DEVELOPMENT AND EVALUATION OF DIGITAL SUBJECT MATERIAL FOR TEACHING COMPUTER STUDIES IN NIGERIA

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Abstract

Digital Subject Materials (DSM) are electronic files that can be viewed on a laptop or mobile devices either online or offline. The ultimate reason for developing a Digital Subject Material is because teaching with a whiteboard, chalk and markers are now a thing of the past. Therefore, if DSM is adequately deployed into teaching and learning, it can enhance learning ability including student's performance and encourages them to learn on their own. The objectives of the study were to: (i) develop DSM for teaching computer studies in Ilorin; (ii) determine educational technology expert rating of the developed DSM on computer studies in Ilorin; (iii) determine computer science expert rating of the developed DSM on computer studies in Ilorin; and (iv)determine the cost of developing DSM. This study utilizes a design and development research of model type. The population for the study consists of all Educational Technology experts and Computer Science experts in Ilorin.The target population comprised of all Educational Technology experts from Educational Technology Department in Faculty of Education, University of Ilorin and all Computer Science experts in University of Ilorin. Specifically, five Educational Technology experts and five Computer Science experts was used for the study. The research instrument used for the study are; DSM for teaching Computer studies, Educational Technology experts rating guide and Computer science experts rating guide. The findings of the study were that: i. ADDIE Model was used for the development of DSM;ii. the grand mean from the rating of educational technology experts on the developed DSM based on the structure, screen design and evaluation were greater than 3.0; iii.he grand mean from the rating of computer science experts on the developed DSM based on the structure, screen designwere greater than 3.0 while the grand mean for evaluation was 2.58; and iv. the estimate for the developed DSM was for thousand, four hundred and fifty naira (N4,45). The study concluded that DSM brings about effective management, teaching and learning. Based on the findings, the study recommended that students should help themselves by making use of information on the internet for learning and shifting their focus from using it for fun and entertainment only.

Keywords: Development, Digital Subject Material, Evaluation

Introduction

The use of technology in everyday lives is becoming increasingly obvious in different settings and affecting many aspects of our social and economic lives. Information and Communication Technology (ICT) has transformed people's daily activities (Kean, Kean &Blicblau, 2016). Technologies are a driving force behind much of the development and innovation in both developed and developing countries as the current knowledge economy and its function depend heavily on ICT use (Deng & Tavares, 2015; Russel, Malfroy, Gosper, & McKenzie, 2014).Higher education (HE) institutions have adopted ICT as a means of enabling students to access the knowledge and skills required to meet the demands of the ever-changing global environment (Altbach, Reisberg, &Rumbley, 2009). It also adds value to the processes of learning and to the organization and management of learning institutions (OECD, 2012) and its use in instruction is essential to the growth and development of teachers and students (Khan, Butt, & Baba, 2013).

Over the years, several efforts have been underway to develop methodologies to measure the educational uses of ICT, surpassing the narrower definition, that is, restricted to the utilization of hardware and software. Although the conceptual understanding of a broader meaning of ICT extends to embody other components (Keane et al., 2016), less is known about how to assess the dimensionality of integrated ICT literacy and measure and its resultant effects using a structural equation modelling (SEM) approach (Lau & Yuen, 2014). The use of ICT has become a major use in many countries, the understanding and mastering of the basic skills in ICT is now been regarded as a cone of educational programs along with reading, writing and numerically (Mayer, 2015).

The adoption and use of various E-learning systems such as Moodle, Sakai and Blackboard to enhance teaching and learning are gaining popularity in Higher Education. In recent years, reference to "digital technology in the classroom" (DTC) can be taken to mean digital processing systems that encourage active learning, knowledge construction, inquiry and exploration on the part of the learners, and which allow for remote communication as well as data sharing to take place between teachers and or learners in different physical classroom locations (CAIE, 2017).

Digital Subject Materials are electronic files that can be viewed on a laptop or mobile device either online or offline. Our current digital materials include pdfs, word documents and excel files. The file format is determined by its content and intended use. The term "digital learning resources" is used here to refer to materials included in the context of a subject that is support the learner's achievement of the described

learning goals. These materials consist of a wide variety of digitally formatted resources including graphics, images or photos, audio and video, simulations, animations, prepared or programmed learning modules (CAIE, 2017).

Statement of the Problem

Population explosion and increasing admission request into schools in every region of the world brought greater constraints on the resources of several schools. For instance, there is problem of inadequate number of human and material resources to cater for the education of the large population. The population of school age citizen in most places has grown tremendously to the extent that only a small percentage can be offered admission. A new learning environment needs to be created which will provide autonomy and flexibility, establish contacts and easy communication between centres of culture and knowledge, and facilitate easy access for all citizens of a knowledge-based society (Charles and Babatunde, 2016).

Therefore, if digital subject materials are adequately deployed into teaching and learning, it can enhance learning ability including student's performance and encourages them to learn on their own. Hence, this study developed and evaluates digital subject materials for teaching computer studies in Ilorin metropolis.

Research Questions

The following research questions were raised and answered in this study

1. What is the process involved in the development of digital subject materialfor teaching computer studies in Ilorin?
2. What is the educational technology expert rating the developed digital subject materials on computer studies in Ilorin?
3. What is the computer science expert rating of the developed digital subject materials on computer studies in Ilorin?
4. What is the cost of developing digital subject materials?

Methodology

This chapter presents the methodology adopted in the study. They include: research design, population, sampling and sampling techniques, instrumentation, procedure for data collection, data analysis techniques.

Population, Sample and Sampling Techniques

The population for this study comprises of all Educational Technology experts and Computer Science experts in Ilorin. The target population comprises of all Educational Technology experts from Educational Technology Department in Faculty of Education, University of Ilorin and all Computer Science experts in

University of Ilorin.Specifically, five Educational Technology experts and five Computer Science experts were used for the study.

Research Instrument

Three research instruments were adopted for this study, they are

1- Digital Subject Materials for Teaching Computer Studies
2- Educational Technology Experts Rating Guide
3- Computer Science Experts Rating Guide

Digital Subject Materials for Teaching Computer Studies

The Digital Subject material was designed to teach a concept in computer studies. The digital material was divided into five chapters; introduction to Operating System, types of operating system, deadlock, introduction to computer software and introduction to programming language.

Educational Technology Experts Rating Guide

The education technology experts rating guide was divided into two sections. Section A elicited information on the respondents such as respondent's highest qualification: Section B contains the various criteria for rating the developed Digital Subject Materials using response mode of Strongly Agree (4), Agree (3), Disagree (2), Strongly Disagree (1).

Computer Science Experts Rating Guide

Computer science experts rating guide was divided into two sections. Section A elicits information on the respondents such as respondent's highest qualification: Section B contains the various criteria for rating the developed Digital Subject Materials using response mode of Strongly Agree (4), Agree (3) Disagree (2), Strongly Disagree (1).

Data Analysis Techniques

Data collected were analyzed using descriptive statistics. Mean and standard deviation were used to answer the research question with the aid of Statistical Package for the Social Sciences (SPSS).

Data Analysis and Results

Research Question One: What is the process involved in the development of digital subject material for teaching computer studies in Ilorin

The design of the instructional content for the development of digital subject material for teaching computer studies in Ilorin was based on the processes of ADDIE model. ADDIE is an acronym for analysis, design, development, implementation and evaluation. The stage in ADDIE instructional design model is adopted in this study. The activities carried out under ADDIE model is outlined as follows:

Analysis: This is the stage where needs assessment, audience assessment, content/objectives specification, selection of authoring/delivery systems and planning of evaluation strategies were determined by the researcher. The need assessment was based on the fact that teaching is enhanced with the use of technology, hence it was concluded by the researcher that instructional content should be designed for usingdigital subject material for teaching computer studies in Ilorin. The content selection is computer studies and the objective is to provide an alternative platform for instructional delivery other than the classroom medium of teaching and learning. The authoring tools for the design of the digital subject material for teaching computer studies in Ilorinare Microsoft PowerPoint (2010).

Design: This is the stage where treatment specification was created on how the instructional content was delivered to the selected samples. A digital subject material was designed to ascertain its operation on devices on an Androids phones in term of aesthetic and balancing of text and video. The script for development stage was then writing and screens were formatted based on the medium to be used.

Development: The design process above was developed through the prototype approach**,** so that the instructional content for the computers study instruction can be subjected to evaluation through implementation. The development of the instructional content was done by the utilization of Microsoft PowerPoint (2010), and PHP for the back end and the navigation page.

Implementation: With the completion of the design and development of the instructional content for digital subject materials. At this stage, students were given a copy of the CD containing the numeracy instruction. Computer science experts and Educational Technology Experts rates the quality, technicality and suitability of the package for teaching.

Evaluation: At this stage, the effectiveness and efficiency of the digital subject materials was determined.Evaluation was carried out at each stage of the procedures.

Research Question Two: What is the educational technology expert rating of the developed digital subject materials on computer studies in Ilorin?

Table 1, a grand mean of 3.42 for structure, screen design has a grand mean of 3.49, evaluation has a mean gain of 3.34. This confirms the suitability and the quality of the developed digital subject materials for teaching computer studies in Ilorin

Table 1: Educational Technology Expert Rating the Developed Digital Subject Materials

S/N	RATING ITEMS	Mean Rating
A	**STRUCTURE**	
1	The content is structured in a clear and understandable manner	4.10
2	The structure allows learners to move around freely in different units	3.16
3	The structure of the package permits learners to advance, review, see examples and repeat the unit or explore another unit.	3.00
	Grand Mean	**3.42**
	SCREEN DESIGN	
1	Screens are designed in a clear and understandable manner	3.10
2	The presentation of information can captivate the attention of the students	4.11
3	The quality of text, images and graphics are good	3.26
	Grand Mean	**3.49**
	EVALUATION	
1	The package allows learners to learn at their own pace	3.43
2	The package allows learner to discover information through active exploration	3.21
3	The package content is relevant to the selected educational technology concept	3.13
4	The materials are well organized and presented	3.61
	Grand Mean	**3.34**

Research Question Three: What is the computer science expert rating of the developed digital subject materials on computer studies in Ilorin?

Table 2 revealed a grand mean of 3.22 for structure, screen design has a grand mean of 3.18, evaluation has a mean gain of 2.85. This confirms the suitability and the quality of the developed digital subject materials for teaching computer studies in Ilorin.

Table 2 : Computer Science Expert Rating of the Developed Digital Subject Materials on Computer Studies In Ilorin

S/N	**RATING ITEMS**	**Mean Rating**
A	STRUCTURE	
1	The content of the subject material you have been given to go through conforms to standard	3.24
2	The content is sufficient to achieve the obtained objectives for the selected topics in Computer Studies	3.54
3	The subtopics have been sequentially and coherently arranged	3.00
4	The language used is simple and easy for both teachers and learners	3.10
	Grand Mean	3.22

B	SCREEN DESIGN	
5	Screens are designed in a clear and understandable manner	3.32
6	The quality of text, images and graphics are good	3.00
7	The diagram in the package are clear and capture attention	3.23
	Grand Mean	3.18
C	EVALUATION	
	The package allows learners to learn at their own pace	2.22
	The package promotes collaboration	3.32
	The evaluation questions for all lesson are relevant for the attainment of the lesson objectives	3.00
	Grand Mean	2.85

Research Question four

What is the cost of developing digital subject materials?

Table 3 indicates that the total sum of four thousand, four hundred and fifty naira (N4,450) only was the cost estimate for the development of the digital subject materials . The benefits of the digital subject materials are unquantifiable and incomparable with the cost.

Table 3: **Cost Implication of Digital Subjects Materials for teaching a selected computer studies**

S/N	Activities	Rate	Amount
1.	Internet connectivity data for downloading computer studies images, materials, images from google.com	N600/ Per Gigabyte	N1000
2.	Editing of downloaded images	N20/Per Instrument	N700
3.	Uploading and Synchronizing of images to produce a digital subject materials	N20/ Per Slide	N750
4.	Miscellaneous		N2000
	Total		**N4450**

Discussion

The study revealed that ADDIE Model was used for the development of the digital subject material. The model was used because having stages clearly defined and facilitates implementation of effective Digital Subject Material. The content selection was computer studies and the objective was to provide an alternative platform for instructional delivery other than the classroom medium of teaching and learning.

The study also found out that the subtopics have been sequentially and coherently arranged and the language used is simple and easy for both teachers and learners with grand mean greater than 3.0. The development of the instructionalcontent was done by the utilization of Microsoft PowerPoint (2010) and PHP for the back end and the navigation page.The study showed that both the Educational Technology and Computer Science experts rated the developed Digital Subject Material based on the structure, screen design and evaluation with grand mean greater the benchmark mean of 2.5. This implies the instructional content, sustainability and quality of the Digital Subject Material was affirmed to conform to the standard.

Conclusion

The results obtained from the data gathered and analyzed in the study indicated that the developed Digital Subject Material satisfied the standard required when evaluated after being exposed to experts. The results also showed that the developed Digital Subject Material covered the required selected Instructional content. Experts also noted that the platform has proper content planning and state the objectives properly. Digital Subject Material therefore, brings about effective Management, teaching and learning. This is an indication that it is an interesting and engaging alternative for conventional teaching and learning. The Teachers were able to manage teaching and class activities and students were able to learn at their own pace upon complete adaptation of the developed system. It is hoped that the full utilization of the developed Digital Subject Material will aid better teaching and better learning activities and improve general school and educational performance in Nigeria.

Recommendations

Based on the results of the study, the following recommendations were made:

1. Government should organize enlightenment programs to educate the teachers and students on the advantage of using Digital Subject Material and other similar technologies in education.
2. Provision of necessary technological facilities should be made by the Government and private owners to schools in order to be able to implement and promote further use of technology in education.
3. More technology-based courses and programs should be included in the school curriculum for effective usage of technology for assessment.
4. Students should help themselves by making use of information on the internet for learning and shifting their focus from using it for fun and entertainments only.

Suggestions for Further Studies

The following are suggestions for further researches in this area;

1. Further research is recommended in other disciplines to ascertain the effect of Digital Subject Material
2. Digital Subject Material can also be designed for Basic and Nursery education.
3. Future research can be helpful to investigate why students act as a passive learners rather than active learners. Also, it could be beneficial to investigate how technical issues can affect the learning and the teaching experience.
4. Similar study should be carried out in other areas of the states as well as other states of the federation with a larger sample.

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