



Effects of Video-Based Instructional Strategy (VBIS) on Junior Secondary School Students' Achievement in Computer Programming in Lagos State, Nigeria

Effet de la Stratégie Pédagogique Basée Sur La Vidéo (VBIS) Sur Les Résultats des Élèves du Premier Cycle du Secondaire en Programmation Informatique dans L'état De Lagos, Au Nigéria.

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Abstract

This study determined the effects of Video-Based Instructional Strategy (VBIS) on students' achievement in computer programming among junior secondary school students in Lagos State, Nigeria. The study adopted the pretest-posttest control group design which applied the quasi-experimental approach. One hypothesis on effect of Video-Based Instructional Strategy (VBIS) on achievement in BASIC programming language was tested at .05 level of significance. The participants were 50 students from Education District V of Lagos State. The purposive method of sampling was used in selecting two Model Junior Secondary Schools from two Education District that participated in the study. Results revealed that the performance of students in the experimental group exposed to VBIS was significantly different from those of the control group exposed to conventional teaching strategies. It was recommended that VBIS should be used to enhance effective teaching of Computer Studies in junior secondary schools.

Keywords: Video-Based Instructional Strategy, Junior Secondary Schools, Students' Achievement, Computer Programming

Résumé

Il a été constaté que les méthodes d'enseignement d'une matière professionnelle comme les études informatiques au Nigéria

découragent la créativité et empêchent les élèves de penser au-delà des contenus présentés par les enseignants. Par conséquent, les étudiants sont réduits à des apprenants passifs dans le processus d'apprentissage et, par conséquent, l'apprentissage devient répulsif pour eux. La stratégie pédagogique basée sur la vidéo (VBIS) est une stratégie innovante qui peut être utilisée dans les écoles pour enseigner et exposer les apprenants au codage. L'utilisation efficace de cette stratégie a été proposée pour améliorer les compétences et les résultats des élèves en matière de programmation. Il a le potentiel de rendre l'enseignement et l'apprentissage de la programmation plus intéressants, conviviaux et significatifs pour les apprenants, contrairement à l'utilisation généralisée des méthodes d'enseignement conventionnelles où les apprenants sont incapables de démontrer une compétence adéquate en codage et ne sont pas capables d'écrire un code de programmation simple. L'étude a adopté la conception du groupe de contrôle prétest-post-test qui a appliqué l'approche quasi-expérimentale. L'hypothèse sur l'effet de la stratégie pédagogique basée sur la vidéo (VBIS) sur le rendement dans un langage de programmation BASIC a été générée et testée au niveau de signification de 0,05. La population de l'étude comprend les élèves du premier cycle du secondaire dans le district V de l'État de Lagos, au Nigéria, tandis que l'échantillon se compose de 50 élèves du district. La méthode d'échantillonnage raisonnée a été utilisée pour sélectionner deux écoles secondaires modèles du premier cycle du district scolaire qui ont participé à l'étude. Les résultats ont révélé que les performances des élèves du groupe expérimental exposés au VBIS étaient significativement différentes dans leurs scores moyens post-réalisation en programmation informatique de ceux du groupe témoin exposé aux stratégies d'enseignement conventionnelles. Il a été recommandé d'utiliser le VBIS pour améliorer l'enseignement efficace des études informatiques dans les écoles secondaires.

Mots clés: Stratégie pédagogique basée sur la vidéo, écoles secondaires de premier cycle, rendement des élèves, programmation informatique

Introduction

Basic Education is fundamental to human capital and the societal development of every nation. Hence, it is regarded as the foundation for

building other levels of education and therefore forms a prerequisite for growth and national development. The emphasis of Basic Education according to Aboluwodi (2015) and Ejere (2011) is placed on the total development of the child. That is, a life-long experience targeted at the improvement of the child's literacy level thus laying the foundation for critical thinking through the culture of appropriate learning, inducement of self-awareness, inculcation of citizenship and life skills. Junior Secondary School Education helps in shaping the future career of Nigerian youths. It is the transitional stage where students are exposed to pre-vocational subjects like Agricultural Science, Home Economics, Computer Science, and a few others. Ogunleye (2019) reflected on entrepreneurial value of education on which industrialization rests, and reasoned that based on the non-existent or poor application of mechanized, chemical and electronic devices in the organization of production processes using inanimate natural sources of energy in Nigeria, the country has remained among the underdeveloped nations. These pre-vocational subjects hold the key to the national development of most nations, hence, they are relevant and instrumental in making the remarkable contributions to the economic growth of developing countries by serving as catalysts to the production of adequate manpower tailored towards industrial, societal and global needs (Vijay, 2017). This can be achieved where students have the opportunity to interact with ICT resources and engage in hands-on activities within the scheme of education.

Computer Studies as an integral part of ICT is one of the major drivers of the 21st-century developmental activities which has made life relatively easy since its emergence in human affairs (Ogunleye, 2007). The progress recorded on developments in all aspects of human endeavour, had been significantly attributed to effective and efficient deployment computer hardware and software for learning in schools. With frequent changes in curriculum to meet the 21st century learner needs, there is an increasing demand for computer technology usage in diverse ways. Indeed, the relevance of various educational media that are technically advanced for open and distance learners and the necessity for staff training and development indicate fundamental rationale for computer knowledge and utilization (Ogunlela & Ogunleye, 2014). Hence, Governmental organizations, educational systems, researchers, school leaders, teachers, parents, and other stakeholders in education consider

Computer Studies to be critical in developing the primary, secondary and tertiary education curriculum (Elimu, 2014).

The inclusion of Computer Studies helps to equip students with necessary skills and knowledge on computer use and application and the integration of its teaching into the school curriculum. However, due to the prevalent absent or inadequate infrastructure, inadequate funding, lack of facilities, resources, methods of teaching among others, Computer Studies has been slowly implemented in most schools (Kyafulilo, 2012; Ogunleye, 2009; 2010). To interact with the computer there is the need to understand its language which is typically machine language and sometimes contains syntax and numerous lines of coded information in mathematical form. The computer uses programmed codes to carry out their task, which is in turn their output. This language adopts the use of binary digits, '0 and '1, which denote 'off and on' indicating the condition of the electric current. Users of the computer have difficulty in writing this language with these digits. They, therefore resort to writing their instructions in a language that is decodable by the computer, called programming language.

The computer programming language is the neo-universal language of our changing planet and basic literacy in computer is needed in the digital age. It is the specific language of and understandable to a computer consisting of several commands given to a computer in the execution of certain tasks. They make use of sequential words, symbols and codes for writing the computer program. This process is referred to as programming. Computer programming is included in Junior Secondary School curriculum to expose students to the advantage of critical thinking and problem-solving skills for the production of globally competitive individuals and thus promote Computer Science compliant learners who will engender growth and development. Learning Programming is a complex task since computer programming requires the generation of unique ideas, new thinking, and creative skills in problem-solving (Wing, 2006; Voskoglou, 2011). This according to Giannakopoulos (2012), has made Students generally perceive the processes of learning the tasks of computer programming as unattractive, difficult and boring.

Literature has revealed that the main challenge faced by teachers and educational practitioners in the field of Computer Education is how to make Computer Programming attractive and interesting to students to

meet up with global competitiveness and create a level playing ground for learners to demonstrate adequate competence needed for economic growth and being able to write a simple BASIC Programming code (Almstrum, Hazzan, Guzdial, & Petre 2005; Kinnunen, 2009; Bell, T., Alexander, Freeman, & Grimley 2008). This requires the application of different strategies and techniques to make the learning of Programming interesting, friendly and meaningful to learners.

Programming entails such abilities as are required to generate solutions to problems. Finding practical solutions indicates the fact that one of the specific learning outcomes through the use of computers can solve problems of the pedagogy and environment. It also solves broad problems broken into their subsets and creates an absorbable part as a generalized central solution. Also, the student is able to design usable, readable and attractive solutions to problems in the desired area of interest. Furthermore, knowledge of Programming helps students to have a good grasp of a wide range of technological gadgets and become able to establish contact with the nitty-gritty of different areas of study including the sciences, engineering, Mathematics and the art of intellectualism and mind building thereby enabling them to solve tasks that demand strategic reasoning, critical thinking, insight, and creativity.

Computers are modern instruments which enable teachers to select the teaching methods that could develop students' interest and participation in learning (Hamidi, Meshkat, Rezaee, & Jafari, 2011). Hence, the National Policy on Education (FRN, 2013) sets guiding principles for procedures and activities in computer technology usage at different levels of learning in school curricula at the early years of education, and this influence the use of Video-Based Instructional Strategy (VBIS) as essentially a problem-solving specialized ICT and technology-based methodology for teaching and learning in schools, which is germane to inspiring, coordinating and supporting students' classroom learning.

The VBIS is a systematic methodology for retentive learning among school children, due to its powerful, expressive, non-textual ways and approaches of capturing, presenting information or facts which help pupils to use ICT-based technology and video content in interaction and learning. VBIS has also been described as a common pedagogical

method used in the classroom and beyond to deliver instruction (Pei-Lin, Savage & Bouck, 2014). In the school classroom, individualised learning with the VBIS fosters independence, helping students gain the capacity for the use of content taught. This type of learning allows learners to watch the video over and over till they are able to understand its content. Indeed, the video, video streams, or video-web communication enhance learning across disciplines especially Computer Studies. Studies have also confirmed the use of video as beneficial to learning, student satisfaction and motivation in the entire learning process (Ecalte, Magnan & Calmus, 2009).

Plavnick, Sam, Hume and Odom (2013) inferred from their findings that students tend to engage themselves in the use of computer technology and are likely to achieve greater level of success through VBI as videos can be played back on mobile devices which are more handy than the video cassette recorders (VCRs). Video-based instruction has been described as the use of videos that a teacher created outside of the classroom situation and specifically used for presenting a concept or content. The VBIS according to Devitt and Palmer (2011), Karakas (2013) is a Computer-Assisted Learning (CAL) that presents information in a video format, using the computer, with the ultimate goal of enhancing student learning. The presentation of visual texts (e.g., video clips, pictures) in the video-based lesson have become a very useful support for learning. Therefore, this study aims at determining the effect of Video-Based Instructional Strategy (VBIS) on the programming skill of Junior Secondary students.

Hypothesis

One hypothesis was formulated and tested.

H₀₁: There is no significant effect of Video-Based Instructional Strategy (VBIS) on achievement in a BASIC programming language.

Methodology

The study adopted the quasi-experimental pretest-posttest control group design with the factorial matrix of a 2X2X3 nature. The population comprises all public Junior Secondary School students in the District V of Lagos State Education zoning while the sample size consists of 50 Public Junior Secondary School Two (2) students in Education District V of Lagos State, Nigeria. The purposive method of sampling was used

in selecting two Model Junior Secondary Schools from the Education District. The treatment (VBIS) was administered on the experimental group while the conventional teaching strategy was used for the control group. The main instrument used is BASIC Programming Skills Achievement Test (BPSAT), a multiple-choice test items developed by the researchers from BASIC programming language content in JSS2 Computer Studies curriculum. The test items is divided into two sections. Section A contains demographic information while section B comprises 20-item multiple-choice questions constructed from two topics “Programming Language” and “BASIC Programming Language” with five options A-E where students were required to select the correct option as an answer to each question. The questions were drawn from the JSS2 Computer Studies curriculum. To ensure that the items in the instrument are reliable, the test was administered to twenty students in JSS2 who were not part of the main study. The collected data were subjected to Cronbach method to determine the reliability of the achievement test with its reliability coefficient (r) of .80. This shows that the instrument was reliable enough for the study. Inferential statistics of Analysis of Covariance test was used for the hypotheses that were generated. Estimated Marginal Mean (EMM) was employed in determining the magnitude of the scores across the groups. The hypothesis was tested at .05 level of significance.

Results

There is no significant effect of Video-Based Instructional Strategy (VBIS) on students' Achievement in BASIC Programming Language.

Table 1: Analysis of Covariance of treatment on Achievement in BASIC Programming Language

Source	Sum of Squares	Degree of Freedom	Mean Square	F	Sig.	η^2
Corrected Model	155.011 ^a	7	22.144	5.191	.000	.464
Intercept	363.986	1	363.986	85.324	.000	.670
Pre-achievement	2.414	1	2.414	.566	.456	.013
Treatment	63.345	1	63.345	14.849	.000*	.261
Error	179.169	42	4.266			
Total	7039.000	50				
Corrected Total	334.180	49				

a. R Squared = .464 (Adjusted R Squared = .374)

Table 1 showed that the treatment has significant effect on the achievement of students $F_{(1,42)}=14.849$; $p<.05$; $\eta^2=0.261$. Hence, the null hypothesis is rejected. The result also showed an effect size of 26.1%. The table of the treatment estimated marginal means showed that students exposed to Video-Based Instructional Strategy had a higher posttest mean score (63.345) compared to the control group.

Table 2: Estimated Marginal Means of Achievement by Treatment and Control Group

Treatment	Mean	Std. Error
Treatment	13.368	.502
Control	9.812	.576

Table 2 above revealed that the post-achievement of students exposed to video-based were significantly different from their counterparts in Control Group. This implies that students taught using video-based has the highest means score and are more engaged than their counterpart in the control group.

Discussion

The results revealed that treatment had a significant effect on the achievement of students in learning of BASIC Programming Language. This was supported by the findings of Akinyemi (2013) that there is a significant difference in competence and achievement of pupils before and after they were exposed to LOGO Programming Instructional Package. The findings of the study revealed that Video-Based Instructional Strategy was effective in enhancing students' achievement in Programming. The use of the strategy provided the students with richer learning experience than they had when taught using conventional teaching methods. It was further supported by Muriithi (2013) in a similar study that the instructional approaches and methods used by teachers play a key role in determining learners' achievement in

any subject at all levels of learning. However, this study negates the findings of Ahiatrogah (2013) who found no significant difference between the achievement in pre-technical skills of Junior High School students exposed to learning with video-based programmed instruction and conventional teaching strategies. The findings of this study are also in line with the finding of Charles-Ogan and Cheta (2015) that learners progressed through video-based instruction faster, understood the concept in greater depth, and thus stimulated their interest through the interactivity in the video. Similarly, The University of Queensland (2016) averred that in certain teaching-learning processes, video can be so good in demonstrating procedures to students towards enhancing their understanding of very complex procedures since they can watch it as many times as they need to view it. This view was also supported by Michael (2013) that video helps the teachers affording them certain advantages over live observation of lessons and that students' learning from the video is greatly increased when the principles are purposefully and appropriately utilized. This means that there is a significant main effect of treatment on students' academic achievement in BASIC Programming Language. This result is also in agreement with the study of Israel (2007) that there is indeed a significant difference in the performance of students exposed to videotaped instruction and their counterparts who were not so opprtuned. This study and its result is contrary to the findings of Lasisi and Daniel (2009) wherein it was indicated that utilizing video-based strategy in teaching and learning could be as equally effective as the potentials of the conventional teaching method.

Conclusion

Based on the findings of this study, it was established that video-based instructional strategy was found to improve students' achievement and also stimulate in programming, as compared with the conventional strategy. The strategy was more suitable in communicating facts and demonstrating procedures to assist in mastering learning where students can view complex procedures as many times as they need to. Hence, a video-based instructional strategy when effectively utilised can be used to enhance the acquisition of authentic learning opportunities for students.

Recommendations

Based on the findings of this study, it was recommended that teachers should adopt Video-Based Instructional Strategy in the teaching of BASIC Computer Programming Language concepts to enhance students' achievement and competence, in coding. Teachers should be encouraged to use Video-Based Instructional strategies in schools to improve students' acquisition of requisite skills in the subject that are germane for cognitive thinking and problem-solving abilities. Similarly, Computer teachers and educators should be adequately sensitised through workshops, seminars and conferences on the use of video-based instruction for instructional delivery at Secondary School level, Also, Government should organize training and re-training programmes for in-service and pre-service teachers on the effective use of VBIS and skill-oriented conferences for Computer Studies teachers at the secondary school level.

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