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COMPARATIVE EFFECTS OF DIGITAL INSTRUCTIONAL VIDEO AND POWER POINT PRESENTATION ON ACADEMIC ACHIEVEMENT AND LEARNING RETENTION OF BASIC TECHNOLOGY STUDENTS

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Abstract
This study compares the effects of Digital Instructional Video (DIV) and Power Point Presentation (PPP) on academic achievement and learning retention of Basic Technology students. Pre-test/post-test non-equivalent control group, quasi-experimental research design was adopted. 250 Basic Technology students from five junior secondary schools in Lagos State were used. Purposive sampling technique adopted to sample schools that teach Basic Technology with application of multimedia tools. Three research questions and three null hypotheses were tested at 0.05% level of significance. The instrument used for data collection was Basic Technology Achievement Test (BTAT). The instrument was subjected to face and content validation by three experts from Science and Technology Education Department, and two from Technical Department, Education District V, Agboju, Lagos. Reliability of instrument Coefficient is 0.83 using Cronbach Alpha. Mean and ANCOVA were used to answer research questions and test the null hypothesis respectively. The study revealed that students taught Basic Technology with PPP had a higher mean score than students taught using DIV technique in the achievement test. Multimedia presentation increases students' academic achievement while Power Point Presentation (PPP) improved students' academic achievement in Basic Technology than digital instructional video presentation. Consequently, it was recommended that Basic Technology teachers should improve academic achievement of their students by incorporating multimedia tools into teaching as a viable and effective strategy to enhance learning. Conclusively, Ministry of Education should organize seminars, conferences, and workshops for Basic Technology teachers on the use of multimedia tools and facilities made available for teacher and students use.

Introduction

As the world Globalization moves, impact of technology can't be underestimated, in order to move in the same pace with other developing Country of the world, this necessitated Nigeria government to build many educational and training institutions and has also developed one form of education or the other to develop citizenry, whether indigenous or western education which specify a range

of curricular and educational systems. The range determines to a large extent the methods, techniques and materials used in curricular delivery. The body of knowledge in the school system is usually classified into small units called subjects. One of these subjects is Basic Technology. Basic Technology is one of the pre-vocational courses of study within the area of Technical Vocational Education and Training (TVET). TVET promotes an understanding of various aspects of industry, technology, and the broader environment, while developing in students' specific manipulative and cognitive skills (Olabiyi, 2005). Basic Technology as stated by the National Policy on Education (FRN, 2013) is one of the compulsory pre-vocational subjects at the Junior Secondary School (JSS) in Nigeria which is aimed to prepare students for future career. It includes counseling on career choices, skills gaining and professional ethics. Basic Technology as subject is of great importance and relevance to Nigeria economy because it is fundamental to basic knowledge required in various field of study (Aluwong, 2002).

The purpose of Basic Technology is to contribute to the achievement of the National Education goals. Therefore, Basic Technology as a pre-vocational subject is designed among others to to provide prevocational orientation in Technology, to provide basic technological literacy for everyday living and to stimulate creativity (NERDC, 2007) (FRN, 2014).

Basic Technology is a foundation subject at the Junior Secondary School (JSS) level meant to provide the basic knowledge and skills in technology. Basic Technology as one of the pre-vocational subjects is a unique and multi-disciplinary subject that covers very large area and draws from many other disciplines in TVET. The revised Basic Technology Curriculum covers the following nine themes: You and Technology (ICT inclusive), Safety, Materials and Processing, Drawing Practice, Tools and Machines, Applied Electricity and Electronics, Energy and Power, Maintenance and Building. The major difference in the curriculum content of the Introductory Technology and that of Basic Technology is the Information and Communication Technology (ICT) that was introduced as a topic under "You and Technology" and the conceptualization of the themes as well as the change in the name from Introductory Technology to Basic Technology (NERDC, 2007).

The academic achievement in Basic Technology has consistently been lower than other core and other selected elective subjects. According to Ogbeide (2010), the low academic achievement in Basic Technology needs to be investigated by educators if the nation must advance technologically. Stressing the low academic achievement of students in Basic Technology,

Akinyede & Uwameiye (2010) stated that: the very low academic achievement in Basic Technology by Junior Secondary School leavers should worry everyone concerned with Science and Technology Education in Nigeria. Akinyede & Uwameiye further pointed out that the JSS III results in Basic Technology in recent years is 30 per cent failure or above on the average.

Research evidence showed that the major problem students are facing in passing Basic Technology at JSS examination is traced to teaching method employed by the teacher to impart the knowledge. Adepoju (2006) points out that students encountered difficulties in learning when they are instructed using verbal approach. Achieving the objectives of teaching Basic Technology requires effective teaching methods. Teaching method can be explained as the method a teacher employs to deliver his/her subject matters to students, based on pre-determined instructional objectives, in order to promote learning in students and so as to facilitate the accomplishment of the set objectives. What a teacher does in the classroom depends to some degree upon his approach to learning situations. Correct use of an appropriate teaching method is critical to successful teaching and learning. Ojo (2022) observed that no method has been the best for every situation. However, a carefully designed teaching method can make wonders in making learning effective, Ndagana & Onofade further explained that the success in the use of the method depends on an intelligent analysis of the educational objectives, student in the class, the curriculum content or type of subject matter being taught.

Blessing & Ojo (2014) posited that teachers must diversify their instructional techniques if they are to successfully reach students of different abilities and learning preferences. Technology tools have been introduced for teaching. Technology tools are electronic devices used for accessing, processing, gathering, manipulating, presenting, and communicating information. The teaching and learning materials using technology tools are designed to accommodate differing needs and abilities which may result in fuller realization of students' capabilities and potentials, and allowing students to take greater responsibilities for managing their own learning (Levin, 2002).

Interactive media is explained as the integration of digital media including combinations of electronic text, graphics, moving images, and sound into a structured digital computerized environment that allows individual to interact with the data for appropriate purposes. The digital environment includes the Internet, telecoms, interactive video, power point and interactive digital television (Andy Finney, 2002). One method through which students' academic achievement and retention in learning can be improved is the use of multimedia method. Multimedia technique, in

view of Yusuf & Onasanya (2015), makes schoolwork real, uses students' experiences, motivates natural interest, promotes retention of learned materials, and carries student forward in clearly defined terms. It also minimizes waste of time, eliminates irrelevant materials from the curriculum and emphasizes creativity. According to Yusuf & Onasanya (2015), this method is an excellent means of fostering cooperation amongst learners. Considering the advantages of power point and digital video method of teaching, this study is undertaken to compare the effects of both methods of teaching in improving academic achievement of Basic Technology, since learning style preference vary between students, the most effective mode of instruction will also vary. This research work aims at comparing the effects of digital educational video and power point presentation on academic achievement and learning retention of Basic Technology students.

Power Point Presentation (PPP) is one of the interactive methods of teaching. It is more structured and interesting to students/audiences than other methods (Amare, 2006). It is a computer- based training tool that provides stable presentations in lecture halls and conference rooms. It is used in over 30million presentations a day and its software is on 250million computers world-wide (Alley &Neeley, 2005). Several studies have suggested that graphics improve students' memory ability (Olabiyi et. al, 2021). Other researchers also reported a corresponding increase in students' performance in courses where it was adopted (Stolo, 1995; Susskind, 2005; Szaba& Hastings, 2000). PPP can be as simple as few text on a colour screen or as complex where tables, pictures, graphs, sound effects, visual effects are inclusive. The effectiveness of PPP and other multimedia like Instructional Video presentations may however depend on the complexity of the topic that is being presented. In actual fact, several researchers have demonstrated that materials, such as graph aided charts are interesting but extraneous texts (Schraw, 1998). However, the Power Point used in this study does not involve audio.

Digital instructional video is another multimedia that combines motion, colour and sound for better understanding of ideas. Instructional Video, otherwise called Digital Educational Video (DEV) is one of the Interactive media that shows/projects, motion pictures, when the pictures are significant factor of a subject educational films are always in black and white, but sometimes in colour. Video imbedded in PPP files or shown separately on television, shows historical footage or re- created events, it can also demonstrate processes or events that cannot easily be replicated in laboratory or slow down and analyze motion (Farrant, 1981, Kemp&Smellie,1989;Wittich&Schuller,1973). Interactive learning occurs when a student pull

together knowledge and skills acquired from information and experiences provided by the teacher. The student is engaged both intellectually and emotionally thus feedback, reflection and dialogue are integral components of interactive learning (Blythe-Lord,1991). Beside technology tools, gender is another factor that influence achievement of students, Okeke (2008) gave a broad analytical concept which draws out women's role and responsibilities in relation to those of men. According to Okeke, gender refers to the socially culturally constructed characteristics and roles which are ascribed to males and females in any society. Gender is a major factor that influences career choice and subject interest of students. Okeke (2008) described the males' attributes as bold, aggressive, tactful, economical use of words while the females are fearful, timid, gentle, dull, submissive and talkative. It may be the reason Umoh (2003) stated that more difficult works are usually reserved for males while the females are considered feminine in a natural setting. Thus in schools, males are more likely to take to difficult subject areas like Technical while the females take to career that will not conflict with marriage chances, marriage responsibilities and motherhood (Okeke 2008). This created fewer job areas available for women, which might be of low status and low income.

Gender issues are currently the main focus of discussion and research all over the world, Nigeria inclusive. The question of gender is a matter of vital concern especially among academics and policy formulators. Intellectuals are worried about the role of male and female in the psychological, political, social, economic, religious, scientific and technological development of nations. Meanwhile, concerns about academic achievement with respect to males and females have generated a considerable interest in the field of TVET over the years. Differences in academic achievement of the two genders are likely to contribute disparities in the allocation of cognitive roles in the world of work.

Statement of the Problem

The understanding of the Federal Government of Nigeria is that Basic Technology would contribute to the national goal of education since the world was increasingly driven by technology. The teaching of the subject has been faced with numerous problems that can impede the realization of the objectives. One such problems is the low academic achievement in the subject. Over the years, student achievement in Basic Technology has been so low that Basic Technology has the highest percentage failure and the lowest percentage pass at the JSSCE for the past 10years (2005-2015) compared to the other core subjects at the junior secondary school level. In fact, how to

achieve the objectives of Basic Technology has been a major concern to educators. Some researchers have tried to identify some of the problems affecting the teaching and learning of basic technology, but it seems the problem of low academic achievement is a persistent one and has reached a level that should worry everyone concerned with the technological development of the nation. It is, therefore, imperative that the state of academic achievement in Basic Technology should be re-appraised so that possible solutions could be offered to remedy the present situation in the teaching and learning of the subject. There are always differences in academic achievement of students in the same class even when taught by the same teacher. This means that the rate of achievement varies may be because of certain factors such as teaching methods, gender, and students' attitude. Thus, it is possible that there exist gaps or disparities in the academic achievement of students based on the influences from these variables. Influences resulting in low academic achievement do not favour national development, and therefore, ought to be minimized. Therefore, the study was designed to compare the effects of digital video and power point presentation on academic achievement in Basic Technology to improve on the academic achievement in the subject in Lagos State.

Purpose of the Study

The study was guided by the following purposes:

1. Compare the mean academic achievement of Basic Technology students taught with Power Point Presentation (PPP) and digital Instructional video (DIV).
2. Compare the mean performance learning retention of Basic Technology students taught with digital Instructional video (DIV) and Power Point Presentation (PPP).
3. Influence of gender on students' academic achievement in Basic Technology

Research Hypotheses

The following null hypotheses tested at 0.05 level of significance guided the study.

1. There is no significant difference in the mean academic achievement score of Basic Technology students taught with digital instructional video and Power Point Presentation as measured by the Basic Technology Achievement Test (BTAT).
2. There is no significant influence of gender (male and female) on the academic achievement of students in Basic Technology as measured by the Basic Technology Achievement Test (BTAT).

Methodology

The research design employed was the quasi-experimental design and non-randomized, pre-test/post-test. The subjects were not randomly assigned to groups rather intact classes were randomly assigned to experimental and control groups. The population sample for the study consisted of 250 students of Basic Technology in five public and private junior secondary schools in Lagos. Purposive sampling technique was adopted and used to sample the schools that teach Basic Technology with application of technology tools for lesson delivery.

The instrument used for data collection was the Basic Technology Achievement Test (BTAT). BTAT was based on standardized test items from the National Examination Council Junior Secondary Certificate Examination (NECO JSCE). The BTAT contained 80 multiple choices of items, 40 for the pre-test and 40 for the post-test of four options. The topics covered, the entire Junior Secondary Schools year I and year II curriculum for Basic Technology. The topics were taught with application of digital educational video and power point presentation. Face and content validity of the study instrument and the lesson plan were ascertained by three lecturers in the Department of Science and Technology Education and two experts from Technical Department of Education District V, Agboju, Lagos. The recommendations and suggestions given by these experts were used to modify and improve the test instrument and lesson plan

The reliability coefficient of the Basic Technology Achievement Test (BTAT) was established using Cronbach Alpha reliability. The reliability coefficient of BTAT was 0.86.

Each student was given a pre-test of Basic Technology Achievement Test (BTAT). Lesson delivery styles were PowerPoint presentations and digital instructional video (i.e., lesson with slides) in the Basic Technology subject. In PowerPoint presentations involved both instructor and graphics presentations, the presentations were made to reflect on the screen from a laptop using PowerPoint software, basic text, tables, and diagrams relating to topics were presented On the other hand, digital instructional video, presentation involved instructor and the corresponding graphics presentations, the presentations on the Television screen from the recorded Video cassette played on the Video player connected to Television. Only basic text, tables, and diagrams relating to topic were presented and the presentations were supported by verbal illustrations for student's easy understanding. Both groups were taught the same topics by the same regular Basic Technology teachers and on the scheduled time. The research questions were answered using mean

of the pre-test and post-test scores. The Analysis of Covariance (ANCOVA) was used to test the hypotheses at 0.05% level of significance

Result

Table 2: Mean of the ***Basic Technology*** Academic ***Achievement Test (BTAT)***

Group	N	Pre-test	Post-test	Retention Test
Power Point Presentation	135	19.47	27.47	29.18
Digital Instructional Video	115	18.77	27.67	29.02

The mean score for the retention test for power point presentation (experiment group) was 29.18 when comparing with digital instructional video (control group) with mean score on the retention test 29.02, the difference is 0.16 points. To see whether there was a significance difference between the groups, the ANOVA analyses were carried out.

The ANOVA shows a significant difference between the groups at the retention test $F(2, 99) = 3.316$, $p < 0.040$. Post hoc comparisons indicated that the difference is between experiment group A and experiment group B, Dunnett $t = -2.543$, $p < .051$.

Table 3: Mean of Pre-test and Post-test Scores of Male and Female in Basic Technology Achievement Test (BTAT)

	Power Point Presentation				Digital Instructional Video			
Gender	N	Pre-test	Post-test	Mean diff. $\overline{X}$	N	Pre-test	Post-test	Mean diff. $\overline{X}$
Male	74	7.28	13.08	5.80	68	7.02	12.26	5.24
Female	63	5.82	7.94	2.12	45	6.52	6.88	0.36

The data presented in Table 3 showed that male students taught with power point presentation had a mean achievement score of 7.28in pre-test, and a mean score of 13.08 in post-test, making a pre-test, post-test mean difference in power point presentation in the BTAT for male to be 5.80. Meanwhile, the female students taught with power point presentation had a mean score of 5.82 in the pre-test and a post-test mean of 7.94 with a pre-test, post-test mean difference of 2.12.Also, male students taught with digital instructional video had a mean score of 7.02 pre-test and a mean score of 12.26 in the post-test making a pre-test, post-test mean difference in the male students taught with digital instructional video to be of 5.24. Meanwhile, female students taught BTAT with digital instructional video had a mean score of 6.52 in the pre-test and a post-test mean of 6.88 with a pre-test, post-test mean difference of 0.36. With these results, the male students taught

BTAT had a higher mean score than the female students. This means that gender influences academic achievement of male and female students measured by the BTAT.

Discussion

The analysis of data presented in tables 1 indicate that students in power point presentation group had better mean scores compared with their counterparts in digital instructional video in both pre-test and post-test. The differences in the mean scores in the pre-test may however be attributed to the initial difference in the knowledge and skills possessed by the students in both groups before the treatment. The post-test result implies that students taught with power point presentation perform better than those taught with digital instructional video group. This result stand as evidence that Power Point Presentation method has positively affects student achievement test in Basic Technology. This agrees with Bartsch & Cobern (2003), and Gonen & Basaran (2008) who revealed that PowerPoint-aided education facilitated learning, attracted students' attention and enhanced their motivation. Also, teaching method that incorporates Power Point Presentation positively affected the student academic achievement and retention. Additional studies support this view (Bartsch & Cobern, 2003; Gok & Sılay, 2008). The work is also in agreement with Szabo & Hastings(2000)who emphasized that power point presentationhelps to keep students' interest and attention on the lecture (, improves student learning (Lowry, 1999), and aids explanations of complex illustrations (Apperson, Laws, & Scepansky, 2006).Gambari& Olumorin, (2013) also stressed that power point presentation made students work better, allow students to do more work in a short time. Thus giving room to greater productivity.

Furthermore, the study is in support of the view of Bartsch & Cobern, (2003) and Gok & Sılay, (2008) who stressed that complex shapes that provided a suitable enough rendition of the original image cannot easily be achieved in instruction video presentation. However, texts and complex figures in a PPP can be easily achieved from the computer/laptop onto a screen. In this way, colour and concrete presentation of graphics helps students to understand better and remember knowledge during examinations because such graphics are identical to the original image. Therefore, the rationale behind the success of the students in the power point presentation group stems from the alleged views. According to the present research results, a teaching method that incorporates Power Point Presentation positively affected the student academic achievement and learning retention.

Similar discussions had been put forward by El-Ikhan (2010) and Moore (1993), who highlighted that PowerPoint-aided education enhanced an adult student's success, attention, and motivation.It was argued thatPowerPoint increases visual quality in the learning process. They also contend that it takes less time to present a subject matter; therefore, more materials can be covered in the classroom. Opponents of PowerPoint however believe that it diminishes creativity and innovation besides elevating format over content, betraying an attitude of commercialism that turns everything into a sales pitch (Tufte, 2003).On the other hand, Creed (1997) describes PowerPoint as a teacher-centered instructional tool that nourishes teacher-controlled lectures. Similarly, Tufte (2006) points out that PowerPoint reduces the analytical quality of a presentation, limits the amount of detail that can be presented, and often weakens verbal and spatial thinking.

Conclusion

The choice of instructional method is a factor in the delivery of a curriculum and consequently impacts on the quality of performance of the recipients. The use of power point presentation as a teaching aid and an instructional technique would generally aid students' motivation, skill development and subject matter assimilation. Students learn better when they are allowed to participate actively in the class by interacting freely with the teacher and their peers, working in groups and using interactive computer software to perform tasks.

Recommendations

Based on the findings of the study, the following recommendations are made: Basic Technology teachers should improve academic achievement of their students by incorporating multimedia into teaching and learning process as a viable and effective strategy created to enhance students learning. Also, ministry of education through science and technology education should organize seminars, conferences, and workshops to sensitize Basic Technology teachers on the use of multimedia tools and to ensure availability of the facilities for teacher and students use.

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