' taught Computer Science using peer tutoring, think-pair-share, 3-2-1 and chalk-talk instructional strategies.

Data collected for males and females in each of the four Strategies for both pre-test and post-test were subjected to Analysis of Covariance to test this hypothesis and were presented separately for each of the Strategies as shown in Tables 5 to 8.

Table 5: Analysis of Covariance of Mean performance Scores of male and female students taught computer science using peer tutoring strategy only

Source of variation	Sum of squares	df	Mean square	F cal	F- probability
Covariates (Pretest)	6470.500	1	6470.500	105.738	.000
Main Effects (Gender)	203.388	1	203.388	3.324	.075
Explained	6673.888	2	3336.944	54.531	.000
Residual	2876.112	47	61.194		
Total	9550.000	49	194.898		

Table 6: Analysis of Covariance of Mean performance Scores of male and female students taught computer science using think-pair strategy only

Source of variation	Sum of squares	df	Mean square	F cal.	F- probability
Covariates (Pretest)	6164.172	1	6164.172	110.560	.000
Main Effects (Gender)	89.891	1	89.891	1.612	.210
Explained	6254.063	2	3127.032	56.086	.000
Residual	2620.437	47	55.754		
Total	8874.500	49	181.112		

Table 7: Analysis of Covariance of Mean performance Scores of male and female students taught computer science using the 3-2-1 strategy only

Source of variation	Sum of squares	df	Mean square	F cal.	F- probability
Covariates (Pretest)	6795.960	1	6795.960	82.977	.000
Main Effects (Gender)	4.674	1	4.674	.057	.812
Explained	6800.634	2	3400.317	41.517	.000
Residual	3849.366	47	81.901		
Total	10650.000	49	217.347		

Table 8: Analysis of Covariance of Mean performance Scores of male and female students taught computer science using chalk-talk strategy only

Source of variation	Sum of squares	df	Mean square	F cal	F- probability
Covariates (Pretest)	9560.372	1	9560.372	186.040	.000
Main Effects (Gender)	12.353	1	12.353	.240	.626
Explained	9572.725	2	4786.363	93.140	.000
Residual	2415.275	47	51.389		
Total	11988.000	49	244.653		

As shown in Tables 5-8 the F.probability values are .075, .210, .812 and .626 respectively. Since the F probability values are greater than the alpha level (0.05) in all the cases the null hypothesis was retained. Thus, there is no significant difference between the mean academic performance scores of male and female students taught Computer Science using peer tutoring, think-pair-share, 3-2-1 and chalk-talk instructional strategies.

Hypothesis 3: There is no significant interaction effect of methods and gender on students' performance in Computer Science.

Table 9*:* Analysis of Covariance for students' overall computer science performance scores by instructional strategies and interaction

Source of variation	Sum of squares	Df	Mean square	F cal	f-probability
Covariates (Pretest)	27763.149	1	27763.149	451.053	.000
Main Effects	953.997	4	238.499	3.875	.005
Method	952.420	3	317.473	5.158	.002
Gender	4.939	1	4.939	.080	.777
2-way Interactions:	285.990	3	95.330	1.549	.203
(Method and Gender					
Explained)	29003.136	8	3625.392	58.900	.000
Residual	11694.854	190	61.552		
Total	40697.990	198	205.545		

The result in Table 9 reveals that for two-way interactions, the f-probability value at 0.05 significance level is .203. Because the alpha level (0.05) is less than the F. probability value (.203), the null hypothesis was retained. Thus, there is no significant interaction effect of methods and gender on students' performance in computer science

Discussion of Findings

Peer tutoring, think-pair, 3-2-1 and chalk-talk instructional strategies on the mean performance scores of students in Computer Science

Table.1 indicates that Peer tutoring is the best strategy for ensuring performance in computer science, followed by 3-2-1, and the think-pair-share strategy. This was further confirmed by the corresponding hypothesis which revealed a significant difference between the mean academic performance scores of students exposed to peer tutoring, think-pair, 3-2-1 and chalk-talk instructional strategies. The result of this study supports the view of previous researchers such as Yusuf, et al (2017) and Taiwo et al (2020) who found that Peer Tutoring enhances students' performance. Also, the current study is in agreement with other studies by Khashane and Wadesango (2016) and Agu and Samuel (2019) that support peer tutoring as a valuable innovative strategy. The findings of this current study contradict the results of Aznam et al (2021) who found that peer tutoring in teaching and learning posed a challenge in scheduling compared to a professional tutor. From the findings also, the 3-2-1 group performed higher than think-pair-share and chalk-talk. The findings show that 3-2-1 is a more effective

instructional strategy when compared with the think-pair-share and chalk-talk instructional strategy. This is in agreement with Citra (2016), Futiha (2019), Susuasih and Wayan (2017) who opined that the 3-2-1 instructional strategy enhances learning and can be used in all subjects but particularly those topics that are confusing to the students.

Table 4 shows that the instructional strategies are significant factors in students' performance in computer science. Hence, the null hypothesis was rejected.

Peer tutoring, think-pair, 3-2-1 and chalk-talk instructional strategies on male and female students' mean academic performance scores in Computer Science

the findings in Table 3 show that for the peer tutoring and 3-2-1 strategy males are more favoured than their female counterparts in enhancing performance in computer science. On the other hand, the females fared better with the think pair share strategy and the conventional strategy. the findings of this study revealed that the male performed better in peer tutoring and the 3-2-1 group than their female counterparts. The present findings are in agreement with Ezenwosu and Nworgu (2013) who revealed that male students slightly performed better than female students and based on the performance he opined that computer science is a male dominant subject that the female students tend to shy away from it. While the female students outperformed the male students in think-pair-share and chalk and talk strategy. However, when subjected to statistical analysis, Tables 5-8 show there is no significant difference between the mean academic performance scores of male and female students' taught Computer Science using peer tutoring, think-pair, 3-2-1 and chalk-talk instructional Strategies.

Interaction effect of methods and gender on students' academic performance in Computer Science.

The findings as shown in Table 9. revealed that there is no significant interaction effect of methods and gender on students' academic performance in computer science. This finding support Igbokwe (2021) who revealed that there is no significant joint effect between the teaching approaches and gender on students' performance in mathematics.

Conclusion

The findings of this study have stressed the need for teachers to enhance students' performance in Computer Science through the use of cooperative instructional strategies. Because of its significant effect on the performance of students in Computer Science.

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