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Computer-Based Programmed Instructional Strategy and Tertiary Institution Students' Achievements in Nigeria

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Abstract
This study was conducted to determine the effect of computer-based programmed instructional strategy (CBPIS) on tertiary institutions students' achievement in Nigeria with the intention of proffering solution to the evident need to improve tertiary students' low achievements. Three research questions and hypotheses guided the study. The study was delimited to Year two cost accounting students in the tertiary institutions in the South East zone of Nigeria. It adopted the Quasi-experimental design of pre-test, post-test non-randomized control group. Two (2) universities were simple randomly sampled for the experiment. The sampled universities were divided into two groups again by simple random sampling, one university in each group. One of the groups comprised 45 students of both gender and was used as the treatment group. The other group made up of 31 students of both gender used as the control group. All the classes used in the experiment were intact classes. The instructional package developed for the treatment group was a computer-based programmed instructional strategy conventional teaching strategy was the package for the control group.The instrument for data collection was a 50-item multiple choice Cost Accounting Achievement Test (CAAT), which was validated by three experts in measurement and evaluation and cost accounting experts. The reliability was tested using (K-R20) approach and obtained a reliability coefficient of 0.89 and test re-test estimate of reliability with the coefficient of stability of 0.84. Data collected were analysed using mean and standard deviation for the research questions while the null hypotheses were tested using (ANCOVA) at 0.05 level of significance. Based on the data analysis, the result revealed that: students taught Cost Accounting using computer-based programmed instructional strategy had significantly higher achievement scores than the control group taught with conventional lecture method, there were no gender differences on students' achievement in Cost Accounting and there was no interaction effect of treatments and gender on students' academic achievement in Cost Accounting. The implication of the study is that Computer-based Programmed Instructional Strategy enhances students' interaction with the learning environment which in turn helps to sustain students' interest in learning and consequently improve students' achievements generally. It was recommended based on the findings that (i) Every Department in the tertiary institutions should be firm in ensuring that newly admitted students come along with their computer systems for effective implementation of this strategy. (ii)Lecturers and students were advised to adopt computer-base programmed instructional strategy in the teaching/learning of cost accounting and all other courses studied in the tertiary institutions. (iii) A software that can centrally monitor its usage should also be developed by software designers to guard against inappropriate application of this strategy by the students.
Keywords: Computer-based Instructional Strategy, Cost Accounting, Achievement, gender and Tertiary Institutions
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Introduction

Academic achievement is paramount in assessing whether the objective of a programme has been achieved. According to Anikweze (2010), academic achievement is referred to student's successful accomplishment of educational tasks usually by means of skill, exertion of energy, practice and perseverance. He further explained that academic achievement is both indicative and predictive. It is indicative when it shows a student's level of success in a completed course of study: Grades A, B, C for instance, have implications in rating academic successes. It becomes predicative when it serves as a criterion for determining the ability of a student to undertake another task successfully. Kpolovie (2014) described academic achievement as the aggregate of each student's demonstrated learning, knowledge, skills, ability and indeed cognitive and affective and psychomotor

domains. It covers class and extra-mural activities It is the outcome of education and indicates the extent to which all educational participants, namely: students, teachers, curricular and educational institutions have achieved the set educational objectives and goals. Agu (2012) opined that academic achievement represents outcome that indicates the extent to which a person has accomplished specific goals that were the focus of activities in instructional environments, specifically, in schools. It is described as the outcome of students' effort in examinations. It could be high, average or poor.

Abdullahi (2013) described poor academic achievement as any performance that falls below a desired standard. Most teachers lack knowledge of innovative teaching and strategic assessment techniques, and these have been responsible for students' poor academic achievement. Additionally, Adunola (2011) maintained that substantial research on the effectiveness of teaching indicates that the quality of teaching is often reflected by the achievements of the learners.

Teaching according to Richland, Stigler and Holyoak (2012), is a deliberate effort by a matured or experienced person to impart information, knowledge, skills to an immature or less experienced person through a process that is morally and pedagogically acceptable. Similarly, Wiggins (2012) defined teaching as the action of a person imparting skills or knowledge or giving instruction. He maintained that teaching is an attempt to assist students in acquiring or changing some skill, knowledge, ideal, attitude or appreciation. Therefore, teaching involves the setting up of activities to enable somebody learn something which can improve the person's knowledge, skills, attitudes and values. Thus, the aim of teaching is to facilitate learning.

For teaching to facilitate learning, Orlich, Harder, Trevisan and Brown (2010) emphasized that the content to be taught has to be worthwhile and the procedure has to be educationally acceptable for activity to be classified as teaching. In this context, teaching can therefore be defined as a systematic activity deliberately engaged in by somebody to facilitate the learning of the intended worthwhile knowledge, skills and values by another person and getting necessary feedback. Central to the process of teaching is the concept of effective teaching. Effective teaching is one that produces demonstrable result in terms of cognitive, affective and psychomotor development of the students. Effective teaching depends on the teacher's use of appropriate instructional methods and techniques (Cabrera and La Nasa, 2002). Regular poor academic achievement by the majority of students is fundamentally linked to application of ineffective teaching strategies to impact knowledge to learners. Consistent with the observations above, Adunola (2011) added that successful teaching in skill does not depend only on the teachers' mastery of the subject matter but, also on the instructional delivery method.

Literature indicated that there are many factors which could hinder effective teaching and learning of any course programme and cause students to have poor academic achievement. Omotayo (2014) and Olarinoye (2015) outlined such factors to include lack of qualified teachers, inadequate supply of facilities and equipment, lack of instructional materials and wrong method of teaching. Among all these factors, teacher's method of instruction has been viewed to have direct impact on students' academic achievement. Many teaching methods and approaches have been used in teaching the students in the tertiary institutions such as lecture method, demonstration method, question and answer method, assignment method, tutorial method, etc. These methods seem not to be yielding the expected results currently. Lecture method was used for the control group in this study. Lecture method of teaching is the oldest teaching method applied in educational institution. This method is one way channel of communication of information. Students' involvement in this teaching method are just passive listeners and sometimes pen down some notes if necessary, during the lecture, combine the information and organize it. This method though teacher centred, has been used to graduate successful students from the tertiary institutions in Nigeria. Lecture method according to Orlich, Harder, Trevisan and Brown (2010) is most convenient and inexpensive method of teaching any subject. It hardly requires the use of scientific apparatus, experiment, and aids materials except for the black board. Lecture method is teacher controlled and information centred approach in which teacher works as a role resource in classroom instruction. In the field of education, lecture method is used very frequently. This method is used in order to acquire knowledge and concept. Lecture method mainly focuses on cognitive objectives. The main emphasis of this strategy is the presentation of the content. In this method the teacher plans and controls the whole teaching–learning process.

Appropriate teaching method influences the degree of learning by students. Agu (2018) described learning as the complex synergy of cognitive, affective, psychomotor and environmental experiences and other influences for the acquisition and enhancement of changes in individual's behaviour and world view for better resolution of problems. Learning according to him, is more effective if the experience makes sense to the learner. Learning means permanent change in behaviours due to teaching and other experiences. Umar, Abdullahi and Hassan (2015) advocated for use of students-centred teaching methods in the teaching yet, most lecturers still use conventional (lecture) method which is teacher-centred in teaching students. Azih and Nwosu (2011) indicated that student-centred methods which are characterized by active involvement of students in the teaching and learning process could be the important factor for improving students' academic performance Students' achievement in any learning activity is sustained by the active involvement of the learner in all aspects of the learning process.

Miller, McNear, and Metz (2013) suggested that one way to improve students' achievement is through the use of active and engaging pedagogies. Therefore, the researchers are of the opinion that, to ensure meaningful teaching and learning that will improve academic achievement, several and specific instructional strategies that are suitable to bring readiness to the problem have to be adopted by lecturers in tertiary institutions for teaching. One of such instructional strategies that is gradually gaining research attention in recent time is Computer-Based Programmed Instruction for students' learning.

Programmed Instruction, according to Yusuf and Afolabi (2010) is one of the important innovations of the twentieth century in the teaching–learning process. It is a technique of teaching in which learners get individualized instruction or learning experience through self instructional materials. Here the self instructional material or the learning experience is logically sequenced into small segments with self corrective instructions. The programmed learning is characterized by initial behaviour, small steps, and active participation of the learner, terminal behaviour, immediate feedback, and self evaluation by the learner. Computer-based instructional strategy is based on the principle of programmed instruction. (Safo, Ezenwa & Wushishi, 2013). Safo et al (2013) described computer based instruction as a new teaching and learning strategy in which the topics to be taught is carefully planned, written and programmed in a computer which could be run at the same time in several computer units and it allows each student to one computer terminal. The instructions are also programmed in a computer disc (CD), this could be played in either audio or video system for the students to learn the program at his or her leisure time and at his or her own pace. Teachers should be able to develop their programs for their students.

The study investigated how the different gender can be affected with this instructional procedure. Gender differences in learning continue to be a focus of interest in the majority of studies which show that there is a communal belief that males perform better in most of the courses (Yazici and Ertekin, 2010). Gender is a cluster of characteristics that differentiate males from females. According to Oluwatelure (2015), gender refers to the social attributes and opportunities associated with being a male or female, man or woman and being a boy or girl; these attributes, opportunities and relationships are socially constructed and are learnt through socialization processes of which the school is one of the major agents.

Fennema and Leder (2010) also identified differential teacher interactions with boys than girls, they praise and scold boys more than they do to girls and called on boys more than girls. In spite of all these evidences, the impact of their differential treatments is unclear and uncertain. Yet, the data collected from these teachers treatments of boys and girls cause gender differences. However, this study is particularly interested in determining the effectiveness of Computer Based programmed Instructional Strategy on the achievement of male and female students in cost accounting in tertiary institutions.

Cost accounting is one of the courses offered in tertiary institutions in Nigeria and its relevance in business organizations cannot be over emphasized. Management in complex business environment is saddled with the responsibility of how to arrive at the minimal cost of production as well as to plan, coordinate and control operations to achieve efficiency and profit maximization. Companies that produce various brands of products find it difficult to distinguish the cost per unit of the variety of goods unless costing techniques is applied (Ebe, Ugwuanyi and Onyeka, 2010).

Cost accounting is generally regarded as a way of gathering and assigning historical costs to units of products and departments especially for the purpose of inventory/stock valuation and profit ascertainment by the business oriented ventures. In the modern age, although determination of profitability has always been the root cause of all commercial activities, still cost accounting has made a place for itself as companies have come to realize that calculation and control over the cost is necessary (Elias, 2005). According to Al-Twaijry (2010), studying cost accounting is fraught with more risks of weak academic performance than studying financial accounting and some other business courses since this course is not straightforward. Cost Accounting involves meticulously accurate analyzing, standardising, forecasting and comparing relevant costing data so as to interpret and report various concern areas to management.

Despite the importance of accounting in daily activities of individuals, businesses and government, the persistent poor academic performance of students in tertiary institutions in cost accounting and other courses has not been adequately addressed. This generally, makes poor achievement a great concern to education stakeholders. Hence this study determined the effect of computer programmed instruction on the achievement of cost accounting students in the tertiary institutions.

Research Problem

The greatest problem of the education sector is poor achievement of students. Aremu and Sokan (2003) identified poor academic performance as a performance that is adjudged by the examiner and other significant as failing below an expected standard. It is frustrating to students and their parents. Its effects according to Aremu and Sokan are equally crucial on the society in terms of lack of manpower in all the fields of the economy and polities. Poor achievement has diverse impacts on the educational, emotional, social and intellectual well being

of the students and the society. According to Zoubi and Younes (2015), poor achievement is one of the problems facing educationists which hindered them in the appropriate implementation of their educational missions. They opined that poor academic achievement presents problems which may lead to the presence of a group of students who are unable to pursue their courses with others because of their weak potentials. This is true because a student with low achievement is lacking in basic knowledge, skill and attitudes. He lacks the background for future learning, he/she cannot practice it and can lead to dropping out of school. This can be frustrating to all. Islam and Islam said that poor achievement should be a concern to teachers in the tertiary institution, but most often, management of institutions see it as students' problems and give it less attention until it becomes serious.

Below is a summary of performances of Business Education students (Accounting option) for three (3) sessions in the institutions under study.

Table 1: Business Education Students Performance In Cost Accounting

INST	YEAR	GRADES						TOTAL
		A	**B**	**C**	**D**	**E**	**F**	
UNIZIK	2015/2016	9(14.0%)	7(10.9%)	12(18.8%)	10(15.6%)	11(17%)	15(23.4%)	64
	2016/2017	10(20.4%)	11(22.4%)	13(26.5%)	10(20.4%)	2(4.1%)	2(4.1%)	49
	2017/2018	2(4.2%)	10(20.8%)	14(29.2%)	8(16.5%)	9(18.75%)	5(10.4%)	48
		A	**B**	**C**	**D**	**E**	**F**	
FUNAI	2016/2017	2(12.5%)	4(0.6%)	2(12.5%)	3(18.8%)	4(0.6%)	1(6.3%)	16
	2017/2018	3(6.3%)	12(25%)	15(31.3%)	9(18.8%)	5(10.4%)	4(8.3%)	48
	2018/2019	6(9.1%)	13(19.7%)	22(33.3%)	11(16.7%)	9(13.6%)	5(7.6%)	66

Source: Examination and Records, 2019 of each school

From the Table 1 above, it is revealed that the percentage of students who have grade 'A' and 'B' are not as high as those with grade 'C' and 'D' in all the institutions which can be interpreted as poor achievement of students in Cost Accounting in the institutions under study.

Wu and Xin (2019) said that failing a test has become a common phenomenon in university study life. 65% failing rate for single subjects and 18% for 3 or more and failing, 2 or more subjects, rates 26%. Therefore the need to carry out this research to proffer solution to the issue of poor achievement of students in tertiary institutions cannot be under estimated in this period of time.

Purpose of the Study

The major purpose of this study is to determine the effect of computer-based programmed instructional strategy on students' achievement in cost accounting in tertiary institutions in South-East Zone. Specifically, the study sought to determine the:

1. effect of computer-based programmed instructional strategy on the mean achievement scores of students in cost accounting.
2. effect of computer-based programmed instructional strategy on the mean achievement scores of male and female students in cost accounting.
3. interaction effects of treatment and gender on the students' mean achievement in cost accounting.

Research Questions

The following research questions guided the study:

1. What is the mean achievement score of students taught cost accounting using computer-based programmed instructional strategy and those taught with the conventional teaching method?
2. What is the mean achievement score of male and female students taught cost accounting using computer-based programmed instructional strategy?
3. What is the interaction effect of treatment and gender on the students' mean achievement score in cost accounting?

Hypotheses

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

1. There is no significant difference in mean achievement scores of students taught cost accounting using computer-based programmed instructional strategy and those taught using conventional method of teaching.
2. There is no significant difference in mean achievement scores of male and female students taught cost accounting using computer-based programmed instructional strategy and those taught using conventional method of teaching.
3. There is no significant interaction effect of treatment and gender on the students' achievement in cost

accounting.

Methodology

The study adopted Quasi-experimental design of pre-test, post-test non-randomized control group. Population for the study comprised of all year 2 Business Education (Accounting) students in (7) public universities in South-East zone.

Two (2) universities were selected using a simple random sampling technique. The sampled universities were further subjected to a simple random sampling technique in order to assign them to each group. One group comprising of 45 students of both boys and girls was assigned to the treatment group while 31 students comprising of both boys and girls was assigned to the control group. The instructional package developed for the treatment group was computer-based instructional strategy while the conventional lecture method of teaching package was developed for the control group.

The instruments for data collection was a 50-item multiple choice Cost Accounting Achievement Test (CAAT). The instruments was validated by three experts and the reliability was tested using Kuder Richardson 20 (K-R20) reliability method in which a coefficient of 0.89 was obtained. Also the Test retest estimate of reliability was used to check the stability of the instrument. A coefficient of stability of 0.84 was established.

Data collected were analysed using mean and standard deviation for answering the research questions while the three null hypotheses were tested using Analysis of Covariance (ANCOVA) at 0.05 level of significance.

Results

The results for the studies were obtained from the data collected and analysed as follows:

Research Question 1

What is the mean achievement score of students taught cost accounting using computer-based programmed instructional strategy and those taught with the conventional teaching method?

Table 2: Mean Achievement Score of students based on Teaching Strategies

Methods	N	Adjusted Mean	Standard dev
Computer-based Instructional Strategy	45	63.51	6.93
Conventional Teaching Method	31	51.10	5.02

From table 3, the results showed that students in computer-based instructional strategy group have an adjusted mean score of 63.51 and a standard deviation of 6.93 while students in lecture method group had a mean score of 51.10 and a standard deviation of 5.02. From these results, the students in computer-based instructional strategy group achieved higher than the students in conventional teaching method group.

Research Question 2

What is the mean achievement score of male and female students taught cost accounting using computer-based programmed instructional strategy?

Table 3: Mean Achievement Score of Students based on Gender

Gender	N	Adjusted Mean	Standard dev.
Male	**25**	**61.52**	**6.79**
Female	**20**	**66.00**	**6.42**

The results in table 4 showed that computer-based programmed instructional strategy does not have pronounced differential effect on males and females. Male students had a mean score of 61.52 and a standard deviation of 6.79, while the female students had mean score of 66.00 and a standard deviation of 6.42.

Research Question 3

What is the interaction effects of treatment and gender on students' mean achievement score in Cost Accounting?

The summary of results of the mean achievement score of students based on interaction effect of gender and teaching strategies in Cost Accounting is presented in table 4 below.

Table 4: Mean Achievement Scores of Students based on Interaction effect of Methods and Gender

Gender	Male Adjusted Mean	Female Adjusted Mean
Computer-based Instructional Strategy	61.52	66.00
Conventional Teaching Method	51.94	50.07

The results in table 5 showed that male students have an adjusted mean score of 61.52 while the female students have an adjusted mean score of 60.00 on the computer-based programme instructional strategy. In a similar way, the male students have an adjusted mean score of 51.94, while the female students have an adjusted

mean score of 50.07 in the conventional teaching method. From the results above, there is no interaction effect of teaching strategies and gender on the mean achievement score in Cost Accounting.

Discussion of findings

The researchers discussed the findings of the study based on the research questions that guided the study.

The findings from the result of analysis of research question one revealed that computer-based programmed instructional strategy was more effective than conventional teaching method in the teaching of Cost Accounting in tertiary institutions. It was revealed that students taught Cost Accounting with computer-based programmed instructional strategy had significantly higher mean achievement scores than the control group that was taught with the conventional lecture method.

It was discovered that the higher achievement scores of the treatment group was due to the fact that computer-based programmed instructional strategy enables the students to progress at their own pace and provides them with appropriate alternative ways of learning by individualizing the learning process which help in the improvement of their academic achievement.

The findings confirmed Agboh (2015) who in his study on the effects of computer assisted instruction (CAI) on students' achievement in Financial Accounting in Colleges of Education in South-East Nigeria found that students taught Financial Accounting with Computer Assisted Instructional method had significantly higher mean achievement than the control group that was taught with the conventional lecture method.

The findings is also in line with that of Mudasiru and Adedeji (2010) on effects of computer assisted instruction on secondary schools students' performance in Biology, whose result showed that students taught Biology using Computer Assisted Instruction performed better than those taught using conventional teaching method.

The result of the analysis of research question two, revealed that computer-based programmed instructional strategy did not yield pronounced difference in mean achievement scores of male and female students in Cost Accounting. The results showed that the males students had an adjusted mean score of 57.64 with a standard deviation of 8.02 while the female students had a an adjusted mean score of 59.44 with a standard deviation of 9.50 which showed that significant difference did not exist in the means scores of male and female students exposed to computer-based programmed instructional strategy in tertiary institutions in south-east zone. The findings agreed with Kadiri (2004) who explained that available literature have not been able to identify a single direction of difference in achievement in cost accounting between male and female students.

The findings from the result of analysis of research question three showed that male and female students taught Cost Accounting using computer-based programmed instructional strategy did better than those taught using conventional teaching method. The results showed that male and female students who were taught using computer-based programmed instructional strategy had an adjusted mean of 61.52 and 66.00 respectively while the male and female students taught using the conventional teaching method had an adjusted mean of 51.94 and 50.07 respectively. This showed that there was no interaction effect between teaching strategies and gender because the effectiveness of computer-based programmed instructional strategy remained superior across gender and groups.

The findings is in line with the findings of Dania (2014) on effect of gender on students' academic achievement in secondary schools social studies, which revealed no significant interaction effect of teaching method and gender on students academic performance in Social Studies. These findings also confirmed the findings of Azih (2008) on the effects of instructional schools in Abakaliki Urban, which revealed no significant interaction effect of gender and instructional strategies on students' mean achievement in Financial Accounting.

Conclusion

Based on the findings, the researcher concluded that:

The effectiveness of computer-based programmed instructional strategy was consistent across gender and groups in the enhancement of students' achievement in cost accounting. Instructional strategies and gender did not have a pronounced interaction effects on the students' academic achievement and retention ability in Cost Accounting in the study area. Therefore computer based instructional strategy which favoured cost accounting students in the tertiary institutions can also be used for students in other departments in the tertiary institutions to improve the poor academic achievement which is now like a canker worm among students in the tertiary institutions.

Recommendations

Based on the findings of the study, the following recommendations are made:

1. Tertiary institutions should be firm in ensuring that newly admitted students come along with their computer systems. As this will help the lecturers and students adopt computer-based programmed instructional strategy in the teaching /learning process.

2. A software that can centrally monitor its usage should also be developed to guide against inappropriate application of the strategy by the students.
3. Curriculum planners should incorporate Computer-based Programmed Instructional Strategy (CBPI) as a strategy for teaching many courses in the tertiary institutions to help solve the problem of poor achievement of students in their various areas of learning in the tertiary institutions.

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