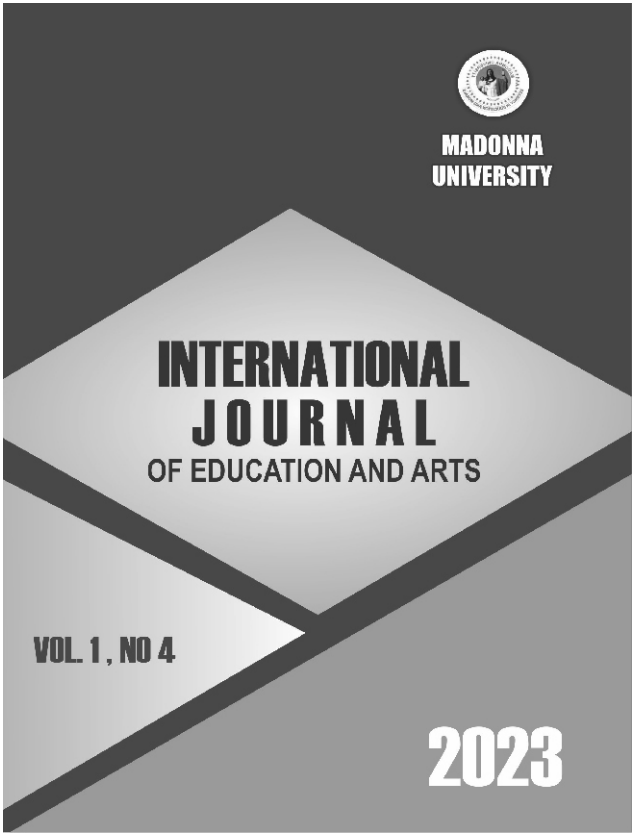
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Usefulness of Ubiquitous Learning Technology and Learning Environments to Postgraduate Students of Computer and Robotics Education, University of Nigeria, Nsukka

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Abstract
The detection technologies; is possible to detect locations of learners in various dimensions and provide them with the necessary learning contents simultaneously. The limitations imposed by traditional learning environments can be overcome by ubiquitous learning. E-learning environments, in particular, assist learners to access learning resources anywhere and anytime they like without being subjected to the limitations of time and space. This paper tries to identify the key factors that influence Computer education-

(innovation, learning motivation, and computer self-efficacy) and their impact on Computer education will bring satisfaction. Two research questions were answered and literatures were reviewed. The study adopted descriptive survey research was adopted and structured questionnaire was the instrument used for the data collection. A total population of 23 respondents drawn from which is the 2017/2018 registered Postgraduate students of the Department of Computer and Robotics Education, University of Nigeria, Nsukka. No sampling technique was conducted because of its manageable population size. A questionnaire containing 97 items titled Ubiquitous Learning Questionnaire (ULQ) was used to obtain information from respondents. The instrument was face-validated by one lecturer from the Department of Computer Education Peaceland College of Education, Abakaliki Campus, Ebonyi state and a lecturer from the Department of Computer and Robotics Education, University of Nigeria, Nsukka. The instrument was trial tested to establish the internal consistency of the items. Twenty copies of the questionnaire were administered to students of Department of Computer Education Peaceland College of Education, Abakaliki Campus, Ebonyi state.

These respondents were not part of the population for the study. The reliability of the instrument was conducted using Cronbach alpha reliability method which yielded overall co-efficient of 0.76 and 65, 73, 74, 63, and 78 for the different clusters respectively. Two research assistants were used. These were assigned to cover the College of Education. Data collected was through four points Likert questionnaires called Ubiquitous Learning Questionnaire (ULQ) with two sections; A for demographic data collection and B for collecting information for the study. To answer the research questions, used to ascertain the deviation of data collected. A criterion of 2.50 was adopted as the cutoff point (agreement level) for the items. Hence, any mean point less than 2.50 was rejected. Data for the study collected from responses was analysed using one sample T – test with standard deviation. The response options of Strongly Aware (SA), Aware (A), Slightly Aware (SA), Not Aware (NA) were used. Based on the findings of the study, conclusions was drawn and recommended that the National

University Commission (NUC) which is the regulatory body responsible for designing the curriculum, accreditation of programmes and general overseeing of the education programmes where the computer educators are trained should also take into account the Context-aware ubiquitous learning environments and the technologies.

Keywords: Ubiquitous Learning, Technology, Ubiquitous Learning Environments.

Introduction

In traditional learning environments, learners are often limited to formal learning activities. This orientation causes learners to remain passive in the learning processes and to lose some motivation for learning (Wang and Wu, 2011). Ubiquitous learning can be defined as an everyday learning environment which is supported through mobile and embedded computers and wireless networks in our everyday life. It is aimed to provide learners with content and interaction anytime and anywhere (Hwang et al. 2008). Insufficient motivation towards the learning process on the part of learners, in turn, can be seen as a factor which could adversely affect their academic achievements. In traditional learning methods, educators often have to guide tens of learners (Hwang and Chang, 2011; Lin, Hsieh and Hwang, Su and Huang, 2012). One of those problems is the lack of individual learning and of getting sufficient feedback because educators face tens of learners in traditional learning environments and some learners can have difficulty in keeping pace with the learning process (Shih, Chuang and Hwang, 2010). Another problem is inadequate tools which could engage learners in the learning process more effectively and efficiently in traditional learning environments (Hwang and Chang, 2011). As a result of the fast advancements in information technologies, different learning approaches have been developed such as e-learning, mobile learning and blended learning, by which global-scale education can

be provided (Harrison, Kostic, Toton and Zurek, 2010;).

Ubiquitous Learning Technology is an e-learning environments through an Internet access, learners can reach learning contents anywhere and anytime they like. As a result of the advancements in wireless communication technologies and mobile technologies, the concept of mobility has been included in e-learning environments. Hence the attention on e-learning environments has shifted towards mobile learning environments (Hwang and Tsai, 2013; Wang, and Wu, 2011; Lin, 2013). Ubiquitous conceived learning environments that adopt the paradigm of "lifelong education". The distance learning and e-learning environments, which have emerged as a result of the developing information in communication technologies and which embrace the lifelong learning paradigm, it is ensured that learners are more motivated towards learning processes and participate individually in the learning process (Rashid, 2012). The importance of creating a learning environment which is integrated with technology in order to actualize the goals of education can be achieved with the aid of Ubiquitous learning (Yang and Wu, 2012). Yahya, Ahmad, and Jalil (2010) claimed that u-learning is an extension of previous learning paradigms because learners are shifting from traditional learning to e-learning and then to m-learning, followed by u-learning.

It can be said, therefore, that e-learning environments are essential for an effective learning process. Rapidly progressing technological developments have led to a review of learning environments (Wu, Hwang and Tsai, 2013). The studies which have been carried out in the field of e-learning since the beginning of 2000s have begun to concentrate on mobile learning and wireless communication due to such technologies (Wu, Hwang and Tsai, 2013). This results in the increasing interest in wireless communication technologies, the rate of utilization from wireless applications in our daily life has also begun to increase in order to check learners' attitude and behaviours.

However, few studies have investigated learners' attitudes and behaviors in innovative learning environments. That is, previous studies of u-learning have focused mainly on descriptive aspects or applications of u-learning in various learning contexts (e.g., Liu & Chu, 2010). The mobile devices such as cellular phones and laptop PCs, learners are able to access learning environments more flexibly, more rapidly and more efficiently anytime and anywhere they like (Lin, 2013). E-learning environments which have generally oriented towards mobile learning environments as a result of the developments in wireless communication technologies and mobile technologies have gained a new orientation towards context-aware ubiquitous learning environments which enable learners to learn in the right place and in the right time as detection technologies such as radiofrequency have been used in education (Hwang, Shi and Chu, 2011, Shih, Chu, Hwang and Kinshuk, 2011). Portability of mobile devices and their communication abilities enable them to be used as more flexible and more effective learning tools. By context-aware ubiquitous learning environments, it is possible to identify where learners are located no matter their gender and thus to simultaneously transfer the relevant information from the primary source to where the learners are. Ibe et al. (2016) viewed gender as the socially constructed roles, learned behaviours and the expectations that are associated with females and males in the society.

Gender is described as the subjective feeling of being a male or female irrespective of one's sex (Ezeh, 2013). In this way, context-aware ubiquitous learning environments are equipped with such a technology to enable an individualized learning process despite any gender but most of the postgraduate students does not utilize this usefulness that is why when their job does not give them chance to be physical present during lectures they would quit their academic pursuit in order to protect their job because of means of survival except those that registered with Distance learning programme. Hence this study intends to expose the usefulness of Ubiquitous learning to postgraduate students and to profer solution to that

problem identified by the researcher. They can continue their learning processes in learning environments which are flexibly designed in all respects wherever they are when harnessed the usefulness of Ubiquitous learning.

Purpose of the Study

The main purpose of the Study was to determine the usefulness of Ubiquitous learning technologies and Learner Characteristics in Ubiquitous Learning Environment Specifically, to determined:

1. Ubiquitous learning technologies
2. Learner Characteristics in Ubiquitous learning environment

Research Questions

1. What are the Ubiquitous learning technologies?
2. What are the Learner Characteristics in Ubiquitous Learning Environment?

Literature Review

Ubiquitous Learning Environments

Ubiquitous learning environments, which enable learners to access their learning resources in the right place and time being capable of providing them with immediate feedbacks and guide them, are also defined as a learning environment which is based on ubiquitous learning technologies. The most important role of ubiquitous learning technologies within the frame of ubiquitous learning environment is the fact that it enables learners to access these learning environments aware and anytime (Yahya, Ahmad and Jalil, 2010). Ubiquitous learning is similar to mobile learning systems which enable learners to access learning contents anytime and anywhere. What distinguishes ubiquitous learning from mobile learning is that it identifies the identities of learners and their locations and provides them with immediate feedback and guidance. It is, therefore, possible to obtain more information in ubiquitous

learning environments compared with other e-learning environments with aid of computer technologies.

Ubiquitous Learning Technologies (U-Computing)

Ubiquitous Learning Technologies are the devices and digital resources used to facilitate Ubiquitous Learning activities. The examples are: Smart phones, Laptop, Computers, satellites, Televisions, Radios, iPads, Projectors, Desktop Computers and Internet. (Chukwuorji I., (2019) Recently, studies have focused on the technological development of u-learning, particularly context-aware ubiquitous learning, by using experimental methods (e.g., Chiou, Tseng, Hwang & Heller, 2010; Chu, Hwang & Tsai, 2010; Hwang, Kuo, Yin & Chuang, 2010). Chiou et al. (2010) formulated a navigation support problem to find learning paths for individual learners for context-aware ubiquitous learning and proposed two navigation support algorithms by considering learning and navigation efficiency, suggesting that the proposed algorithms can better facilitate learners' effective and efficient use of learning resources and realization of learning efficacy than other methods.

Meanwhile, Chu et al. (2010) developed computer-based tools and learning environments that can serve as an extension of the mind and referred to them as “mind tools” for context-aware u-learning as a knowledge engineering approach. They demonstrated that this approach can increase learning motivation and enhance students' learning achievement. However, previous studies of u-learning have been limited particularly in terms of explaining learners' behaviors. For example, most studies of u-learning have focused on developing and experimentally testing new learning approaches in designed learning environments.

Context-Aware Ubiquitous Learning Environments

The detection technologies like radio frequencies utilized in context-aware learning environments, users can be located and it is ensured that the resources in learning environments are adapted to the

environments where users are located. (Shih, Chu, Hwang and Kinshuk, 2011). As a result of the opportunities offered by this service, is integration between the actual life and the virtual life that becomes possible; and this is a significant point in e-learning environments (Hwang, Shi and Chu, 2011). Where the real life and the virtual life could be integrated together, learners can deal with their learning problems in the real life with the help of the virtual life anytime and anywhere and this can be considered to be a development which can increase the efficiency of the learning process through the internet-based learning environment.

Internet-based Learning Environments and Context-Aware Ubiquitous Learning Environments

Context-aware ubiquitous learning environment is a learning paradigm which provides learning contents in the right place and time and which, by doing so, moves ahead of Internet-based learning that requires computer technology, provides learners with uninterrupted information and, at the same time, enables them to access learning contents anywhere and anytime (Shih, Chuang and Hwang, 2010). The detection technology, context-aware ubiquitous learning environments can also access information on the current space and time of learners, and this characteristic distinguishes this type e-learning environment from others. Components of a context-aware ubiquitous learning environment, is a learning environment composed of several elements, as listed below:

1. *Detection technology*: It is used to detect the location of learners.
2. *Server*: It is a structure which saves contents and which provides learners with active or passive support in their learning processes.
3. *Mobile Learning Devices*: Each learner has to possess relevant mobile learning devices in order to be able to receive the support coming from the server and to access information over the Internet.
4. *Wireless Network*: Wireless networks are necessary to enable communication among mobile learning devices, detectors and the server, all these have features.

Features of Context-Aware Ubiquitous Learning Environments

In a study they carried out, Yang, Okamoto and Tseng (2008) referred to eight features of context-aware ubiquitous learning environments. The various educational settings require the performance and examination of u-learning in different contexts such as ubiquitous pedagogy, classroom-centered u-learning modes, faculty education for u-learning implementation, development standards for u-learning resources, and the development of u-learning management systems (Liu, Li & Carlsson, 2010).

1. *Mobility*: Learners are able to continue their learning processes while moving from one position to position.
2. *Location Awareness*: Locations of learners are detected by the system.
3. *Interoperability*: Different standards such as learning resources, learning services and learning platforms can be set to work together.
4. *Seamlessness*: The services offered to learners are maintained uninterruptedly as long as learners have the required device and connection.
5. *Situation Awareness*: It is identified which information, and where and when, is to be provided to learners.
6. *Social Awareness*: The existing information about the social relationships of learners is linked with what they do and what they know
7. *Adaptability*: Learning materials and services can be adapted to the preferences and current needs of learners.
8. *Pervasiveness*: Learning contents and services are accessed openly. Thus, a pervasive learning environment is provided.

The existing studies suggest that context-aware ubiquitous learning environments increase learner motivation and thus improve the efficiency of the learning process (Shih, Chu, Hwang and Kinshuk, 2011; Wu, Hwang and Tsai, 2013). It can be shown as one of the important factors in the learning process for keeping the motivation of learners high in learning environments. When learners use mobile devices to engage in the learning process, they might feel a

strong interest to the learning process however, they might also get disappointed along the learning process if no proper assistance or guidance is provided subsequently and thus lose their motivations (Hwang, Shi and Chu, 2011). The detection technologies such as radio frequency, a context-aware ubiquitous learning environment is capable of collecting information about the situation of learners and provide them with the necessary guidance in a context aware way (Chen and Huang, 2012). It can be concluded, therefore, that context-aware ubiquitous learning environments have a positive contribution to the learner motivation. An increased motivation of learners towards the learning process can be considered as an element which can increase their economic achievements.

In addition to all these features that they possess, context-aware ubiquitous learning environments can also gain learners the analysis and assessment skills listed in Bloom's Taxonomy in its learning purposes section (Wu, Hwang and Tsai, 2013). When equipped with such skills, learners can be expected to reach academic achievement in the learning process. The desktop computer aided educational system provides less mobility and it is more embedded. Therefore, these learning systems are immobile. It is seen when desktop computer aided education is compared with mobile learning that mobile learning is ahead in terms of mobility and that learners are able to work more collaboratively when they are not limited to a certain space. In diffuse Internet environments, too, learners can obtain information from their own learning environments through the communication between embedded devices and the learning environment, but this situation localizes the usability of diffuse learning environments and makes it limited. Such limitations can be eliminated by ubiquitous learning environments where devices with higher mobility are included in the learning environments. Even if they are in motion, learners are able to access ubiquitous learning environments. These characteristic of ubiquitous learning environments are embraced by learners. This increases the usability of ubiquitous learning environments and makes it important.

The Importance of Context Aware Ubiquitous Learning

Integration of steadily increasing technologies in learning environments enables learning processes to be applied more efficiently and effectively. Learning process has become a learner-oriented process due to context-aware ubiquitous learning environments with their technological integration feature. Previous studies have considered various technologies and highlighted the importance of individuals' characteristics in examining the relationship between a new technology and user satisfaction. Learners' characteristics are important in analyzing a given technology itself, and it is the user's perception of the technology's attributes that influences his or her satisfaction (Kim & Garrison, 2010). This study proposes three constructs for learner characteristics (innovation, learning motivation, and computer self-efficacy) that may have positive effects on u-learning satisfaction.

Therefore, the skill of individual learning which learners should possess can be improved through context-aware ubiquitous learning environments. In this environment, learners are provided with the opportunity to learn simultaneously from the primary resource anytime and anywhere. The context-aware ubiquitous learning environments, help learners gain the Digital skills of the 21st century, also can be used as a lifelong learning tool. It can be concluded in this context that the inclusion of ubiquitous learning environments in learning environments is significant for an efficient and effective learning.

Context Aware Ubiquitous Learning Environments can be used anywhere. Those environments which incorporate technology and are designed for education can be used anywhere where the education process continues, because those learning environments which are blended with technology eliminates limitations such as time and space and provide flexible learning environment.

Research Methodology

Descriptive survey was used for this study. Descriptive survey is suitable for this study because it is based on the views and opinions of the respondents in the area of study. In this study, the population of the study twenty-three (23) which is the 2017/2018 registered Postgraduate students of the Department of Computer and Robotics Education, University of Nigeria, Nsukka. These students were used because they were expected that Ubiquitous Learning would help them to study anytime, anywhere with their smart phones and e-learning technologies and still work at their various states without coming down to the university environment.

Data would be collected through four points Likert questionnaires called Ubiquitous Learning Questionnaire (ULQ) with two sections; A for demographic data collection and B for collecting information for the study. A group of Postgraduate students of the Department of Computer and Robotics Education, University of Nigeria, Nsukka were used through a survey and asked to participate in this study. The total of 23 questionnaires were shared and obtained for the study.

Method of Data Analysis

To answer the research questions, one sample T – test was used to analyze the data collected from responses while standard deviation would be used to ascertain the deviation of data collected. A criterion of 2.50 will be adopted as the cutoff point (agreement level) for the items. Consequently, any mean point less than 2.50 will be rejected.

Results

Section A: Demographic information.

A total of 23 responses were used to test the proposed research model. The respondents' Demographic data mean ranges from 1.52 to

One-Sample Statistics

	N	Mean	Std. Deviation
STUDENTS		2.22	.518
AGE	23	2.43	.662
GENDER	23	1.52	.511

2.43.

The data for answering research question one was presented in Table 1.

Table 1: Mean rating of the responses of Registered Postgraduate students 2018/2019 session in Computer and Robotics Education Department, UNN on the Ubiquitous learning technologies

One-Sample Statistics

	N	Mean	Std. Deviation
MOBILEOPERATINNGSYSTEM	23	3.17	.576
WIRELESSAPPLICATIONPROTOCOL	23	2.70	.876
MOBILEHARDWARE	23	3.26	.752
MULTIMEDIATOOLS	23	3.22	.736
HARDWARELIKEDESKTOPCOMPUTERS	23	3.0870	.73318
MOBILEDEVICESANDAPPLICATION	23	3.04	.562
SOFTWAREINTERNETCONNECTION	23	3.48	.593
WEBBROWSERS	23	3.04	.825
WEBBASEDAPPLICATIONS	23	3.04	.878
GPSSYSTEM	23	3.30	.703
SENSOORANDACTUATORS	23	2.78	.951
RFID	23	3.17	.834
WIRELESSCOMMUNICATIONEQUIPMENT	23	3.30	.765
PDAS	22	2.95	.899
WEARABLESOMPUTTERS	23	3.04	.706

The Data presented in Table 1 revealed that the fifteen items on the Ubiquitous learning technologies had their mean values ranged from 3.04 to 3.48 indicating that the fifteen items were Strongly Aware (SA), for the Ubiquitous learning technologies.

The fifteen items on Ubiquitous learning technologies in the Table had their standard deviation ranged from 0.56 to 0.95 and were less than 1.96 (95% Confidence level). This indicated that the respondents were not too far from the mean and from one another in their responses. This added some value to the reliability of the mean.

This agrees with the detection technologies such as radio frequency, a context-aware ubiquitous learning environment is capable of collecting information about the situation of learners and provide them with the necessary guidance in a context aware way (Chen and Huang, 2012). Moreso, Context-aware ubiquitous learning environment is a learning paradigm which provides learning contents in the right place and time and which, by doing so, moves ahead of Internet-based learning that requires computer technology, provides learners with uninterrupted information and, at the same time, enables them to access learning contents anywhere and anytime (Shih, Chuang and Hwang, 2010).

..Research Question two

Table 2: Mean rating of the responses of Registered Postgraduate students 2018/2019 session in Computer and Robotics Education Department, UNN on the Learner Characteristics in Ubiquitous Learning Environment.

One-Sample Statistics

	N	Mean	Std. Deviation
LEARNERCHARACTERISTICSINENVIRONMENT	23	3.13	.694
PERMANENCY	23	3.22	.795
ACCESSIBILITY	23	3.09	.733
IMMEDIACY	23	3.00	.905
INTERACTIVITY	23	3.00	.798
SITUATINGOFINSTRUCTIONALACTIVITIES	23	2.96	.706
ADAPTABILITY	23	3.13	.694
MOBILITY	23	2.96	.706
LOCATIONAWARENESS	23	3.13	.694
INTEROPERABILITY	23	2.96	.638
SEAMLESSNESS	23	3.17	.834
SOCIALAWARENESS	23	2.87	.815
ADAPTABILITYENVIRONMENT	23	2.83	.778
PERVA SIVENESS	23	2.83	.834

The Data presented in Table 2 revealed that the fourteen items on the Learner Characteristics in Ubiquitous Learning Environment had their mean values ranged from 2.83 to 3.22 indicating that the fourteen items were Strongly Aware (SA), **for** the on the Learner Characteristics in Ubiquitous Learning Environment.

The fourteen Learner Characteristics in Ubiquitous Learning Environment in the Table had their standard deviation ranged from 0.64 to 0.91 and were less than 1.96 (95% Confidence level). This indicated that respondents were not too far from the mean and from one another in their responses. There is some value added to the reliability of the mean. This is in agreement with Yahya, Ahmad and Jalil, 2010 that the most important role of ubiquitous learning technologies within the frame of ubiquitous learning environment is the fact that it enables learners to access these learning environments aware and anytime. Meanwhile, Chu et al. (2010) developed computer-based tools and learning environments that can serve as an extension of the mind and referred to them as "mind tools" for context-aware u-learning as a knowledge engineering approach.

Conclusions

The fact that ubiquitous learning environments, which draw on detection technologies such as radio frequencies, enable learners to access learning contents from the primary resource anytime and anywhere means that these environments are flexible, democratic and reliable. In order to fulfill the goals of education, a learning environment integrated with technology is an effective element (Yang and Wu, 2012). In this paper, it can be said that the learning environments which incorporate technology assume a significant part in rendering the learning process effective and efficient. Ubiquitous learning environments, which also eliminate such restrictions as time and space involved in traditional learning environments, provide learners with lifelong learning opportunity. Ubiquitous learning environments, which simultaneously provide learners with learning contents in the lifelong learning process, ensure that learners are individually included in the learning process. It can be said, in this way, that ubiquitous learning environments contribute to the improvement of the 21st century skills such as relational technology and individual learning.

Recommendations

In the light of the findings of this study, the following recommendations are put forward:

1. The National University Commission (NUC) which is the regulatory body responsible for designing the curriculum, accreditation of programmes and general overseeing of the education programmes where the computer educators are trained should also take into account the Context-aware ubiquitous learning environments and the technologies.
2. Curriculum planners should add the Context-aware ubiquitous learning environments and the technologies when renewing the curriculum of computer education. The identified Context-aware ubiquitous learning environments and the technologies should be integrated into the curriculum of computer education.
3. The government should organize seminars and workshops for computer educators of the various universities to learn the necessary Context-aware ubiquitous learning environments and the technologies. This is because when they learn the Context-aware ubiquitous learning environments and the technologies, it will enhance their job performance, give them job security, reduce stress, and saves their time for effective learning activities.
4. Students in computer education should be trained on the Context-aware ubiquitous learning environments and the technologies during classroom instructions. It will help them to acquire the Context-aware ubiquitous learning environments and the technologies which computer educators will require for improved teaching and learning upon graduation.

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