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Assessing the Effects of Cooperative, Competitive, and Individualistic Instructional Strategies on the Learning Outcomes of Senior Secondary School Students in Computer Science

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Abstract
The traditional approach has been criticized for always being teacher-oriented, a method which lays down rules and definitions on top of students. This strategy is still being used today because it allows a great deal of information to be turned over in a short time. The result is that students perform very poorly at both internal and external examinations. Therefore, this research sets out to discover an instructional method that could improve the old technique and enhance students' knowledge of the subject. Using cooperative, competitive and individualistic methods of learning in the three experimental groups with a fourth anticipating which would promote meaningful learning for computer science. The study was based on a quasi-experimental design with pretest and post-test control groups. The target population for the study was the entire public Secondary School Computer Science Two (SSS 2) student body in Ondo State, Nigeria. A sample of 400 students from intact senior secondary school two (SSS 2) classes formed the researcher's basis. For the research, the 40-item PCAT (Post Test Achievement Test) was developed for use by the researcher. The investigation was guided by four research questions and four hypotheses. The hypotheses were tested using Analysis of Variance (ANOVA) and Analysis of Covariance (ANCOVA), with an alpha level cutoff at 0.05 significance levels. The study's findings revealed that cooperative learning turned out to be most effective; close behind it came competitive and individualistic practices with the traditional styles a little further back. Most importantly, cooperative techniques influence everyone involved in them from whatever level or gender of beginner they may have started as. In the light of these results, it is recommended that instructors and students alike should receive routine training in cooperative learning concepts, methods and rules.

Keywords
Effects, Instructional strategies, Learning outcomes, Students, Computer science

INTRODUCTION

In recent years, with technology playing such an important role in a broad range of industrial and everyday activities, the field of computer science has become far more prominent than ever before in contemporary education. In a modern society marked by rapid technological change, computer science education has great significance. This is the view expressed by Oladimeji et al. (2018). For example, computer science offers problem-solving techniques that can be used in any venue. These capacities include problem analysis, solution development and implementation. In the digital era, the demand for computer science is very strong. Also, people who have completed their studies in this field are exposed to a lot of choices where the scope for employment ranges over all kinds of companies such as software engineering or data analytics and from the researcher's experience on campus, there are also courses teaching internet security such as firewalls. As Olojo and Faboya (2023) assert, the addition of computer science is necessary to solve contemporary social problems such as poverty, health care or climate change.

In domains like data analysis, simulations and modelling, the discipline of computer science helps to solve complex problems. In computer science, an emphasis is placed on logical reasoning, algorithmic thinking and attention to detail. These are skills that go beyond the specific context of programming-- they serve as abilities for general problem-solving. As a result, having an extensive understanding of computer science enables the automation of repetitive functions and thus improves efficiency in multiple fields. There are no doubt profound implications for productivity and resource allocation (Olojo & Faboya, 2023; Anah, 2018). In a nutshell, computer science education is an essential tool in the development of individuals as well as society and employment environments. It helps them participate and contribute within the increasingly digitalized, technological society in which we live.

Secondary education serves as an important bridge; assisting students in preparation for their future studies at university and helping them choose a career of interest (Olofin et al., 2023). The last year of secondary education is particularly important to students. It is their first contact with computer basics. This is a sound foundation for advanced graduate studies or subsequent work in this field. The National Policy on Education (2014) emphasizes that students with an early appreciation of computer science and other related fields must enjoy a sound foundation in senior secondary education. This programme is the base for undergraduate studies in computer science. Computer science students who do their studying in the final year of secondary school master skills all companies want, though not limited to programming language and problem-solving or analytical thinking. The more the world becomes technological, the more technically literate is all that much a necessity (Olofin & Olojo 2022). Technology is evolving so rapidly and our chances of getting ahead are as good as being in a coffin, we always have to keep one foot on the edge.

Senior secondary education provides students with a sturdy foundation in computer science, so that they may build upon this to expand their knowledge and skills through advanced studies or practical work (Olofin, et al., 2023). Computer science has far-reaching international influence. Senior secondary computer science education presents the opportunity to obtain knowledge and skills that are transferable between nations, making it possible for people who receive this training to have a wide scope of international cooperation and employment. As a result, the consideration of senior secondary computer science education is highly relevant in present-day society. Knowledge and ability learnt here are beneficial for further studies or future employment as well as daily life itself. Technology is the key to participation in our growingly digital and technologically driven society, it enables people's involvement.

The role of instructional practices in the field of computer science; where change and dynamism prevail in all directions. These methods are central to how students learn and directly affect their achievements. There are many types of teaching methods, from lectures to practical coding exercises and visual presentations to group projects. This means that a wider range of students can come into contact with the material. Using active learning approaches of problem-solving activities, coding challenges and project-based learning, students participate in the process of picking up habits. It helps us to develop a deeper understanding because in doing this we can apply the concepts of theory as practice. According to Olojo & Faboya (2023) a well-designed computer science education can help students acquire skills in logical thinking and problem-solving. The design of the tests must evaluate students' ability to critically analyze, judge and utilize their knowledge within actual situations. Through partnered coding projects and group work in the classroom, students can develop their interpersonal skills; cooperation abilities; and communication capabilities. These skills are crucial in both the academic and professional domains.

In computer science in particular, educational techniques must be flexible and subject to revision as new tools, languages or methodologies become available. This is because the profession changes and advances so rapidly, with new technologies continually are being developed. This allows students to develop abilities that are in line with modern business operations. Fundamental concepts are often used as the foundation for developing and understanding computer science education. To institute creative educational methods, it is especially important for them first of all clearly to understand basic concepts. Therefore students will have a comprehensive foundation that can support their future studies. Therefore, in the field of computer science education good instructional practices are key to a creative, effective and inclusive learning environment. This acquisition of knowledge, and development of a broad perspective, is essential in guiding students through the rapidly changing world where computer technology reigns supreme. Whether a cooperative, competitive or individualistic instructional strategy is employed can significantly change how students encounter the subject matter, work with others and understand difficult topics.

Teaching methods in computer science education is a topic of much concern and interest. Computer science students are expected to develop strong problem-solving, critical thinking and teamwork skills in addition to technical know-how. Thus, for educators and policymakers who want to optimize the education experience in this field, it is important they know which types of instruction have what effect on senior secondary students 'learning outcomes. Students have different learning styles and preferences. Others perform best under conditions enabling them to find answers together and exchange viewpoints (Olojo & Ojo, 2011; Arra, et al., 2011). Some people could thrive in competitive situations with ambition and the desire to succeed. And individualistic approaches aren't bad for some people either, who can focus and proceed at their own pace. With the rapidly shifting nature of technology and its varying degrees of incorporation into different industries, computer science education must remain dynamic to be effective.

The goal of this research is to offer the best possible advice for how instructors can change their teaching approaches in response to individual students 'diverse needs and thereby help increase student interest, proficiency and enthusiasm for computer science. The study will endeavour to explore the relationship between senior secondary school students 'computer science learning outcomes and cooperative, competitive, and individualistic teaching styles under these circumstances. This research aims to provide data-backed advice for the teachers and policymakers striving to produce a dynamic, effective learning environment in this crucial field by carefully examining these strategies within computer science education.

The study aimed to explore how much using cooperative, competitive and individualistic types of schooling would enhance students 'computer science grades. In particular, the objective of this study was to:

1. determine the effect of cooperative, competitive, individualistic and conventional instructional strategies on the pre – achievement scores of students when exposed to computer science concepts;
2. determine the difference in the post – achievement scores of students when exposed to computer science concepts using cooperative, competitive, individualistic and conventional instructional strategies;
3. find out the difference in the pretest and posttest scores of students when exposed to computer science concepts using cooperative, competitive, individualistic and conventional instructional strategies; and
4. find out the interactive effect of gender and treatment on students' achievement when exposed to computer science concepts.

RESEARCH HYPOTHESES

The under-listed hypotheses were generated for the study:

1. There is no significant effect of cooperative, competitive, individualistic and conventional instructional strategies on the pre – achievement scores of students when exposed to computer science concepts.
2. There is no significant difference in the post–achievement mean scores of students when exposed to computer science concepts using cooperative, competitive, individualistic and conventional instructional strategies.
3. There is no significant difference in the pretest and posttest mean scores of students when exposed to computer science concepts using cooperative, competitive, individualistic and conventional instructional strategies.
4. There is no significant interactive effect of gender and treatment on students' achievement when exposed to computer science concepts.

LITERATURE REVIEW

To ensure that learning experiences are effective and meaningful, educators use a variety of teaching methods. These are methods which actively involve the students, raising and testing their ability to judge information for themselves. They even allow them access directly to sources of knowledge or skills as well. These methods concern themselves with active, effective learning and catering to differences between learners (Issac 2010). Whether they are used individually or in combination with each other depends on the nature of a given subject area, level of education and type of student. The chosen method of instruction should fit within the learning objectives, students 'nature and subject matter. Furthermore, the form of instruction also depends on the nature and level of training and individual student needs (Kizlik 2016). These are sometimes combined by capable instructors in their efforts to create an active and stimulating educational environment. The instructional approach employed by a classroom teacher can be categorised into three main strategies: cooperative, competitive or individual (James & Eric 2018; Olojo and Ojo 2011). These are tactics to expand classroom interaction and effective learning.

Cooperative learning is a pedagogy in which students with varying skills work together in small teams to accomplish an objective (Olojo & Ojo, 2011). It means doing any number of things to pursue an understanding. According to Cohen (1994), in doing research students at this origin of a "collective atmosphere" keep contact with one another by exchanging ideas and information, they don't just passively listen as things are said but actively seek further knowledge through reading. After the exchange of viewpoints over a wide area, thereafter it is decided collectively--the students present their findings to all class members together. This approach encourages teachers to use a variety of other assessment methods, which means less reliance on competitive examinations. One concern for students is performance within cooperative learning groups. Students must accept responsibility for themselves, but at the same time should receive feedback as to how well or poorly they've scored (Slavin 2011; Olojo & Ojo 2011). This method simplifies the identification of the few people in a group who need help. Students' academic achievement and long-term retention of knowledge is also enhanced. It has often been used to build up student self-esteem and internal motivation. In another sense, it cultivates a friendlier attitude toward learning or mastering the art of socialization. Cooperative learning is not just group work, but more or less a team with structured activities which may include problem-solving, project completion and product development. It assumes that everyone in the same section has agreed on a level of understanding and cooperation between all members in case one student does well, and then every member can toast him or her with success (Slavin 2011; Johnson & Johnson 2005).

However, competitive learning takes place when one student succeeds in completing his or her desired objective while the other students do not (Olojo & Ojo 2011; Olojo 2023). Consequently, when students are required to interact with what they have learned, competitive learning becomes the most suitable type of education. The phenomenon under study may assume either an interpersonal or a group-to-group character. In class, students compete with each other. This is a direct result of the competitive nature, in which one student's success depends on another being unsuccessful. The current system of education puts much pressure on competition among students for grades, prestige, or other emoluments such as scholarships and places at respected institutions of higher learning. Within our society and the present educational structure, competition comes before cooperation. This is especially true in a traditional competitive classroom setting where children's main concern often lies with their grades and how they stack up on the grade distribution curve. The focus is on outperforming every other person. The result is an us-versus-them environment in which outstanding students are pampered with every possible promotion and plaudit. But at the same time, their colleagues with ordinary or below-average performance are left without such awards (Sunday & Elphinah, 2016). The traditional instructional paradigm often seen in schools is that of testing individual student performance through competition. It's an assessment method aimed at measuring students 'capacities and determining a rank order system based on grades. This methodology is based on the principle that those who win take all, while losers get nothing. The educational experience will produce performance objectives.

Indeed, the environment of an individualistically is that it strives after separate aims. For example, one man can achieve his objective without affecting others' achievements at all. In a meritocratic learning environment, the value of what one has done is understood based on individual efforts and contributions-- even if others are doing bad work (Sunday & Elphinah, 2016; Olojo, 2023). By 'individualistic environments' we mean those educational settings in which students believe that they learn from personal incentives and rewards. Within this particular context, learners shouldn't be too worried about what their peers are doing. Learners do their work and one person's success does not affect other learners 'progress. This means that learners 'attainment of goals must be self-directed, and must conform to conditions laid down by either the student or instructor. Learners work at their own pace and receive individual attention and assessment based on achievement with no regard for the achievements of others. The individually organized classroom makes such divisions necessary. Students do their work, regardless of what others are doing or where they may be in the process. Naturally, in terms of the restaurant experience, at what time an individual consumes his meal does not frighten or bother others. In this age of individualism, students are more concerned for themselves and want to come up with the best possible outcomes. They're not even thinking about how that might affect their classmates 'aims.

Research at the local and international level has tried to determine how best we can teach effectively. But such research is still ongoing, with no end in sight. James and Eric studied, in 2018, the effect of using a cooperative learning approach on trainees 'understanding and remembrance of science concepts. This study showed that the use of a cooperative learning approach was indeed an effective educational intervention to improve student achievement and retention. In addition, research found no apparent gender differences in the retention of subjects who served as a sample in this study. As a result, the researchers found that adopting a cooperative instructional model has the potential to heighten students 'grades and long-term retention of knowledge. A study by Edekor and Agbornu (2020) using a cooperative learning strategy resulted in improved academic achievement across the board for all students, regardless of their abilities. The goal of this research was to determine the effect on mathematics performance in a single case study group of Junior High Schools located within the Volta Region. The study found that there was no statistically significant link between gender and teaching technique concerning students 'average performance. As a result, the study's conclusions indicate that using cooperative learning methods is an extremely good technique for teaching mathematics. Previous research suggests that cooperative learning strategies, regardless of whether the individual is highly skilled or not and irrespective of one's gender (Ajaja, 2018; Crosby & Owens, 2018; Steven &Slavin, 2018; Megnin, 2020; Ajaja & Eravwoke, 2010), affect everyone involved equally because it allows for another person.

A study by Kolawole (2008) has shown that the cooperative learning method is superior to the competitive one. The study has looked at how competitive and cooperative learning strategies affect the academic performance of Nigerian students in mathematics. The study also found that boys were significantly better than girls at both learning strategies. It was also reported by Sunday et al. (2021) that on the other hand, there is a marked difference in academic performance between students who were taught cooperative or competitive learning strategies and those who formed part of the control group. The objective of this study was to examine the effect that cooperative and competitive teaching strategies offered on secondary school statistics achievement in Gwagwalada, Abuja city Nigeria. Further, the research found that using a cooperative or competitive learning style was gender-neutral as there were no significant differences in performance between male and female students. Furthermore, Owoyemi (2018) found that Chemistry students who took part in cooperative learning performed better academically than those exposed to competitive grouping. In addition, the achievements of both experimental groups were higher than those in the control group. The study indicates that there is no difference between males' and females 'intellectual success. Okereke & Ugwuegbulam (2014) conducted a study to determine the impact of competitive learning strategies on secondary school students 'learning outcomes. Their research results showed that the use of competitive learning methods led to better outcomes in chemistry.

METHODOLOGY

The method used in this investigation is the kind of pre-test and post-test control group quasi-experimental research described by Campbell & Stanley (1970). Thus, the effects of independent variables on dependent variables are tested in this design. The researcher followed the following design to obtain reliable results on presumptive linkages among variables. Fig. 1 below shows the design format:

(Experimental Group 1)	O_1	X_1	O_2
(Experimental Group 2)	O_3	X_2	O_4
(Experimental Group 3)	O_5	X_3	O_6
(Control Group)	O_7	C	O_8

Fig. 1: Design Format

where: O_1, O_3, O_5 and O_7 represent the pre – test

O_2, O_4, O_6 and O_8 represent the post – test respectively

For the group one, group two, group three and the control group respectively.

X_1 = represents treatment 1 using cooperative instructional strategy

X_2 = represents treatment 2 using competitive instructional strategy

X_3 = represents treatment 3 using individualistic instructional strategy

C = represents the control group using the conventional teaching method

The design is essentially a Quasi – experimental research consisting of three experimental groups and one control group.

The population for this study consisted of all the Senior Secondary Two (II) Computer Science Students in Ondo State, Nigeria. At the time of the survey, the State had 281 public secondary schools. Since they were no longer beginners when it came to the concepts and skills of computer science, students at Senior Secondary School 2 (SS II) could be brought up quickly in level. In addition, the students were not preparing for any external examinations and had plenty of time to devote to working on an experiment. These students were also happy to exchange their ideas on computer science. The sample was based on a purposive random sampling technique. 400 students in senior secondary school two (SSII) were selected from eight secondary schools of Ondo State, including 189 boys and 211 girls. 50 students were then chosen at random from each of the schools previously selected. Later, two schools were picked at random for each group. Therefore, there were one hundred (100) students in each of the three experimental groups and one control group. The following factors were used to choose which schools to choose:

i. Well – equipped computer laboratories
ii. Qualified and well – experience computer science teachers
iii. Good libraries, well – stocked with current computer science textbooks, journals and periodicals

The instructional package for this project consisted of the schedule work and teaching materials on chosen topics. The different content objectives under the given sub-topics determined for students were derived by consulting textbooks on computer science that are required in all senior secondary schools of Ondo State. The package was made up every week. The package includes an overview of the lesson plan, as well as duration, behavioral goals for students and those activities appropriate to this age group. Teaching style is also provided in detail. A package draft was reviewed by three old hands among secondary school computer science teachers and WAEC/SSCE/NECO examiners. These educators were asked to:

i. Evaluate the learning objectives to see if they are appropriate for the material to be learnt.
ii. Assess the degree to which the accomplishment exam for each topic represents the lesson's objectives.

The objectives and achievement tests were modified to better suit classroom application based on the feedback from these teachers.

The computer science topics taught during the study are:

i. Browsing, searching, and filtering data, information and digital contents
ii. Evaluating data, information and digital contents
iii. Mapping data, information and digital contents
iv. Communication and collaboration
v. Interacting through digital technologies

The Pre-Test Computer Achievement Test (PTCAT) was one of the tools used in the study. It was given to all students before treatment and had been devised merely to control for homogeneity among instructional groups which were broken down into cooperative, competitive, and individualistic types respectively. After the treatment (taught them the computer science package), however, the Post-test Achievement Test (PCAT) was given to all three groups. How the three groups were treated could have been a factor if any differences between pre-test and post-tests were noticed. There were two comparable tests: the Pre-Test Computer Achievement Test (PTCAT) and the Post-Test Achievement Test (PCAT). This achievement test had forty multiple-choice, objective questions. The format is developed from the linguistic and psychological contents of studied materials in a multiple-choice fashion. There were two portions in the test: Section A deals with personal students' information; and section B contains 40 multiple-choice objective questions. The content of items was based on a test plan stressing the applicability of its stated objectives. These items were used to collect data in both the pre-test and post-test. All of the subjects covered in the experiment were covered in the test's content.

Validity of the tools was established by face and content validity procedures. It was accomplished by assuring that the questions were well-written and took into account all the ground covered in the presentation. The questions for the tests were modified versions of those on earlier standardized tests given by both the West African Examination Council (WAEC) and the National Examinations Council. This means that the questions' items were reliable.

The pre- and post-test results were processed using the SPSS 23 version. The study questions were studied with descriptive statistics (mean and standard deviation). Hypothesis testing is done employing Analysis of Variance (ANOVA) and Analysis of Covariance (ANCOVA). Alpha criteria were set at 0.05 to test each of these hypotheses.

Hypothesis 1: There is no significant effect of cooperative, competitive, individualistic and conventional instructional strategies on the on the pre – achievement scores of students when exposed to computer science concepts.

One-way Analysis of Variance (ANOVA) at the 0.05 level was carried out to test the validity of this hypothesis; pre-achievement mean scores were compared for students exposed respectively to cooperative, competitive, individualistic or traditional teaching styles. Table 1 displays the outcome.

Table 1 One way Analysis of Variance (ANOVA) showing the academic performance of Students exposed to experimental and control groups in Pretest in Computer Science

Source	SS	Df	Ms	Fcal	Ftable
Between groups	122.688	3	40.896		
Within groups	6627.690	396	16.737	2.433	2.60
Total	**6750.378**	**399**			

*P<0.05

At the 0.005 level of significance, Fcal (2.433) was smaller than Ftable (2.60).
As shown in Table 1, at the level of significance of p = 0.05 (2-sided), Fcal was less than Ftable (F ratios are statistics used to judge differences between situations). Therefore, the null hypothesis of no significant difference was accepted. As a result, computer science concepts showed no significant differences in pre-achievement mean scores for students following cooperative; competitive individualistic and conventional instructional learning strategies.

Hypothesis 2: There is no significant difference in the post – achievement mean scores of students when exposed to computer science concepts using cooperative, competitive, individualistic and conventional instructional strategies.
The post-achievement mean scores of students exposed to cooperative, competitive, individualistic, and traditional teaching styles were compared using a one-way Analysis of Variance (ANOVA) at the 0.05 level of significance to test the hypothesis. Table 2 displays the outcome.

Table 2 One way Analysis of Variance (ANOVA) showing the academic performance of students exposed to experimental and control groups in posttest in Computer Science

Source	SS	Df	Ms	Fcal	Ftable
Between groups	9896.708	3	3298.903		
Within groups	39272.870	396	99.174	33.264*	2.60
Total	**49169.578**	**399**			

*P<0.05

The F - value calculated from the table (399 degrees of freedom) was 33.264, which far exceeds an estimated significance level p = 0.05 (two-tailed test), as shown in Table 2; this is to say that there are some noticeable differences between situations here at least at a significant level of 0.05. Therefore, the null hypothesis was rejected. This showed that the two groups of students who received treatments and those who didn't were very different in their performances. This showed that the treatment was effective enough to greatly raise the grades obtained by students who received its experimental administration. Therefore, Scheffee's Post - Hoc of multiple comparisons among the groups was used to determine which two sets exhibited statistically significant differences at 0.05 alpha levels. Table 3 displays the outcome.

Table 3 Scheffee's Post – Hoc analysis of treatment and post achievement mean scores of Students in Computer Science

	N	Mean	Cooperative	Competitive	Individualistic	Conventional
Cooperative	100	44.18		*	*	*
Competitive	100	35.16				*
Individualistic	100	36.47				*
Conventional	100	30.32				

Table 3 demonstrates the two treatment groups that differed greatly in post-achievement mean scores at the.05 level. The data showed a high degree of post-achievement mean scores for students who had received cooperative instruction, compared with the competitive strategy. And, as in the previous case (a comparison between objective problem-solving and comprehensive instructional strategies), mean scores for students receiving cooperative instruction are found to make a significantly higher score than those who receive individualistic or conventional treatment. Likewise, the average difference in instructional strategy between competitive and conventional is strong favor of competitive strategy. Lastly, the mean difference between individualistic and conventional approaches is considerable in favour of the former.

Hypothesis 3: There is no significant difference in the pretest and posttest mean scores of students when exposed to computer science concepts using cooperative, competitive, individualistic and conventional instructional strategies.
To put the hypothesis to the test, mean scores of students exposed to cooperative, competitive, individualistic, and traditional teaching styles were compared using Analysis of Covariance (ANCOVA) at the 0.05 level of significance. Table 4 displays the outcome.

Table 4 Analysis of Covariance (ANCOVA) summary of Treatments and students' achievement in computer science

Source	SS	Df	Ms	Fcal	Ftable
Corrected Model	12976.494	4	3244.124	35.405	2.37
Covariate (Pre - Test)	3679.787	1	3079.787	33.612	3.80
Group	10722.013	3	3574.004	39.006*	2.60
Error	36193.083	395	91.628		
Corrected Total	49168.578	399			
Total	**5833019.00**	**400**			

**P<0.05*

In Table 4, Fcal (39.006) was greater than Ftable (2.60), at the level of significance of p = 5 percent. Therefore, the null hypothesis was rejected. This means that the mean scores of students exposed to computer science concepts by cooperative, competitive, individualistic and standard teaching styles had a large difference. The Multiple Classification Analysis (MCA) was employed to evaluate the influence that treatment exerted on students 'computer science accomplishments. The results are shown in Table 5.

Table 5 Multiple Classification Analysis (MCA) of Treatments and students' achievement in computer science

Grand Mean = 36.53					
Variable + Category Treatment	**N**	**Unadjusted Deviation**	**Eta**	**Adjusted for independent + Covariate**	**BETA**
Cooperative	100	7.66	28.38	7.90	0.21
Competitive	100	- 1.36		- 1.85	
Individualistic	100	- 0.05		0.19	
Conventional	100	- 6.20		- 6.33	
Multiple R^2					0.046
Multiple R					0.214

Table 5 shows the Multiple Classification Analysis (MCA) of treatments and students' success in computer science. Students exposed to cooperative teaching technique had the greatest post-accomplishment mean score of 44.43 (36.53 + 7.90) with a grand mean of 36.53. Individualistic learning followed closely with an adjusted post-achievement score of 36.72 (36.53+(0.19)), competitive learning with an adjusted Post - achievement mean score of 34.68 (36.53 + (-1.83)), and conventional learning with the lowest adjusted Post - achievement mean score of 30.20 (36.53 + (-6.33). This suggests that cooperative, individualistic, and competitive teaching techniques (in that sequence) are genuine instructional strategies for the effective higher performance of computer science students. In other words, the cooperative learning group outperformed the individualistic and competitive learning groups, as well as the traditional learning group, in the computer science test.

R is the coefficient of multiple correlations. This suggests that the treatment had a low and favourable connection with PCAT. R2 was 0.046 as the coefficient of determination. This means that the variance in pre-test PCAT accounted for 4.6% of the variation in post-test PCAT score. In other words, the remaining 95.4% variance in post-test PCAT was caused by the researcher's treatment.

Hypothesis 4: There is no significant interactive effect of gender and treatment on students' achievement when exposed to computer science concepts.

To test the hypothesis, male and female students exposed to cooperative, competitive, individualistic, and traditional teaching styles had their accomplishment mean scores compared and statistically analyzed using Analysis of Covariance (ANCOVA) at the 0.05 level of significance. Table 6 displays the outcome.

Table 6 2x3 Analysis of Covariance (ANCOVA) of Gender and treatment on students' Achievement in Computer Science

Source	SS	Df	MSS	Fcal	Ftable
Corrected Model	13467.580	8	1683.448	18.437	1.94
Covariate (pretest)	3291.104	1	3291.104	36.043	3.84
Gender	92.926	1	92.926	1.018	3.84
Group	10742.293	3	3580.764	39.216*	2.60
Group * Gender	405.045	3	135.015	1.479	2.60
Error	35701.997	391	91.309		
Corrected Total	49169.578	399			
Total	**583019. 000**	**400**			

** P<0.05*

In Table 6, Fcal (1.479) was less than at the .05 level of significance and smaller than Ftable (2.60). So the null hypothesis won out. In other words, when students learned computer science-related topics there was no significant interaction effect of gender and treatment on their success. That is to say, male and female students given the same treatment had nearly identical achievement mean scores in computer science. In the same way, gender was not a main impact at significance of 0.05; Fcal = I.OI8 and Ftable = 3.64 dc On the other hand, students 'achievement in computer science was affected by treatment and this effect reached statistical significance at the 0.05 level (Fcal =39.216; Ftable=2.6).

DISCUSSION

The research findings indicate that the impact of cooperative, competitive, individualistic, and traditional learning groups on pre-achievement mean scores was not statistically significant in the context of computer science ideas. This implies that initially, the four groups had a high degree of homogeneity during the inquiry. Put otherwise, the initial level of information possessed by the students for the research was roughly the same across all four groups. The results also indicated a significant disparity in the average scores of students who were exposed to computer science subjects using cooperative, competitive, individualistic, and traditional learning approaches. The evidence shown in the results of Hypothesis 2 supports this assertion. This indicates that there was a notable disparity in the average results of students who were exposed to different learning approaches during the pretest and posttest. In contrast to the control group, the experimental groups exhibited superior mean scores in academic performance throughout the post-test phase.

An inspection of the results revealed a significant difference between the experimental groups and control group in their post-test scores. The finding shows that the intervention helped to increase academic achievement in computer science. The results showed substantive differences between cooperative and competitive orientations; between cooperative and individualistic orientations; between the two latter types on one side, together versus other-orientedness (or conventionalism) in particular on the other. Two groupings were clearly distinguished among respondents with only slight overlap across lines common to both. The results show that cooperative learning proved the most successful of the several styles used, with competitive and traditional varieties being less effective than individualistic ones. The results of this study correspond to those reported by Kolawole (2008), Akdeniz &Tarim (2008), Effndi (2010), Ajaja (2018), Crosby & Owens (2018), Steven &Slavin (2018), Megnin (2020), Ajaja & Eravwoke (2010), and Hauwa (2021), all of whom concluded that cooperative behaviour outperforms competitive or individualistic behaviour.

One possible explanation is that students' active participation in giving and receiving explanations makes underlying concepts easier to grasp. With this principle of cooperative learning, students have greater scope to communicate with each other and solve problems together. They can also share ideas as well as mutual help one another out in their work. Traditional methods of education, on the other hand, accord priority to the role played by teachers (master), which leaves much less space for student involvement in activities such as discussion and problem-solving.

The fourth was to look at the impact of gender and therapy on students ' achievements. Thus, there was no significant gender-by-therapy interaction. This means that students of both sexes receiving equal treatment will have similar mean scores in computer science achievement. In other words, perhaps one can say that both male and female students could gain similar benefits from a cooperative or competitive approach to the study of computer science. In other words, the adoption of cooperative learning minimizes gender as an obstacle to education. This conforms with observations found in the work of James and Eric (2018), and Edekor and Agbomu (2020) that small groups have no gender inequality, or how those involved interact, as well as what they achieve. This finding is in contrast to the findings of Kolawole (2008), Ilugbusi and Adamu (2001), and Kolawole (2008), whose investigations revealed that male students outperformed female students. This finding is in contrast to the findings of Kolawole (2008), Ilugbusi and Adamu (2001), and Kolawole (2008), whose investigations revealed that male students outperformed female students.

CONCLUSION

The study presents an expansion of research on reception learning, with an emphasis on the utilization of cooperative, competitive, and individualistic methods of education as an alternative to the traditional lecture technique for teaching computer science concepts. The former approach's teacher-dominated component drew strong criticism for rendering students docile. Scholars characterize the conventional approach as teaching students rules, concepts, and processes to remember rather than engaging them in active learning. This method is still utilized in our classrooms even though it routinely results in low student performance in both internal and external tests since it encourages learners to acquire a lot of knowledge rapidly. This study seeks to develop an educational technique that can enhance and strengthen the traditional approach to improving learning and student performance in computer science. The three experimental groups employed cooperative, competitive, and individualistic teaching techniques, and they were used in conjunction with the fourth group (the traditional methodology) to determine which method would lead to increased meaningful learning in computer science. The study's findings revealed that, among the four approaches tested, the cooperative technique was the most effective in enhancing cognitive performance in computer science. Also, male and female students exposed to the same treatment did not differ significantly in their achievement mean scores in computer science.

RECOMMENDATIONS

Based on the findings of this study, the following recommendations were made:

1. Teachers at the secondary school level can try out a collaborative learning method to enhance students 'performance and social interaction abilities, thus creating Metacognition.
2. To make the cooperative learning concepts, processes and rules work effectively; instructors as well as students should go through a period of training so that they clearly understand what their responsibilities are.
3. Ministry officials, curriculum developers and school principals should actively promote training in how to practice cooperative learning at all levels of education.
4. Teachers also have to take special workshops and refresher courses. Standards for assessment need to be established in the course of implementation.
5. All students, both males and females alike, should make popularizing captivating a priority.

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