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Effect of Computer-Based Programmed Instructional Strategy on Tertiary Institution Students' Retention 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' retention in Nigeria with the intention of proffering solution to the evident need to improve tertiary students' low retention of knowledge. 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 teaching procedure that made use of the computer-based instructional strategy while another teaching procedure that used the 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 face and content validated by three experts in measurement and evaluation and cost accounting experts. The reliability was tested using Kuder Richardson 20 (K-R20) estimate of reliability with a coefficient of internal consistency 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 three null hypotheses were tested using Analysis of Covariance (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 retention scores than the control group taught with conventional lecture method. The study revealed that there were no gender differences on students' retention in Cost Accounting. Also there was no interaction effect of treatments and gender on students' knowledge retention 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' retention 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

Whether one is studying for a certification or taking part in professional development, the main objective is to learn and retain the new information. Learning retention is about making new information stick and finding effective ways to do this. It is the process of transferring new information into long-term memory. According to Safo, Ezenwa and Wushishi (2013), retention is the ability to keep or retain the knowledge of what is learnt and be able to recall it when it is required. In the context of this study, retention is the ability to recall or remember what has been taught after a given time as a measure of students' progress. Haynie (2003) defined retention of

learning as learning which lasts beyond the initial testing and it is assessed with tests administered two or more weeks after the information has been taught and tested. Haynie further explained that retention of learning is measured with two tests: the initial test and the delayed retention test. The initial test is the test employed at the time of instruction or immediately thereafter while the delayed retention tests are those tests administered two or more weeks after instruction and initial testing to measure retained knowledge.

Ogwo and Oranu, (2006) emphasized that unless the teacher stimulates students' interest in learning, students' retention level will be low. Hence, it is essential that accounting lecturers use teaching method which ensures students' active involvement in learning and provide suitable learning environment to improve retention and stimulate interest of students in cost accounting. Although some students learn great details in tertiary institutions, many forget much of what is taught to them over time (Sargent, Faye and Lederberg, 2011). Therefore, a common goal of all educators is to increase the long-term knowledge retention of learners (Halpern & Hakel, 2002).

However, the fact remains that, according to Bacon and Stewart (2006), students ordinarily and regularly forget what they have learned in their classes. In fact, the majority of the knowledge students seemingly have mastered, as evidenced by their achievement in Cost Accounting, is not retained or sustained over time. Numerous reasons exist for the vast amount of learning loss from students. McIntyre and Munson (2008) identified one of the problems to be students' use of cramming, which has shown significant negative impact on retention level over time. Although students admit that cramming does not lead to long-term retention, they continue the practice because the system has rewarded them for remembering and recalling information on demand (McIntyre and Munson, 2008). They therefore recommended that teachers discourage students from cramming by employing pedagogies that require a deeper level of learning.

Retention simply refers to how much a person remembers after an interval of time without practice and that it is the difference between what is initially learnt and what is later forgotten. Bichi (2002) defined retention as storage of information over some period of time; this time period is called retention interval. If for some reasons, the subject is unable to produce the response at the end of the retention interval, forgetting has occurred.

Retention works together with academic achievement. Retention which is the ability to retain things experienced or learned, has an area of focus to some accounting educators in recent years. Retention of learning on the other hand, refers to a repeated performance by a learner, of behaviour earlier acquired, elicited after an interval of time. It is affected by degree of original learning, teaching effectiveness, the method of learning and learner's memory capacity, among other factors.

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 retention 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.

To learn and retain new knowledge, a comprehensive teaching method such as computer-based programmed instructional method is needed. The pedagogical approach that teachers choose to employ in the classroom according to Bacon and Stewart (2006) has implications on students' knowledge retention level. Teachers need strategies and methods that will help students retain knowledge. Miller, McNear, and Metz (2013) suggested that one way to increase students' retention of the subject matter 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 retention, several and specific instructional strategies that are suitable to bring readiness to the problem have to be adopted by lecturers in tertiary institutions for the teaching of cost accounting. One of such instructional strategies that is gradually gaining research attention of recent time is Computer-Based Programmed Instruction for students learning accounting courses.

Programmed Instruction, according to Spiech (in 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. Programmed Instruction is the solution to the slow learners and it has solved the problem of individual differences in the class room. The teacher usually face a large amount of difficulties while teaching in a heterogeneous class in traditional teaching – learning environments and the complexities get multiplied with the increase in number of learners in the class.

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. According to Yusuf and Afolabi (2010), programmed instruction is also based on the principle of reinforcement. According to this principle, you can influence an individual's behaviour by granting or withholding a reward.

As you reinforce certain kinds of desirable behaviour and fail to reinforce undesirable behaviour, your student gradually learn what is expected of him, and he acts accordingly. Thus, as he answers a question correctly, he is led to new material based on that answer. The main focus of programmed instruction is to bring desirable change in the cognitive domain of the learner's behaviour. The structure of this teaching method is that the selected content is analyzed and broken into smaller elements. Each element is independent and complete in itself.

The current trend in research all over the world is the use of computers to enhance student learning. Perhaps the greatest contribution of present day technology is the development of computer, which has influenced our lives in every sphere. Example is the introduction of computer-based instructional strategy, which has proved to be an efficient and effective technique for teaching and learning process. 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 Compact 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.

According to Oranu (2003), the conventional method is teacher-centred, content driven, certainly not student-centred as students are not given enough opportunities to participate in the classroom instructions. Students taught with conventional methods find it difficult to retain their learning and apply it to new situations which consequently cause students to lose interest, perform poorly and encourage poor retention of learning materials.

Gender differences in learning continue to be a focus of interest and majority of studies show that there is a communal belief that males are better in accounting (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 in Accounting. However, this study is particularly interested in determining the effectiveness of Computer Based programmed Instructional Strategy on the retention level of male and female students in cost accounting in tertiary institutions.

Cost accounting is one of the courses offered in tertiary institutions 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 are 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 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 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.

Institute of Cost Accounting of India (2016) be defined cost accounting according to the as accounting for costs classification and analysis of expenditure as to enable the total cost of any particular unit of production to be ascertained with reasonable degree of accuracy and at the same time to disclose exactly how such total cost is

constituted. Thus, cost accounting is the classifying, recording and appropriate allocation of expenditure for the determination of the costs of products or service, and the presentation of suitably arranged data for the purpose of control and guidance of management. Despite the importance of accounting in daily activities of individuals, businesses and government, the persistent poor performance of students in tertiary institutions in cost accounting has not been adequately addressed.

Research Problem

Observations over the years are that there has been a low retention level of business education students in accounting which includes cost accounting. However, the fact remains that, according to Bacon and Stewart (2006), students ordinarily and regularly forget what they have learned in their classes. In fact, the majority of the knowledge students seemingly have mastered, as evidenced by their achievement in Cost Accounting, is not retained or sustained over time. Numerous reasons exist for the vast amount of learning loss from students. McIntyre and Munson (2008) identified one of the problems to be students' use of cramming, which has shown significant negative impact on retention level over time. Although students admit that cramming does not lead to long-term retention, they continue the practice because the system has rewarded them for remembering and recalling information on demand (McIntyre and Munson, 2008). They therefore recommended that teachers discourage students from cramming by employing pedagogies that require a deeper level of learning.

Based on the above recommendation by McIntyre and Munson (2008), the researchers are of the opinion that, to ensure meaningful teaching and learning that will improve retention, several and specific instructional strategies that are suitable to bring readiness to the problem have to be adopted by lecturers in tertiary institutions for the teaching of cost accounting and other courses. One of such instructional strategies that is gradually gaining research attention of recent time is Computer-Based Programmed Instruction for students learning accounting courses.

Purpose of the Study

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

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

Research Questions

The following research questions guided the study:

1. What is the mean retention 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 retention 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 retention 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 the mean retention score of students taught cost accounting using computer-based programmed instructional strategy and those taught using conventional teaching method.
2. There is no significant difference in mean retention score of male and female students taught cost accounting using computer-based programmed instructional strategy.
3. There is no significant interaction effect of treatment and gender on the students' mean retention score 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 selected universities were further subjected to a simple random sampling technique in order to assign them to each group. One group

comprising of 45 student 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 teaching strategy 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 study were obtained from the data collected and analysed as follows:

Research Question 1

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

Table 1: Mean Retention Score of Students Based on Teaching Strategies

Methods	No.	Adjusted Mean	Standard dev.
Computer-based Instructional Strategy	45	64.78	6.10
Conventional Teaching Method	31	47.97	4.79

From the results in table 1, students in computer-based programmed instructional strategy had an adjusted mean retention value of 64.78 with a standard deviation of 6.10 whereas students in conventional teaching method had an adjusted mean retention value of 47.97 with a standard deviation of 4.78. Computer-based programmed instructional strategy is therefore, a better strategy in enhancing retention ability in students than conventional teaching method.

Research Question 2

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

The summary of results of the mean retention score of students based on gender in Cost Accounting is presented in table 2 below.

Table 2: Mean Retention Score of students based on Gender

Gender	N	Adjusted Mean	Standard dev.
Male	25	66.68	6.99
Female	20	67.40	6.21

The results in table 2 showed that male students have an adjusted mean of 66.68 with a standard deviation of 6.99 and the female students have an adjusted mean of 67.40 with a standard deviation of 6.21. This showed that computer-based programmed instructional strategy enhance retention in both male and female students.

Research Question 3: What is the interaction effects of treatment and gender on students' mean retention score in Cost Accounting?

The summary of results of the mean retention score of students based on interaction effect of gender and teaching strategies in Cost Accounting is presented in table 3 below.

Table 3: Mean Retention score of Students Based on Interaction Effects of Teaching Strategies and Gender

Gender	Male Adjusted X	Female Adjusted X
Computer-based Instructional Strategy	62.68	67.40
Conventional Teaching Method	48.94	46.79

The results as shown in table 3 indicated that interaction of teaching strategies and gender produced an adjusted mean retention of 62.68 for male students and an adjusted mean retention of 67.40 for female students in the computer-based programmed instructional strategy. The results in table 8 further showed that the interaction effect of teaching strategies and gender produced mean retention of 48.94 for male students and mean retention of 46.79 for the female students in the conventional teaching strategy . Based on the above results, there is no interaction effect between teaching strategies and gender on students' mean retention 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 in table 1, revealed that students the computer-based programmed instructional strategy group had higher mean retention scores with an adjusted mean of 64.77 and a standard deviation of 6.10 as against those in the conventional teaching strategy who had an adjusted mean of 47.96 and a standard deviation of 4.79. This implies that students taught using computer-based programmed instructional strategy retain cost accounting learning more than those taught with the conventional teaching method. It was concluded that students retain the concepts for a long period when taught with computer-based programmed instructional strategy than when taught with the conventional teaching method.

The findings is in consonance with that of Losgold (2001) who in his study found out that students taught with computer assisted instruction retain electronic learning more than those taught with the conventional teaching method. He opined that students' scores on delayed tests indicate that the retention of content learned using Computer assisted instruction is superior to retention following traditional instruction alone.

The findings agreed with the findings of Eze, et al (2016) on a study on the effects of problem-based teaching method on students' performance and retention in Financial Accounting in Technical Colleges in Anambra State that students taught using problem-based teaching had higher mean retention scores in Financial Accounting than those taught using conventional teaching method.

The finding confirmed that of Eze (2006) in his study on the effects of multiple intelligence-based on achievement and retention of learning in introductory Technology that the students who were taught with multiple intelligence-based instructional approach performed better and have higher retention ability than those taught with conventional lecture method – in Introductory Technology.

The findings equally supported the findings of Banswal (2015) on the retention effect of Computer Assisted Instruction (CAI) on students' achievement for teaching Chemistry topics of class VIII students. The results showed that in the computer assisted instruction, the students retained the concepts for a long period of time as compared to the traditional lecture method.

The findings from the result of analysis of research question two in table 2, revealed that there was no significant difference in the mean retention scores of male and female students taught Cost Accounting using computer-based programmed instructional strategy. The results showed that male students have an adjusted mean of 57.11 and a standard deviation of 9.39 while the female students have an adjusted mean of 58.91 with a standard deviation of 11.48. This showed that computer-based programmed instructional strategy enhance retention in both male and female students.

The findings confirmed the findings of Ayuba (2017) on the Effects of Computer – Based Instruction on Retention and Performance in Algebraic Word Problems among Junior Secondary School Students in Kaduna State, Nigeria which showed that the difference in retention of male and female students exposed to CBI was not significant.

The findings agreed with the findings of Egbunnu, Agbo and Anyagh (2017) on effect of computer aided instruction on Senior Secondary School students' retention in Mathematics in Makurdi Metropolis of Benue State, Nigeria which showed that there was a significant difference in the mean retention scores of males and females students in favour of the males. This implies that males retained better than females with (CAI).

The findings from the result of analysis of research question three in table 3, showed that male and female students taught using computer-based programmed instructional strategy have adjusted mean of 62.07 and 67.04 respectively, while the male and the female students taught using the conventional teaching method have adjusted mean of 48.94 and 46.79 respectively. This showed that there is no interaction effect between teaching strategies and gender on students' mean retention in cost Accounting. Since both the male and female students taught using computer-based programmed instructional strategy achieved high retention level than male and female students taught with the conventional teaching method. This means that there is no interaction effect between methods of teaching and gender in Cost Accounting.

The findings is in line with the findings of Eze, et al (2016) on the effects of problem-based teaching method on students' performance and retention in Financial Accounting in Technical Colleges in Anambra State, whose findings revealed that students taught financial accounting using PBTM performed better with higher post-test scores and retention level than those taught using lecture teaching method. Also there was no interaction effect of treatments and gender on students' academic achievement and retention in financial accounting.

The findings is also in consonance with the findings of Umoru et al (2019) on Effects of programmed teaching method on academic achievement and retention of students in Business Studies in Oyo State, Nigeria, who found that the interaction effects of teaching methods and gender was not significant. This means that there is no interaction effects of teaching methods and gender on students' retention in Business Studies.

Conclusion

Based on the findings, the researcher concluded that:

Computer-based programmed instructional strategy increased students' retention level in Cost Accounting. Instructional strategies and gender did not have a pronounced interaction effects on the students' retention ability in Cost Accounting in the study area. Computer-based programmed instructional strategy is better than the conventional teaching strategy in the teaching and learning of cost accounting.

Recommendations

Based on the findings of the study, the researchers recommended that:

1. Tertiary institutions should be firm in ensuring that newly admitted students offering Accounting come along with their systems. As this will help the lecturers and students adopt computer-based programmed instructional strategy in the teaching /learning process.
2. Tertiary institution should in collaboration with the software design to develop a software that can centrally monitor the usage of the strategy to guide against inappropriate application by the students.
3. Curriculum planners should incorporate Computer-based Programmed Instructional Strategy (CBPI) as a strategy for teaching Accounting courses in tertiary institutions.

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