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AN APPRAISAL OF STUDENTS' ACADEMIC PERFORMANCE AND RETENTION IN PHYSICS USING ICT-BASED TEACHING STRATEGIES

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ABSTRACT

The study was carried out to appraise the impact of ICT-based teaching methodologies (video-taped instructions and Power Point presentations) on academic performance and retention of secondary school students in Physics. The study was conducted in Cross River State, Nigeria with a quasi-experimental research design using non-randomised pre-test and post-test control group. The sample for the study consisted of 176 SS2 students drawn from four intact classes of four secondary schools within the study area. Physics Achievement Test (PAT) with a reliability coefficient of 0.85 was used for data collection. Mean and Analysis of Covariance (ANCOVA) was used in the treatment of the obtained data. The results of the study showed that there was a significant difference in the academic performance and retention of students taught using video-taped instructions and those taught using power point presentations. Findings of the study showed that students taught using video-taped instructions had a higher academic performance and retention than those taught using power point presentations. The study concludes that the use of blended ICT-based teaching methods can improve learner's academic performance and retention.

KEYWORDS

Video Taped Instruction (VTI), Power Point Presentation (PPT), Academic Performance, Retention, Physics.

Introduction

The instructional delivery method adopted by the teacher plays an important role in learning, skills acquisition and meaningful interpretation of information by the learners. The use of technology in schools has developed new ways of teaching and learning. It has led to enhanced learning by providing a better understanding of the topic as well as motivating the students (Lari, 2014). Information and Communication Technologies (ICTs) has increased its popularity since the integration of computers into the learning environments. Their use has fostered qualitative changes in how teaching is approached, especially in terms of presenting contents audio visually. This has provided teachers and students some advantages like helping to visualize the concepts, using time effectively, improving complex problem solving and higher order thinking skills (Hopson *et al*., 2002; Gürbüzc *et al*., 2010). Educationists have recognized the power of audio-visual materials in capturing the attention of learners, increasing their motivation and enhancing their learning experience (Cruse, 2007). With the traditional methods of instructions gradually giving way to improved and ICT-based pedagogy, video-taped instructions and power point presentations are among the ICT enhanced teaching methodologies with very high patronage by the teachers. As media devices become increasingly portable, and as they spread even further through young people's environments, media messages will become an even more ubiquitous presence in an already media-saturated world (Cruse, 2007).

Videotaped instruction (VTI) is an instructional delivery approach that combines still and motion pictures in its pictorial presentation and it is a medium which can be used to achieve various teaching and learning objectives (Aninweze, 2014). VTI is created for use in classrooms or in other educational settings. It has the qualities of providing a semi-permanent, complete and audio-visual record of event. Mayer (2001) explains that viewing, while it may appear to be passive, can involve the high cognitive activity necessary for active learning. Well-designed multimedia instructional messages can promote active cognitive processing in students, even when learners seem to be behaviorally inactive.

PowerPoint is a software programme that has become a basic means of delivering presentations in schools, lecture halls and educational centers. Every day more than 30 million presentations are delivered with PowerPoint (Savoy *et al*., 2009). More than 20 years have elapsed since PowerPoint first appeared, and since then its presence in classrooms has risen considerably. The advantages of using PowerPoint presentation in the teaching and learning process are numerous. According to Karen (2014), PowerPoint slide presentation has become an ingrained part of many instructional setting and can also be a highly effective tool to aid learning. The source identified the following advantages of PowerPoint: PowerPoint Presentation enables users to engage multiple learning styles, increases visual impact, improves audience focus, provide annotations and highlights, analyses and synthesizes complexities, enriches curriculum with inter-disciplinarity and increase spontaneity and interactivity.

The use of video-taped instructions and power point presentations for teaching Physics is novel in Nigerian public secondary schools. This has called for further investigations to optimize the benefits in order to make a paradigm shift to the new era of ICT enhanced pedagogy. The purpose of the study was to appraise students' academic performance and retention in Physics using ICT-based teaching strategies. To achieve this purpose, two research questions and two research hypotheses were raised to guide the study.

Research Questions

I. Is there any difference in the academic performance of students taught Physics using Video Taped Instructions (VTI) and those taught using Power Point Presentations?

II. Is there any difference in the retention of students taught Physics using Video Taped Instructions (VTI) and those taught using Power Point Presentations?

Research Hypotheses

H_{01} There is no significant difference in the academic performance of students taught Physics using Video Taped Instructions (VTI) and those taught using Power Point Presentations

H_{02} There is no significant difference in the retention of students taught Physics using Video Taped Instructions (VTI) and those taught using Power Point Presentations.

Materials and Methods

A quasi-experimental research design using non-randomized pre-test and post-test control group was used for the study. The sample consisted of 176 Senior Secondary Two (SS2) students drawn from three intact classes of three secondary schools in Cross River State, Nigeria. Data was collected using "Physics Achievement Test (PAT)" which was designed for the study. The instrument comprised 20 multiple choice questions with options A-D and a reliability coefficient of 0.85.

The instructional video package and the PowerPoint presentation was developed using note of lessons on Physicstopics to be taught to the students before commencement of the study. A pre-test of the "Physics Achievement Test (PAT)"was administered to the students before they were taught the concepts in their respective groups using video-taped instruction and PowerPoint presentations. After the treatment, the test was again administered as a post-test. After an interval of one month, the test was again administered to test the student's retention of the concepts. The obtained data was analyzed using appropriate statistical tool.

Results

The result of the findings of the study is as presented in Tables 1-4.

Table 1: Mean Statistics of Student's Academic Performance

Instructional strategy	N	Pre-test Mean	Post-test Mean	Mean Difference
Video-tape	55	37.09	74.46	37.37
PowerPoint	59	37.03	67.20	30.17

Table 2: Mean Statistics of Student's Retention Performance

Instructional strategy	**N**	**Post-test Mean**	**Retention-test Mean**	**Mean Difference**
Video-tape	55	74.46	78.64	4.18
PowerPoint	59	67.20	70.93	3.73

Table 3: ANCOVA of Academic Performance of Students

Source	**Type III Sum of Squares**	**Df**	**Mean Square**	**F**	**Sig.**
Corrected Model	2183.47[a]	2	1091.74	13.99	.00
Intercept	7352.73	1	7352.73	94.24	.00

Pretest	686.81	1	686.81	8.80	.00
Instructional strategies	1486.20	1	1486.20	19.05	.00
Error	8660.39	111	78.02		
Total	580700.00	114			
Corrected Total	10843.86	113			

*=Significant at P< 0.05 alpha level

Table 4: ANCOVA of Student'sRetention Performance

Source	Type III Sum of Squares	Df	Mean Square	F-cal	Sig.
Corrected Model	1693.29[a]	2	846.64	9.22	.00
Intercept	9865.84	1	9865.84	107.44	.00
Posttest	3.78	1	3.78	.041	.84
Instructional strategies	1401.74	1	1401.74	15.27	.00
Error	10192.68	111	91.83		
Total	647150.00	114			
Corrected Total	11885.97	113			

*=Significant at P< 0.05 alpha level

Discussion of Findings

I. Academic Performance:

The result in Table 1 revealed that the mean difference for students taught Physics with video-taped instruction was 37.37 while that of students taught with PowerPoint presentation was 30.17. This means that students taught Physics with Video-Taped Instruction performed better than students taught with the PowerPoint presentation.

Also, result in Table 3 shows that the calculated F-ratio for the effect of instructional strategies at df 1, 112 is 19.05, while its corresponding calculated level of significance is .00 alpha. This level of significance is less than .05 in which the decision is based. With this result, the null hypothesis was rejected. This implies that there is a significant difference in the performance of students in Physics between those taught using video-taped instruction and those taught using PowerPoint presentation. This finding is possible because video-taped instruction can present factual and conceptual information with visual illustration and graphics which could make learning interesting and thus could enhance students' academic performance. However, this research findings support the observation of Aninweze (2014) who reported that video-taped instruction has the qualities of providing a semi-permanent, complete and audio-visual record of event. Though students taught using power point presentation in the study had an achievement score that was above average, those taught with VTI out-performed them in the FAAT. A synergy of the two instructional methods is very likely to produce students with higher achievement scores than those of the traditional methods. The findings are in line with Ramon *et al*., (2013), who posited that the use of technology can have a very positive influence on learning, provided that its use fits the circumstances inherent in learning.

II. Retention:

Data in Table 2shows the mean difference of the post test scores which was administered after an interval of one month. The mean difference for students taught Physics with Video-Taped Instruction (VTI) was 4.18 while that of students taught with PowerPoint presentation was 3.73. This means that

students taught Physics with video-taped instruction had a higher retention than students taught with the Power Point presentation.

Also, Table 4 shows that the calculated F-ratio for the effect of instructional strategies at df 1, 112 is 15.27, while its corresponding calculated level of significance is .00 alpha. This level of significance is less than .05 in which the decision is based. With this result, the null hypothesis was rejected. This implies that there is significant difference in the retention of students in Physics between those taught with video-taped instruction and those taught with PowerPoint in favour of those exposed to video-taped instruction.

This finding is possible because video-taped instruction could assist teacher to teach a large population of students effectively and the use of this package could arouse and sustains students attention the more. What the learners see and hear has a tendency of remaining permanent in them. This finding supports that of Nouri and Shahid (2005) that there is no conclusive evidence that PowerPoint presentations improve short-term or long-term memory. The latter results are consistent with other media comparison studies that showed the medium alone does not influence learning. The findings supports that of CPB (2004) who found that the mix of spoken language, text, still images and moving images in television and video results in higher learning gains than media that rely primarily on only one of these symbol systems. Wetzel *et al*.'s 1994 review of research concluded that combining sound with either still or moving images resulted in more learning than simply adding motion to still images. One of the greatest strengths VTI is its ability to communicate with viewers/learners on an emotional, as well as a cognitive, level. Emotional memories can have a lasting effect on the learners, thereby helping in the retention of the concepts learnt. Because of this ability to reach learner's emotions, VTI can have a strong positive effect on both motivation and affective learning. Not only are these important learning components on their own, but they can also play an important role in creating the conditions through which greater cognitive learning can take place.

Conclusion/Recommendations

An analysis of the overall results of the current study showed that VTI is an effective technology in teaching Physics. Though power point presentations are equally beneficial, the uniqueness of VTI stood it out as it was found to enhance both academic performance and retention in FAAT over power point presentations. The importance of using VTI pedagogy stems from its flexibility and verity which the students prefer. It affects positively students' achievement and the retention of information. Repeating and expanding this study with different groups and different subjects will support the data in the present study and also reinforce the applicability of ICT-based teaching strategies in enhancing academic performance and information retention.

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