



Effect Of Multimedia Instructional Strategy In Enhancing Students' Academic Retention Ability: A Case Study Of Ondo State Technical Colleges In Nigeria

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ABSTRACT

Academic retention ability of students for concepts taught in school has been of great concern to all stakeholders in education, especially as it is likely to have corresponding impact on both retention of students' in high school grades, as well as in facilitating the capability of educational institutions to retain the students in schools. These phenomena which constitute socio-economic problems worldwide apply also to students and educational situations in Nigeria. Thus these researchers set out to explore if a modern student-centred teaching method, like the multimedia instructional strategy could enhance students' academic retention ability. In this study one research question guided the study and one hypothesis was tested at 0.05 alpha level of significance. The study adopted quasi-experimented design in which the pre-test, post-test, delayed post (Retention) design involved two unequal intact (experimental & control) groups. A total of 123 mechanical trades (year II) students from technical colleges in Ondo State, Nigeria, formed the population. By purposive sampling technique, two intact groups of students (43 and 41) located in two local Government Areas apart from each other, were selected to form a sample of 84. There were three data collection instruments namely the lesson plan for the control group, the lesson plan for the experimental group, and the Mechanical Trade Achievement Test (MTAT). These were validated by two mechanical technology lecturers from the Department of Technology and

Vocational Education and one lecturer from Measurement Evaluation Unit, all from the Nnamdi Azikiwe University, Awka, Nigeria. Using the Kuder-Richardson formula 21 (KR-21) techniques, the MTAT was subjected to the reliability test to yield the reliability coefficient of 0.82. Thereafter, the experimental and the control groups were pre-tested, and then subjected to treatment (teaching) for five weeks and later post-tested. They were further tested (delay post test or retention test) after two weeks of no activity. The MTAT was used for all the tests, except that each time, the contents were reshuffled, and the colour of the paper changed. The resulting data were collected and analyzed with the mean for the research question and the analysis of the covariance (ANCOVA) at 0.05 level of significance. The findings of this study revealed that teaching with multimedia instructional strategy really enhanced student's academic retention ability as shown from the mechanical trade students. It was therefore concluded that multimedia technology is more effective in improving students' academic retention ability. Consequently it was recommended that teachers should adopt using multimedia technology in teaching.

Keywords: Multimedia, academic retention ability, teaching and learning.

INTRODUCTION

Retention and Academic Retention Ability

In the education industry, retention has been of central concern to all stakeholders, from parents through the teachers to the education policy makers. While students retention in higher institutions could be, to great extent, a measure of satisfactory performance of the institutions in effectively meeting their set goals, it further portrays the extent to which students could complete and graduate from their educational programmes. Thus the educational institutions are usually rated highly when more students are retained to successfully complete and consequently graduate from their programmes of study (Yorke & Longdem, 2004).

Some of the strategies according to Margaret-Heagrey and Thomas, (2009) for increasing student retention in higher educational institutions include maintaining high quality and motivating academic staff, exciting curriculum of studies and the environment as well as effective teaching methods which more-often-than not, emphasize active student-centered instructional methods. However further discussion on these strategies is beyond the scope of the present study.

On the other hand, retention of students in high school grades (grade retention) is very contentious among researchers. Educational researchers for example Holes, (1989) and Holes & Matthew (1984) have contended that making low performing students repeat a grade (grade retention) is an ineffective educational practice in the system. Indeed recent studies for example Jimerson, (2001) concluded that the practice of grade retention should be entirely abandoned and discarded. However, more recent studies for example, Lorence, (2006), and PISA (2011), contended and advised that making students repeat a grade could help increase academic achievement and by extension improve the students' academic retention ability.

What is clear and emerging from these researchers is that as time went on, educationist and policy makers were beginning to see the merit in grade retention since it provided the students the opportunity to re-learn what they could not know in the first attempt. Thus, opportunity is created for the students to improve in their academic retention ability, and hence greater chances are created for them to complete and graduate from their studies.

Academic retention ability of students could result or develop from students' academic achievement in that individuals who significantly achieve high scores in an academic endeavour are more likely to significantly retain more knowledge too, and vice versa (Akpan & Aminikpo, 2017). Thus, academic retention ability is the capacity of the individuals to retain or remember for use overtime, those academic concepts (achievements) - qualities or attributes of skill or knowledge which the individuals initially demonstrated soon after instruction. Usually academic achievement score is measured by the score obtained in a prescribed academic test. Specifically, therefore, those who acquired high achievement scores in the test are most likely to acquire high academic retention ability scores too. Academic retention of learning is simply the ability to remember what has been learnt. Academic retention of learning is the repeated performance of behaviour earlier acquired by the learner and elicited after an interval of time.

However, academic retention can be facilitated by the nature of instruction and teaching/learning method, which could very often be active (student centred) (Demmert, 2001; Runnei, 2012). Shrun and Glinson, (2013) contended that the use of appropriate teaching method could avail students the opportunity to learn more from what they were taught and to grab knowledge with practical skill orientation for lifelong utilization. Hence to obtain high academic ability scores implies that the educative process was successful. This is essential in the educative process, because such high academic retention ability scores in acquired knowledge or skill could be successfully transferred to the work place, and could eventually result in high labour productivity.

From the above reviews, it could be construed that student academic retention ability could have profound effect in ameliorating grade retention as well as improving educational institutions' ability to retain students. Specifically when students do not present satisfactory academic performance in prescribed promotion examinations, they are very likely to be retained in the grade. Again when more students are retained in the grades to the extent that they do not graduate when due, the educational institutions are likely to retain less students in the schools.

The thrust now is to locate the instructional strategy, preferably, student-centred, which could enhance students' academic performance and by extension the student retention ability. By and large, students' academic retention ability has profound effect on the student grade retention and capacity of educational institutions to retain students. Therefore, it is worthwhile to investigate if a particular instructional strategy, like the multimedia could effectively enhance students' academic retention ability. After all, both the student grade retention and the capacity of the educational institutions to retain students in schools constitute some socio-economic problems for both the education industry and the stakeholders in education.

In Nigeria, technical colleges otherwise the vocational technical schools aim to produce artisans and technicians for business and industries. Thus, teaching and learning process strive to provide the graduates of the schools with knowledge, skill and desirable work attitude. There is a lot of

emphasis on effectiveness of the teaching process to the extent that those who do not do well in the promotion examinations are retained to repeat the modules (or the grades). Incidentally, mechanical trades are one of the trades offered in technical colleges. Often, grade retention or repeating the modular courses in the colleges leads to the inability of the colleges to attract and retain enough students. Essentially, the teaching and learning process uses other methods (demonstration, lecture) which do not include the multimedia instructional strategy.

Multimedia Instructional Strategy

With the incursion of technology, specifically information and communication technology (ICT) into education, researchers are concerned with finding integrative ways of making teaching and learning interesting and fulfilling to students, particularly in science, technology and vocational education. Thus the thrust is to locate teaching methods, instructional strategies and approaches that could make the teaching and learning rewarding such that the students could actively participate in the learning process and hence create and construct their own knowledge.

Such methods, strategies and approaches, like the cognitive apprenticeship teaching method (Eze, Obidile & Okotubo, 2020); the constructivism instructional strategy, (Ogundola, Popoola & Jonathan, 2010) and even the multimedia instructional approach (Cyril, 2016) would essentially make the teacher the facilitator of knowledge while the learner remains the active participant in the learning process. This opportunity can be easily provided by the multimedia instructional strategy.

As an interactive instructional strategy, the multimedia uses the computer equipment to present materials, track learning and direct the learners and the teachers to use additional materials that they may need in the teaching/learning processes. Because the multimedia provides various audio-and video packages, it makes learning and teaching interesting and self-paced. Thus as held by Slack, (1999) the students could learn at their own time and pace. As specified by Udofia, Ekpo, Nsa and Akpan (2012), the multimedia is a combination of texts, CD-Rom, DVD, graphics and video in the teaching/learning process. Thus with the explosion of the internet, great interest is generated through the use of the multimedia technology in the expansion of knowledge, especially in distant learning.

According to Iqbal and Khan (2015), and consistent with UNESCO & ILO (2002) the multimedia is multisensory and hence stimulates multiple senses of the audience at a time. The authors went on to state that multimedia being interactive in nature, enables the teachers to control the content and flow of information. Furthermore, Gilakjani, (2012) is of the view that multimedia increases student interest level, enhances their understanding and increases their memorizing ability. Therefore it could have some profound impact on academic retention ability.

Because of the profound impact that the student academic retention ability is envisaged to have on the students' grade retention, and on the capacity of educational institutions to retain more students in schools, it is pertinent to find out if multimedia instructional strategy could enhance students retention ability. This is exactly what these researchers have set out to accomplish in the study.

PURPOSE OF THE STUDY

The purpose of this study is therefore to determine the effect on the mean academic retention ability scores of students when taught with multimedia instructional strategy and their mean academic

retention ability scores when they are taught with the conventional (demonstration/lecture) teaching method. Mechanical trade students (Year II) of the technical colleges in Ondo State, Nigeria were chosen for the study because the problems of students' grade retention as well as inability of educational institutions to retain students in schools are also obtainable in Nigeria.

RESEARCH QUESTION

The following research question guided the study:

What is the effect on the mean academic retention ability scores of mechanical trade students' when taught with the multimedia instructional strategy and when taught the conventional (demonstration/lecture) teaching method?

HYPOTHESIS

The following null hypothesis was tested at 0.05 level of significance:

There is no statistically significant difference between the mean academic retention ability scores of mechanical trade students when taught with multimedia instructional strategy and when taught with the conventional instructional strategy.

RESEARCH METHOD

This research study adopted a quasi-experimental design. This design involved the pre-test post-test, and delayed post-test (retention) for the two un-equal (experimental and control) groups. (Nworgu, 2015). This design is used essentially because the study set out to find the effect on the mean academic retention ability (delayed post-test) scores of the mechanical trade students (being used for the study) when they are taught with multimedia instructional strategy and when taught with the conventional teaching strategy.

One Hundred and twenty three (123) students of year II offering mechanical trades in Ondo State Technical Colleges formed the population. The sampling technique was purposive to reflect the technical colleges that had facilities for the study. Two intact (not sampled) un-equal group of students' - 43 (39 males and 4 females), 41 (34 males and 7 females) were chosen from two technical colleges in two different Local Government Areas located far-apart from each other. Both colleges that were purposively chosen had all the facilities for teaching the students with the multimedia instructional strategy and the conventional instructional strategy. By random sample, (loss of the coin) one of the colleges was designated the experimental group while the other was designated the control group. Thus a total sample of 84 (73 male and 11 female) students participated in the study.

For data collection, the researchers used three instruments, namely; the lesson plan for the experiment group, the lesson plan for the control group and the Mechanical Trade Achievement Test (MTAT). The MTAT was made up of 50 multiple choice objective test questions adapted from the National Business and Technical Examination (NBTE) past question papers. The basic concepts of engine maintenance, engine parts, and engine over hall formed the test items on the objective question papers. The items elicited questions that touched on the cognitive, affective and psychomotor domains and agreed with Bloom's taxonomy of educational objectives. The regular class teachers in the two schools involved in the study were trained as research assistants. The teachers in the experimental school were trained to teach with multimedia instructional strategy,

while those in the control school were trained to teach the student with the convectional instructional method.

All the instruments for data collection were validated by three experienced lecturers (two from Dept. of Technology & Vocational Education and one from the Measurement & Evaluation) all from Nnamdi Azikiwe, University, Awka, Nigeria. To establish the reliability of MTAT, the instrument was administered on 32 Mechanical trade-year II students of Benin Technical College, Benin, Edo State who have same characteristics as the students under study, but were not part of the study groups. Kuder-Richardson formula 21 (KR21) was used to analyzed the resulting data, and this yielded the reliability coefficient of 0.82.

Both the control and experimental groups were pre-tested using MTAT. This was to establish the base-line information on the research subjects. Thereafter, the experimental group was taught the mechanical trades concepts with multimedia instructional strategy while the control group was taught with the conventional instructional strategy. The teaching lasted for five weeks for both groups of students who were taught by their regular class teachers (research assistant) in their schools during normal school hours.

After teaching (treatment) the experimental and the control groups were post-tested. After an interval of two weeks of no-activity, the experimental and control groups were tested again with MTAT(delayed post-test)to obtain the academic retention scores. It must be noted the contents of MTAT for all the tests-pre-test, post-test and delayed post-test have remained the same except that the contents were reshuffled, and the colour of the paper changed for each test. That was to ensure that the research subjects would not know that they were taking the same test on each occasion. That therefore ensured the stability of the test results.

Thereafter the researchers marked the test and recorded the data. The researchers statistically analyzed the data. The mean was used to analyze the research question while the standard deviation was used to interpret the spread of the scores about the means. The hypothesis was tested at 0.5 level of significance using the Analysis of Covariance (ANCOVA). The ANCOVA is very effective in controlling the individual difference between test groups, particularly when there was no randomization within the groups.

RESULTS

Research Question: What is the effect on the mean academic retention ability scores of mechanical trades students taught with multimedia instructional strategy and when taught with the conventional (teaching method?) In answering the research question, Table 1 was used.

Table 1: Summary Table of Mean and standard deviations of the experimental and control groups achievement in pre-test, post-test and the delayed post-test(academic retention Ability)

Method	Pre-test(a)		Post-test(b)		Delayed post-test(c)		Mean difference
Experimental group(Multimedia)	Mean	Std	Mean	std	Mean	std	b-c mean
	16.12	4.77	31.59	3.97	34.58	3.57	2.99
Control Group(Conventional)	3.4	1.84	19.22	3.37	16.63	3.28	-2.59

In this study our focus is on the post-test scores (b) obtained after the treatment and the delayed post-test score, (c) obtained after an interval of two weeks of no activity that is the academic retention ability scores. Thus the results in Table 1 show that the experiment group has post-test and academic retention ability scores of 31.59 and 34.58 respectively, while the mean difference is 2.99. On the other hand, the control group has the post-test score of 19.22 and the academic retention ability score of 16.63. Thus the group has the mean loss of -2.59. This shows that experimental group retained more skill and knowledge acquired during treatment, while the control group has knowledge loss. A look at the pre-test which provides the baseline information prior to the treatment will confirm that there was academic achievement progress in the two groups after treatment has been administered.

(ii) Hypothesis: There is no significant difference between the academic retention ability scores of mechanical trades students when taught with multimedia instructional strategy and when taught with the conventional instructional strategy. The answers to the hypothesis are presented in Table 2.

Table 2: Summary Table of ANCOVA of academic retention ability scores of mechanical trade students when taught with multimedia and conventional method

Source	d.f	Sum of squares	Mean sum squares	F-cal	F-tab	Sig	Remarks
Retention	1	3057.361	3057.361	2.57.686	3.96	0.000	Rejected
Gender	1	7.959	7.959	0.671	3.96	0.415	Not rejected
Retention*Gender	1	6.517	6.517	0.549	3.96	0.461	Not rejected
Error	80	1064.283	13.304				
Total	83						

Essentially we want test in this summary of ANCOVA above, the significant difference in the academic retention abilities of two groups of the mechanical trades students' after they have been exposed to the two instructional strategies. Since, from the table, the p-value 0.00 is less than the p-value of 0.05, and since the F-calculated value of 257.686 is greater than the F-tabulated value of 3.96, therefore the null hypothesis is rejected. Thus there is a significant difference between the academic retention ability scores of the mechanical trade students when taught with multimedia instructional strategy and when taught with the conventional instructional strategy.

Hence, students who were taught with multimedia instructional strategy have higher academic retention ability than those taught with the conventional teaching method. It can therefore be construed that teaching with multimedia instructional strategy indeed enhanced student's academic retention ability.

Although gender consideration was not central to this study, it can be seen that gender has no effect on the academic students' retention ability. This is buttressed by the fact that the interaction of gender and method (teaching strategy) is not also significant in this study. In order words, gender didn't necessarily affect the capacity of students to retain knowledge and skills.

DISCUSSION

The findings of this study showed that teaching with multimedia actually enhanced students' academic retention ability in mechanical trades, whereas for those taught with the conventional teaching method, it didn't. This implies that teaching with multimedia, if systematically applied in

teaching and learning could encourage students to learn and retain more knowledge and skill. This is in line with the findings of Cyril, (2016), and Ogundola, Popoola & Jonathan (2010), which held that teaching with multimedia does not only encourage students to learn and retain concept very well, but also could improve their overall performance. Both the results of the research question and the hypothesis are supportive of the efficacy of the multimedia instructional strategy in enhancing academic performance and academic retention ability.

Since students grade retention and the inability of educational institution to retain students do often arise because of poor students' academic performance in schools, multimedia teaching strategy need to be seriously explored in order to ameliorate such socio-economic problems. By transferability of learning, students could transfer some of the skills thus learnt to the work place. Therefore, students on graduation could contribute significantly to labour force productivity.

These could also enhance societal economic growth in that;

- a) Student loss of time by being retained in the grade could be saved.
- b) The capacity of educational institution to retain students in the system could be improved. Furthermore, the capacity of educational institutions to earn more funds from the lost fees could be improved.

CONCLUSION

The study showed that teaching with multimedia instructional strategy does not only necessarily enhance student academic performance but also the students' academic retention ability. In order words, if multimedia could enhance students' academic ability, it could also be tried as a remedy to rectify students' grade retention as well as to improve the capacity of educational institutions to retain students in schools. Thus multimedia instructional strategy is capable of being a source for solving these socio-economic problems.

Although this study was done with the technical college students studying mechanical trades in Ondo State, Nigeria, however, this same study could be replicated with other students studying other subjects in some other educational institutions - secondary and higher educational institutions - in other geographical locations; particularly as this socio-economic problem is prevalent among students and in educational institutions.

This will enable us to establish whether this trend in students' academic retention ability is tenable beyond the present circumstances. Given the same experimental conditions we may then conclude that the multimedia instructional strategy has the efficacy of enhancing students' academic retention ability, and hence capable of reducing students' grade retention and the capacity of the educational institutions to retain more students in schools.

When this is done, we could hold that the multimedia instructional strategy is capable of improving the quality of graduates through effective academic retention ability. Hence the quality of the workforce would be improved, unemployment reduced, and the socio-economic stability of the society maintained.

RECOMMENDATION

On the basis of the findings and conclusion of the study, the following recommendations are proffered:

- i. Teachers in general (including mechanical trades teachers) should use the multimedia instructional strategy in teaching educational concepts, so that students should learn and retain what they have been taught. This will eventually improve their performance at the work place on graduation.
- ii. Students (including mechanical trades students) should be encouraged and motivated, to consistently use multimedia in learning new skills and knowledge. Mastery of new skills and knowledge could make graduates creative and resourceful in the application of these skills and knowledge in the work-place.
- iii. Ministries of Education, policy makers and other stakeholders in the education industry should synergize with school administrations to create platforms such as workshops and seminars to impart on the teachers and students the requisite competences for effectively using the multimedia in teaching and learning.

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