OPTIMIZING E-LEARNING IN WOODWORK TECHNOLOGY EDUCATION FOR SUSTAINABLE DEVELOPMENT IN NIGERIA

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Abstract
The study focused on optimizing e-learning in woodwork technology education for sustainable development in Nigeria. Three research questions guided the study. The study employed a survey research design. The population consisted of 209, made up of 22 lecturers and 177 students of woodwork technology education as well as 10 Computer/ICTs lecturers in the study areas. The instrument for the study was E-Learning in Woodwork Technology Education Questionnaire (ELWTEQ). The instrument was face validated by three experts and tested for reliability using Cronbach Alpha technique with a co-efficient of 0.79 obtained. Out of 209 copies of the ELWTEQ administered to the respondents with the help of three research assistants, only 193 copies were duly filled and received, which represent 92.79 percentage return rate. The data collected were analyzed using Mean and Standard Deviation. The findings of the study revealed 12 prospects of optimizing in e-learning, 12 challenges of optimizing e-learning and 10 strategies for optimizing e-learning in woodwork technology education. Recommendations were made to effect e-learning collaboration through public-private partnership (PPP) and lecturers' offices should be adequately equipped with e-learning facilities for their lecture materials to the students.

Keywords: *E-learning, Optimizing, Sustainable development, Woodwork technology education.*

Introduction

In this age and season of globalization, which has reduced the wide world to a global village, best practices and global benchmarks in all fields of human endeavour including higher education are accessible on the internet and could be replicated in Nigeria. The school environment of the 21st century according to Osuala (2004) should be the center of electronic marvel with the introduction of multimedia systems, televisions, computers, and e-learning. Electronic-learning (E-learning) is all about learning that occurs at the computer. E-learning is a new paradigm shift in the educational sector to advance the technology education knowledge, attitudes and skills base. The convergence of Internet-enabled learning in the view of Olaniyi (2006) is called e-learning. "E-" refers to "everything, everyone, engaging and easy" in addition to 'electronic'. Holmes and Gardner (2006) emphasized that e-learning provides great opportunities for both educators and learners to enrich their educational experiences. G-Cube (2018) stated that e-learning comes in many variations and often a combination of purely online-no face-to-face meetings; blended learning; synchronous; asynchronous; instructor-led group; self-study with a subject matter expert; web-based; computer-based (CD-ROM); and video/audiotape.

E-learning according to Mole (2011) can address the scarcity of teaching and research materials in the libraries of institutions of higher learning. Mole stated further that e-learning allows students, lecturers and researchers to share their research outputs with the global community and improve the provision of current e-books, e-journals and other library resources, enhance access of academic libraries to global library and information resources; enhance scholarship, research and life-long learning through the establishment of permanent access to shared virtual archival collections. Advantages of e-learning in the opinion of Bhuasiri, Xaymoungkhoun, Jeung and Cigenek (2011) include: increase in accessibility to information; better content delivery; personalized instruction; content standardization; accountability; on-demand availability; self- pacing; interactivity; confidence; and increased convenience. In view of this study, e-learning is a internet-enabled learning that uses technologies to provide personalized and online-no face-to-face curriculum instructions for both educators and learners electronically for economic and production skills activities in woodwork technology education.

Wood is the raw material obtained from felled coniferous and deciduous trees, which are later processed into various products of the woodwork. Woodwork is the process of manipulating wood materials into finished products or articles. The woodwork in the view of Feirer (1994) is the activity or skill of making products from wood such as wood carving, cabinet making (cabinetry and furniture), joinery, carpentry, and woodturning. Woodwork trade areas of specializations in the opinion of the Federal Government of Nigeria (FGN, 2013) include upholstery, carpentry and Joinery, wood machining, and furniture making. However, woodwork is a capital investment ability to make wood products for economic and productive enterprise. The *real-life* experiences in woodworking trade areas can be acquired in woodwork technology education.

Woodwork technology education is among the technology education programmes in Nigeria. Woodwork technology education is a course aimed to provide students with experiences in woodworking industrial systems within a controlled environment that provides optimum exposure to *real-life* economic and production skills situations. Matson (2016) stated that woodwork technology education students require economic and production skills in frame construction, carcase construction, stool construction and the use of wood workshop facilities for school practical project. In other words, training in woodwork technology education should be geared towards educating students to secure employment in the educational institutions; become employable in the woodworking industry; become self-employed, and pursue further education in technology education institutions. Concerning this study, woodwork technology education is a programme aimed to provide students with e-learning experience in woodworking industrial systems to *real-life* economic and production skills situations for sustainable development (SD).

Sustainable development (SD) otherwise considered as *"equitable* and *balanced*" development, simply means that for development to be sustained or continue indefinitely, there should be a balance of interest amongst different groups of people, within the same generation and between future generation. The term SD in the view of Shobowale and Akinwale (2011) is the development that meets the needs of the present without compromising the ability of future generations to meet their own needs. The United Nations Educational, Scientific and Cultural Organization (UNESCO, 2010) stated that SD is not a fixed concept; rather it is a culturally-directed search for a dynamic balance in the relationships between economic, social and environmental systems with the overall goals of long-term stability this is only achievable through the integration and acknowledgement of the economy, social and environmental concerns throughout the decision-making process. The notion of SD in the opinion of Ehlers (2007) is centred in the use of new "*thinking processes*" to realize new values in the reinforcement of e-learning that should be part of a lifelong learning process. The three interdependent and mutually reinforcing pillars of SD in the opinion of the United Nations 2005 World Summit Outcome Document in Shobowale and Akinwale include economic development, social development and environmental protection, as shown in Figure 1:

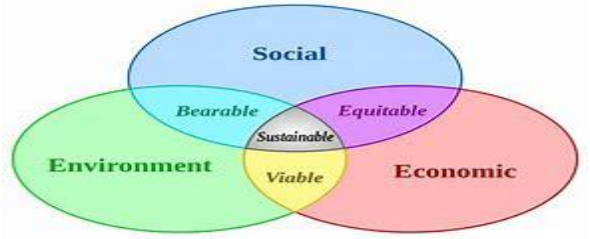

Figure 1: *The three interdependent and mutually reinforcing pillars of sustainable development (Shobowale & Akinwale, 2011)*

Operationalized the three interdependent and mutually reinforcing pillars of SD as shown in Figure 1. Shobowale and Akinwale emphasized that SD is a means of resolving the conflict between the various competing goals and involves the simultaneous pursuit of economic prosperity, social equity and environmental quality famously known as three dimensions with the resultant vector in woodwork technology education. E-learning allows woodwork

technology education to be conducted smoothly via the internet and other associated Web-based learning tools for economic growth, social development and environment conservation. Within the context of this study, SD is the development of e-learning to meet the need of the present woodwork technology education for economic prosperity, social equity and environmental *sustainability. These* can be achieved through effective optimizing e-learning operational systems.

Optimization is the practice of making changes or adjustments to make a product more desirable. In practice, e-learning network in woodwork technology education for sustainable development requires the integration of economic, social and environmental objectives across sectors, territories, and generations. Therefore, woodwork technology education in the tertiary institutions in Nigeria needs to focus on e-learning development practice of making changes or adjustments to make woodwork products more desirable for sustainable development. However, optimizing e-learning in woodwork technology education is a process of making effective changes or adjustments in teaching and learning to meets the needs of the present without compromising the ability of future generations to meet their own needs, which will also stand the test of future challenges.

A challenge is a situation of being faced with something that needs great mental or physical effort to be done successfully. Mahenge, 2001) observed that there is need to changing the attitude of all academic staff in tertiary institutions to shift from traditional approaches of teaching methods to the e-learning of instructions. The challenges of optimizing e-learning according to Ostlund (2005) include lack of pedagogy in their curriculum and inability of teachers to assist the students to develop the ability necessary to make them use the e-learning effectively. The challenges of e-learning in the view of Judith (2004) include: many students lack confidence and experience with computers; many students, lack skills in commonly used applications such as Microsoft Word, Excel and PowerPoint, time management skills, self-motivation, among others. The process of making e-learning investment delivering productivity in woodwork technology education, require effective strategies to survive

The strategy is a pattern in a stream of decisions that guides an organization's ongoing alignment with its environment and shapes internal policies and procedures (Shobowale, 2015). Such strategies according to Farashuddin (2005) should be appropriately linked to the tertiary institution's mission, culture, strengths, and weaknesses, its opportunities, and threats. Strategies for optimizing e-learning for quality education in the opinion of Wadi and Sonia (2002) include: facilitating the acquisition of basic skills and competencies; enhancing teacher training; increasing learner motivation and engagement. Strategies for optimizing e-learning according to Ilechukwu and Njoku (2014) include prioritization and optimal investment in science and technology; research and development (R & D); and enhance technological competencies. Indeed, optimizing e-learning in woodwork technology education in tertiary institutions is a veritable tool to *economic, social,* and *environmental sustainability* in Nigeria.

Statement of the Problem

E-learning ensures effective pedagogy in woodwork technology education in the computer age. The call for optimizing e-learning in woodwork technology education is to infuse and inject efficiency and effectiveness in teaching and learning activities. Eke (2011) submitted that e-learning is a learner-controlled, self-paced education environment, where the learner has authority over the learning environment; thereby allowing learners to work at their pace, convenience. Observations revealed that sustainable development is the type of development that meets the needs of present generations without jeopardizing the ability of future generations to meet their own needs. Studies also showed that there is the dearth of trained teachers for e-learning, lack of facilities, infrastructures and equipment. It does appear that e-learning is challenged with the problem of material devices such as a computer, computer laboratories, internet and e-mail facilities, videophone systems, teleconferencing devices, wireless applications; among others. There is a need to explore and develop new directions of teaching and learning of woodwork technology education in an increasingly networked world. Woodwork technology education in Nigeria needs to adequately prepare for a strategic response associated with e-learning. But the question remains: what is the prospect of optimizing e-learning? what are the challenges of optimizing of e-learning? what are the strategies

for optimizing e-learning? It is against this background, that this study, was undertaken to focus on optimizing e-learning in woodwork technology education for sustainable development in Nigeria.

Purpose of the Study

The major purpose of the study was to focus on optimizing e-learning in woodwork technology education for sustainable development in Nigerian. Specifically, the study sought to determined:

1. Prospects of optimizing e-learning in woodwork technology education for sustainable development.
2. Challenges of optimizing e-learning in woodwork technology education for sustainable development.
3. Strategies for optimizing e-learning in woodwork technology education for sustainable development.

Research Questions

The following research questions guided the study:

1. What are the prospects of optimizing e-learning in woodwork technology education for sustainable development?
2. What are the challenges of optimizing e-learning in woodwork technology education for sustainable development?
3. What are the strategies for optimizing e-learning in woodwork technology education for sustainable development?

Methodology

The study employed a survey research design. Survey research design according to Shobowale (2014) involves the use of a structured questionnaire to elicit information from the respondents in respect of research questions. The survey research design was appropriate for this study because it aimed to elicit information from the respondents in respect of optimizing e-learning in woodwork technology education for sustainable development. The study was conducted in the University of Lagos, Akoka; Federal College of Education (Technical) Akoka, Yaba, Lagos and the Federal University of Technology, Minna, Nigeria. The population for the study was 209, made up of 22 lecturers and 177 students of woodwork technology education as well as 10 Computer/ICT lecturers from the three federal tertiary institutions in Yaba, Lagos and Minna, Niger State of Nigeria. A structured questionnaire developed by the researchers titled: E-Learning in Woodwork Technology Education Questionnaire (ELWTEQ) that addressed the three research questions with 39 items on a 5 point Likert scale response options of Strongly Agree (SA=5); Agree (A=4); Undecided (U=3); Disagree (D=2); and Strongly Disagree (SD=1) respectively, were used as an instrument for data collection. The instrument was face validated by three experts. Two experts from the Department of Science and Technology Education and one expert from the Department of Computer Science, both at the University of Lagos, Akoka. Nigeria. A reliability coefficient of 0.79 was obtained using Cronbach Alpha technique to determine the internal constituency for ELWTEQ. Out of 209 copies of the ELWTEQ administered to the respondents with the help of three research assistants, only 193 copies were duly received, which represent 92.79 percentage return rate. The data collected from the respondents were analyzed using *Mean* and *Standard Deviation* for answering the three research questions, the item with the Mean of 3.50 and above was regarded as *Agree*; while anyone with *Mean* score below 3.50 was considered as *Disagree* by respondents on optimizing e-learning in woodwork technology education for sustainable development in Lagos State, Nigeria.

Results

Research Question 1

What are the prospects of optimizing e-learning in woodwork technology education for sustainable development? The data collected to answer the research question 1 areas presented in Table 1.

Table 1: Mean Opinion of Respondents on the Prospects of Optimizing E-Learning in Woodwork Technology Education for Sustainable Development. N=193

SN	Prospects of Optimizing E-Learning	$\overline{X}$	SD	Remarks
1.	E-learning is an innovative pedagogical model of instructional delivering.	4.00	0.83	Agreed
2.	E-learning enables leaners to connect with possible opportunities globally.	4.08	0.81	Agreed
3.	Learners who participate in e-Learning achieve better grades than those studied in the traditional approach.	3.73	0.76	Agreed
4.	Learners have access to information that is correct and up to date through the web and institution intranets.	4.32	0.72	Agreed
5.	Learners can meet in a virtual space with other members.	4.50	0.98	Agreed
6.	Learners can access the right training at the right time with the right people.	4.18	0.88	Agreed
7.	E-learning enables learners to progress at the pace that suits them best while getting the information that they need.	4.50	0.98	Agreed
8.	E-learning simultaneously reaches an unlimited number of learners globally.	3.82	0.78	Agreed
9.	E-learners access, modify, print and send documents globally.	3.86	0.79	Agreed
10.	E-learning provides materials to learners 24 hrs a day, for 7 days in the week.	4.00	0.83	Agreed
11	E-learners receive the same messages and can engage other learners globally.	3.77	0.77	Agreed
12.	E-learning provides self-assessment quizzes scored to lecturers automatically.	3.91	0.80	Agreed
13.	E-learning makes use of multimedia in practice according to learners' abilities.	4.23	0.89	Agreed
14.	E-learning makes reduces stress for both lecturers and students.	4.90	1.13	Agreed
15.	E-learning provides WhatsApp, Telegram, etc., for both lecturers and students.	4.05	0.84	Agreed
16.	E-learning equips individuals with digital skills for the job market enterprise.	4.27	0.91	Agreed
17.	E-learning makes the students dependent on learning experiences globally.	4.14	0.87	Agreed

The data in Table 1 represents the response of respondents on 17 prospects of optimizing e-learning in woodwork technology education for sustainable development. The table revealed the Mean scores of respondents ranged from 3.73 to 4.90. This indicated that the *Mean* scores were above the cut-off point of 3.50, showing that the respondents agreed to all the 17 items as prospects of optimizing e-learning in woodwork technology education for sustainable development in Nigeria.

Research Question 2

What are the challenges of optimizing e-learning in woodwork technology education for sustainable development? The data collected for this research question 2 areas presented in Table 2.

Table 2: Mean Opinion of Respondents on the Challenges of Optimizing E-Learning in Woodwork Technology Education for Sustainable Development. N= 193

S/N	Challenges of Optimizing E-Learning	$\overline{X}$	SD	Remarks
1.	The cost of acquiring, managing and maintaining ICT infrastructure.	4.05	0.84	Agreed
2.	Lack of e-learning pedagogy in woodwork technology education curriculum.	3.86	0.79	Agreed
3.	Lack of vision framework for implementing e-learning infrastructure.	4.00	0.83	Agreed
4.	Inadequate IT skills personnel required for the implementation of e-learning.	3.75	0.77	Agreed
5.	Lack of skills in commonly used applications such as Microsoft Word, Excel and PowerPoint by both lecturers and students.	4.50	0.98	Agreed
6.	Inadequate e-learning manpower to train both the lecturers and students.	4.89	1.12	Agreed
7.	Inadequate funding of the tertiary institutions in implementing e-learning.	4.65	0.48	Agreed
8.	Lack of e-learning literacy among the students from the primary school level.	3.91	0.84	Agreed
9.	Lack of e-learning technologies required for students learning.	4.15	0.74	Agreed
10.	Lack of affordable specialized e-learning centre for students.	4.27	0.91	Agreed
11	Insufficient information and knowledge on e-learning prospects to students.	4.14	0.87	Agreed

The data in Table 5 represents the response of respondents on 11 challenges of optimizing e-learning in woodwork technology education for sustainable development. The table revealed the *Mean* of respondents ranged from 3.75 to 4.89**,** falls within the limit of agreement, with a corresponding standard deviation of 0.77 to 1.12. This indicating uniformity in the opinions of the respondents as challenges of optimizing e-learning in woodwork technology education for sustainable development in Nigeria.

Research Question 3

What are the strategies of optimizing e-learning in woodwork technology education for sustainable development? The data collected to answer this research question 3 is as presented in Table 3.

Table 3: Mean Opinion of Respondents to the Strategies for Optimizing E-Learning in Woodwork Technology Education for Sustainable Development.
N= 193

SN	Strategies for Optimizing E-Learning	$\overline{X}$	SD	Remarks
1.	Establish an initial visual style guide for eLearning development	4.32	0.94	Agreed
2.	Optimal funding and provision of critical e-learning infrastructure through public-private partnership (PPP).	4.09	0.85	Agreed
3.	A proper e-Learning curriculum that is not pulled directly from books and classroom courses should be developed.	4.00	0.83	Agreed
4.	Special provision to get decent Laptops across to both the lecturers and students.	4.30	0.46	Agreed
5.	E-Learning curriculum must be relevant to the content needed for the students.	3.95	1.09	Agreed
6.	E-learning has to be mainstreamed into the curriculum, from fresh year to final year students.	3.59	0.73	Agreed
7.	The electricity power supply should be improved to enhance the use of e-learning technologies.	3.73	0.76	Agreed
8.	E-Learning allowance to purchase internet WiFi, data, alternative electricity generators for both lecturers and students.	4.22	0.74	Agreed
9.	Implementing essential one-on-one e-learning mentoring both the lecturers and students.	4.38	0.52	Agreed
10.	A robust IT technical capability to deliver rich multi-media course content to students on demand.	4.06	0.64	Agreed
11	**Allow learners solutions for the best ways to navigate the course.**	3.73	0.76	Agreed
12.	Integration of mobile devices such as iPods, MP3 players, e-book readers, and modules e-learning platforms.	4.05	0.84	Agreed
13.	Recognized pre-service and in-service training on e-learning for the lecturers.	3.73	0.76	Agreed
14.	Lecturers' offices should be adequately equipped with e-learning facilities for their e- lectures and notes.	4.27	0.91	Agreed

The data in Table 3 represents the response of respondents on 14 items that had their *Mean* values ranged from 3.59 to 4.38. This indicated that the *Mean* scores were above the cut-off point of 3.50. The respondents were, therefore, agreed to all the 14 items as strategies of optimizing e-learning in woodwork technology education for sustainable development in Nigeria.

Discussion of Findings

The findings of this study in Table 1 revealed 17 prospects of optimizing e-learning in woodwork technology education for sustainable development. The findings of this study agreed with the work of Bhuasiri, Xaymoungkhoun, Jeung and Cigenek (2011) who emphasized that e-learning increase in accessibility to information; better content delivery; personalized instruction; content standardization; and increased convenience.

The findings of this study also captured the opinion of Mole (2011) who argued that e-learning can address the scarcity of teaching and research materials in the libraries of institutions of higher learning. The findings and the study of authors above helped to add value to the findings of this study on 17 prospects of optimizing e-learning in woodwork technology education for sustainable development in Nigeria.

The analysis of the result showed in Table 2 indicated 11 challenges of optimizing e-learning in woodwork technology education for sustainable development. The findings of this study are in agreement with the view of Ostlund (2005) who posited that challenges of optimizing e-learning include: lack of pedagogy in the students' curriculum and the inability of teachers to assist the students to develop the ability to make the use the e-learning effectively. The study also supported the work of Mahenge (2001) who argued that much of initial work is needed first in changing the attitude of all staff to shift from traditional approaches to e-teaching and learning methods of instructions. The findings and the study of two authors above helped to justify this study on 11 challenges of optimizing e-learning in woodwork technology education for sustainable development in Nigeria.

The result of the study in Table 3 disclosed 14 strategies of optimizing e-learning in woodwork technology education for sustainable development. The findings were in line with the opinion of Ilechukwu and Njoku (2014) who opined that strategies of optimizing e-learning include: optimal investment in science and technology; research and development (R & D) and enhance technological competencies. The study also supported the work of Wadi and Sonia (2002) who asserted that strategies for optimizing e-learning for quality education include: facilitating the acquisition of basic ICTs skills and competencies; enhancing teacher in-service training; increasing learner motivation and engagement. The finding of the above researchers helped to support the justification of this study on 14 strategies of e-learning in woodwork technology education for sustainable development in Nigeria.

Conclusion

Based on the findings of this study, it was concluded that 17 prospects of optimizing e-learning in woodwork technology education to enable learners to connect and collaborate on possible opportunities globally. The study identified 11 challenges of optimizing e-learning in woodwork technology education curriculum and indicated 14 strategies for optimizing e-learning in woodwork technology education for sustainable development. Therefore, e-learning should be appropriately optimized in woodwork technology education for economic prosperity, social equity and environmental quality in Nigeria.

Recommendations

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

1. There should be optimal funding and provision of critical e-learning infrastructure through public-private partnership (PPP) in woodwork technology education.
2. Lecturers offices should be adequately equipped with e-learning facilities for woodwork technology education lectures and notes to the students.
3. There should be adequate e-learning pedagogy in woodwork technology education curriculum that will make teaching and learning easy for both lecturers and students.

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