Development of E-Learning Design Strategies towards Effectives University Smart Learning Environment

Dr. Vero E Mogboh

Department of Educational Foundations, Faculty of Education, Godfrey Okoye University Enugu.

Abstract
In contemporary society, innovation technologies expand to almost every field of human activity,including such wide field as education.Due to integrating innovation technologies into the educational process practice, this phenomenon gained special significance within improvement and modernization of the established educational system.Innovative applications and new learning methods must be built to orchestrate formal and informal learning in order to bring smart learning experiences into the learning landscape and instructional context.
This paper explores the core aspects of knowledge discovery and the major obstacles to be addressed when developing intellectual education settings to facilitate personalization. The paper also presents an attempt for a critical analysis of e-learning as a mono-educationaltechnology in a pandemic.

I.   Introduction

In most higher education institutions in developed countries, the use of new technology in optimizing education delivery is gradually becoming a widespread phenomenon (Mbwette, 2011; Nihuka, 2011). This comes from the need to benefit from the ability that new technology has to enhance the delivery of education (Nihuka, 2011). In the developing country, innovation in e-learning technology has led to various improvements in higher education systems, especially with regard to the distribution of education and support processes (Dublin, 2003).

In the Nigeria background, it is clear that the full potential of such technology has not been completely explored to date in the implementation of higher education and distance learning in particular. This article has proposed several factors that impede the full realization of this potential in the country. (Kassimu A., *et al.*, 2018).

In recent decades, e-learning has become an increasingly important mode of learning and teaching and has been accepted as an effective and efficient form of learning. The spread of e-learning has been encouraged not only in higher education and vocational training but also in primary and secondary schools by the increasingly growing number of Internet users with smartphones and tablets worldwide (BegoñaGros, 2016).

E-learning and conventional approaches to distance education share the emphasis on learning "any time, any place" and the belief that learners are at a distance from the teacher. The development of e-learning (technical and pedagogical) was influenced by these early observations and stressed the need for collaboration and interaction (BegoñaGros, 2016).

The advancement in education technology and the growing interest in asynchronous space growth have driven the increase in the word e-learning in the mid-1990s as a means of defining online smart learning, which is completely intermediated through technologies. The pedagogical principle and technologies underlying e-learning have increasingly grown to help and make learning simpler. In the literature of 1990, the advantage of using ICT as an apprenticeship to be able to practice anywhere, or wherever was very popular (BegoñaGros, 2016).

In online learning, students can directly engage with the learning material in different formats (e.g., video, audio, document, etc.). In addition, they can also sequential, monitor, and assess their learning with the aid of an instructor(Huang, R.H., et al. 2020). This exchange can be achieved in a research group across a range of synchronous and asynchronous internet events (video, audio, computer conferencing, chats, or virtual world interaction). These online environments, which are synchronous and asynchronous, facilitate the creation of social and collaboration skills and personal ties amongst participants(Huang, R.H., et al. 2020).

In addition, the findings of the literature will include important inputs that might be used in determining which technology could be implemented into education and the type of interventions that would be suitable to resolve the factors and circumstances.

The article will also include a framework for guidance on potential plans for technological adoption and application, as well as support standards for teachers in the design and delivery of e-learning instruction.

(Kassimu A., et al., 2018). This was driven by a question: "What factors are needed in Nigeria to effectively integrate e-learning into higher education?" "Specifically, for literature searches, the following sub-questions were used. (Kassimu A., et al., 2018):

- How is e-learning conceived?
- What institutional factors contribute to the successful implementation of e-learning?
- How do knowledge, skills, perceptions, and access to e-learning technologies by instructors and students lead to the effective integration of e-learning?
- What kind of support is necessary for instructors and students during e-learning integration?

The goal of this article contribution is to examine the key obstacles to be addressed when developing smart environments for educational learning. This shows that a significant characterisation of the requirements that can guide universities when determining which innovations, work well with an institution's current system is desperately required. Therefore, a good awareness of variables and situations that can affect effective adoption becomes essential for technology incorporation to be efficient. This paper reviews the studied literature on conditions in Nigeria for the successful introduction of e-learning technology into higher education. The outcome of the review was to provide a powerful insight into the factors and conditions that need to be addressed in Nigeria to successfully integrate e-learning into higher education. (Kassimu A., et al., 2018).

II. Problem statement

Worldwide development in innovation-based learning, and internet learning specifically, presents chances for students to get to more elevated levels of schooling that were beforehand too far. The focal point of this article depends on online educating and learning, and explicitly, approaches that arrange the students and lecturers to have a positive encounter. Due to this fact, there is always a saying that, change is the only constant of this universe and the only trustworthy factor. So, how can something still with the tag of traditional be good and up to date for us? Our education system unfortunately comes with the tag of traditional and is strictly a pen and paper system. In our society and the education system, practical knowledge has not been given the ample importance that it needs.

Our traditional education system is too rigid, too conservative and, to some extent, lacks critical examination, it is full of dos and don'ts, as well as, fears and threats. It is not open and so does not give enough room for research and improvement. Traditional education has limited scope in terms of content and curriculum, it is mainly informal, hence limiting the span of knowledge, due to this fact it does not have well defined structure, duration or time. Traditional education lacks uniform standard, the standard varies from teacher to teacher or community to community.

Education system of a society has a basic task of providing every individual with the knowledge he/she may require for survival. Thus, our traditional education system needs a good makeover.

III. Philosophy of the Vision of Smart E-Learning

Smart learning refers to the use of smart technology such as cloud computing, learning analytics, or big data focuses on the capture, review, and orientation of learning data to enhance learning and teaching, and promotes the creation of personalized and adaptive learning (Mayer et al. 2013; Picciano 2012).

The philosophy of the vision of Smart e-Learning is to empower the learning capacity of the student and to permit the teacher for smarter preparation and delivery of the course. This introduces a new model for e-learning to accomplish such goals(Shehab A, et al., 2016).

Consequently, instead of using experience and intelligence to direct learning by a rigid problem-solving process, this proposed ideal directs students to use their intelligence and knowledge to;(Shehab A, et al., 2016);

- Learn to learn,
- Set cognitive goals,
- Facilitate problem comprehension, and
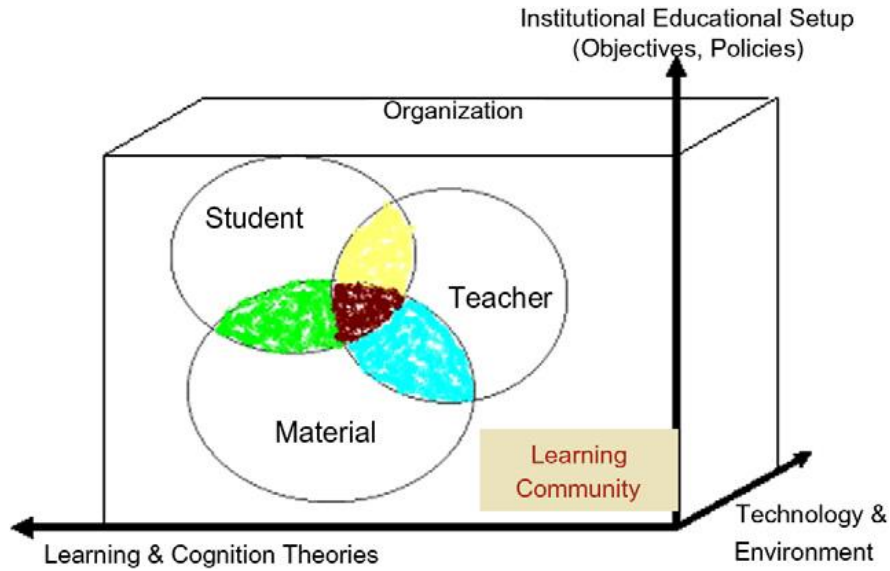- Develop skills for self-monitoring and organizing knowledge.

Figure 1: the envisioned smart e-learning's model (Shehab A, *et al.,* 2016)

The Smart e-Learning model, as seen in Figure 1, focuses on the student, the teacher, and the material which are the core triad of the learning form. This triad is part of a learning environment in which participants can be adequately organized through successful joint team activity to achieve optimal results with minimal effort. This may be done by means of a shared e-learning environment (S. Gamalel-Din., 2002) governed by the protocols and principles of cooperation of the educational institution in charge.

Noteworthy, within three delimiters, this learning organization works(Shehab A, *et al.,* 2016):

- The objectives and policies of the institutional educational setups at large,
- The currently available technology and its acceptance by the learning community, and
- The current status of education, learning, and cognition theories and the pedagogical educational methods.

Fortunately, open sources of knowledge exist intensively in the age of the Internet and therefore, content and learning material are available, it is also gracefully permissible to exchange and reuse them.

Consequently, teachers should use this instructional material in the planning of their classes. Sharing and reusing instructional materials lowers the expense of designing new classes, saves editing time, and prevents repetition of efforts(Shehab A, et al., 2016).

In summary, the theory of smart learning emphasizes the value of technical design to enhance learning.

IV. Methodology

The strategy for conducting this literature review was to use keywords such as e-learning, perceptions knowledge and skills, Smart learning, implementation, facilities, access, support, design, higher education, Nigeria, and developing countries. These keywords were then searched through Academia.edu, Researchgate.net, Google Scholar, Google search website and other Research-based articles, reports, and speeches that focused on e-learning integration in higher education.

Microsoft office and Computer hardware and software was then used to organize thoughts by recording the articles and how they addressed different search questions. Articles cited in reference lists were also followed up as well as new searches of the literature were done to address emerging ideas in the paper. The amount of literature available on this subject is quite overwhelming with the following features; first, search results show that the area of factors and conditions for e-learning integration in higher education is quite widely studied and documented. However, this review should not be considered as exhaustive of every research study available on the topic rather, it is a representative of what does exist.

V. Results
5.1 Factors Responsible for Effective E-Learning Integration

In this paper, factors for effective e-learning integration are organized into three major groups namely: institutional factors, instructors' and students' factors, and support factors as elaborated in figure 5.1.1 – 5.1.3. (Kassimu A., et al., 2018).

5.1.1 Institutional Factors

Several systemic circumstances affect decisions on what e-learning technology can be used by a given institution of higher education. The institutional requirements include organizational structure and leadership, broad engagement, strategy (and mutual vision), clear plans, and increased access to e-learning, according to Fisser (2001).

Management wants to identify and set goals for e-learning adoption in the form of cooperation and engagement by stakeholders of the organization. Getting a group with a common view of e-learning will make it easier for the organization to transit to e-learning with less opposition and obstacles. (Kassimu A., et al., 2018).

The problem of financing and costs is another structural aspect affecting the decision to start incorporating e-learning into the curriculum. One of the considerations affecting the choice and deployment of technology is the expense associated with e-learning integration, so its funding must be carefully prepared (Aguti and Fraser, 2006).

Countries with a higher financial capital base have a greater chance of reaping the advantages provided by technology than those with fewer resources. Moonen (2000) argues that when evaluating the introduction of e-learning in education, the effects, as well as the costs, are necessary to be addressed thoroughly. Ideally, the issue of cost-effective technological facilities and their conceived impact on learning needs to be considered seriously when deciding to integrate e-learning in education. (Kassimu A., et al., 2018).

5.1.2 Instructors' and Students' Factors
5.1.2.1 Instructors' Knowledge, Skills, Perceptions, and Access to Technologies

Several reports describe the awareness, expertise, and attitudes of teachers regarding the use of technology in education and internet access as crucial factors for the successful adoption of e-learning (Hoven, 2000; Smart and Cappel, 2006). The literature indicates that both teachers and higher education students have a combination of expertise, abilities, and mixed opinions on the use of technology for educational purposes (Nihuka, 2011; Mnyanyi, Bakari and Mbwette, 2010; Nyandara, 2012) . (Kassimu A., et al., 2018).

Waite (2004) and Hoven (2000) report on the relation between expertise and skills in the use of technology in education and how technology is used by teachers. They claim that the usage of e-learning technology in higher education is comparatively limited and relies on a small variety of applications, with the predominant use of word processing and rare use of video/network conferencing, e-mailing, and the internet. It illustrates that teachers use computers to meet already established learning objectives rather as a tool for a means of learning.

5.1.3 Support Factors
5.1.3.1 Instructors Support
The literature available indicates that teachers need numerous forms of support for the effective adoption of e-learning in higher education, including pedagogical and technical support, and management support (De Boer, 2004).
a)   Pedagogical and Technical Support
Consideration of necessary kinds of pedagogical and technological assistance for higher education are an essential part of the successful introduction of e-learning courses. This is crucial because most teachers have not known how to implement e-learning techniques and so this is still a very difficult endeavour for them for which close assistance seems important.
Three places where teachers who require pedagogical and technological expertise are described from a Telnova report (2005);
(I)   planning and improving e-learning lessons
(II)   designing student experiences such that e-learning does not only include content delivery (designing instruction)
(III)   training on how to promote e-learning environments with various features and characteristics. . (Kassimu A., et al., 2018).
b)   Management Support
Support from the administration is crucial for the successful higher education adoption of e-learning technology. Since management has the requisite requirements, such as ICT regulations, benefits, and services, their engagement and involvement in the application of new technology at all levels is the most important factor in the effective adoption of e-learning (Sife et al., 2007). Management needs to be responsive and tolerant not only to the concept of e-learning adoption but also in numerous areas to help teachers and students.
c)   *Students Support*
Another vital aspect of successful e-learning delivery in higher education is student assistance. Thorpe (2002) gives a helpful description of student support as "all those components that are capable of responding to a known learner or group," in other words, the appearance of the human face of course. In her description, three

primary elements can be derived: identification, in other words, the ability to deal with the needs of identified individuals; engagement, the ability to respond to student needs; and the ability to sustain communication during the course time/duration.

5.2 E-Learning Design Strategies
In comparison to conventional classroom learning, online education is distinguished by separate instructor and learner sites, so versatile learning can take into account accessible online teaching and learning directions using multiple technologies such as (Huang, R.H., et al. 2020);

5.2.1 Instructional organization of learning
In online environments, a variety of teaching and learning techniques may be used to build flexible guidelines, as highlighted in the following examples of teaching approaches (Petrina, 2011).

*5.2.1.1 Lecture***:** sometimes referred to as direct teaching. The instructional technique for directinstruction relies largely on teacher-directed methods and is the most widely used method of teaching. Here, the material has to be prepared in advance and arranged. Also, for the classes or sessions, the teacher must be informed of the student specifications. This method is successful in supplying students with information in a step-by-step systematic way and requires the active involvement of students (Huang, R.H., et al. 2020).

5.2.1.2Debate: A method of debate in which a few students propose and challenge various points of view concerning a topic. "Should rights to free speech on the internet be extended to students in schools (Huang, R.H., et al. 2020)?

5.2.1.3Discussion: Conversations take place as a group meets to communicate with each other about a matter or incident of common interest. A community of learners gathers to explore what they have heard about a phenomenon (Huang, R.H., et al. 2020).

5.2.1.4Student-led discovery: in this contest, students are assigned responsibility for unique topics and methods of distribution. They select if they want the content to be researched, and then how to show it in an entertaining manner to the rest of the class (Huang, R.H., *et al.* 2020).

5.2.1.5 Experiential Learning: Experiential Learning relies more on experiences and incorporates students in other environments to incorporate their knowledge. It's all about the learning experience rather than relying on the content(Huang, R.H., et al. 2020).

5.2.2 The social organization of learning activities
Several social organizational techniques can be used to build flexible learning in online environments, as illustrated in the following examples (Promethean, 2017; Petrina, 2011; Huang, R.H., et al. 2020);

*5.2.2.1 Independent research***:** Independent research provides several teaching approaches that build student skills such as initiative, self-belief, time control, and self-improvement. Under the guidance of a teacher or guide, students are advised to perform a scheduled task. It also requires community study with an assigned partner or studying. The teachers specifically plan to these approaches in other to address the individual requirements of a group(Huang, R.H., et al. 2020).

*5.2.2.2Cooperative learning:*In this contest, students are grouped into four to six classes. The classes are often as varied or heterogeneous as possible. In this contest, roles are well established, but they are subject to negotiation. This cooperative approach brings a clear sense of responsibility for it.

In summary, we define the teaching organization styles according to the engagement of teachers and students in online settings to help teachers incorporate both the learner characteristics and the material characteristics(Huang, R.H., et al. 2020).

5.3Effective Support Services for University Smart Learning Environment
The key to providing high-quality online education is successful support systems. Online education support systems provide two support types: support services for online instruction for teachers and support services for online learning for students. In partnership with the community, schools, companies, communities, culture, etc., all programs can be given(Huang, R.H., et al. 2020).

5.3.1Technical services for teachers
Efforts should be made to increase the capacity of teachers to teach electronically since most teachers are inexperienced with both synchronous and asynchronous online teaching resources. It covers online teaching techniques, implementations of information technology, cases of disease reduction in schools, and cases of local teacher preparation, to facilitate the accelerated development of the online teaching skills of teachers. Teacher support covers how to use synchronous cyber learning tools, how to use the device for learning management and how to design learning events, etc.(Huang, R.H., et al. 2020).

5.3.2Learning supports for students
The efficacy of positive learning programs is expressed in two aspects: it will facilitate productive learning and personality development for students. Successful learning refers to the growth and enhancement of the understanding, cognition, maturity, and abilities of students.Personality development requires primarily the cultivation of a healthy attitude to life, good thought, simple communication, and cooperative skills, comprehension of laws, loyalty, perseverance, and creativity(Huang, R.H., et al. 2020).

5.3.3 Ensuring reliable network infrastructure

In order to facilitate multiple practices, stable network connectivity is essential, such as synchronous cyber teaching using video conferencing, asynchronous cyber learning through accessing or uploading digital learning tools, and collaboration via social apps with peers, etc. Schools can measure and analyse the bandwidth of the network and, if necessary, increase it. The following techniques can be implemented to maintain a stable network system that can accommodate millions of students studying at the same time(Huang, R.H., et al. 2020).

5.4 Adopting Suitable Digital Learning Resources

The word 'digital learning resource' is used to refer to resources included in a course that facilitate the accomplishment of the described learning objectives by the learner. These materials consist of a broad range of digitally formatted tools, including pictures or pictures of graphics, audio and video, simulations, animations, modules of learning designed or programmed (Epigeum, 2019).

Digital learning tools such as Large Open Online Courses (MOOCs), Small Private Online Courses (SPOCs), online video micro-courses, e-books, demos, templates, graphics, videos, quizzes, sports, and e-notes allow learning more available and contextualized through the development of ICT in education(Huang, R.H., et al. 2020).

5.4.1 Utilizing Friendly Learning Tools

Effective selection and use of learning resources as shown in table 1 are helpful to learners in discovering and analysing information, building knowledge, engaging with peers, communicating comprehension, and assessing learning results in specific ways.

When choosing learning situations, the convenience of instruments should be taken into account. In specific, software should be simple and easy to;

(a) help teachers build and handle resources efficiently, release reminders and manage students; (b) help students gain resources, engage in learning activities;

(c) help teachers and students collaborate in real-time(Huang, R.H., et al. 2020).

Table 1. Classification of learning tools(Adopted from Huang, R.H., et al. 2020)

Categories of Tools		Suitable Teaching Scenarios	Representative Tools
Tools for resource production	PPT recording software	Suitable for PPT-assisted video recording	PowerPoint and WPS in Windows, Keynote in IOS system
	Screen capture software	Video editing; especially suitable for producing software operation courses	Camtasia Studio, QuickTime, Adobe Premiere
	The software of video production	Producing micro-course video quickly	Huawei Course maker App
	The software of original video producing	Suitable for recording handwritten calculation and action skills display	Mobile phones, CamScanner
	The software of Multimedia learning resource-producing	Appropriate for developing multimedia courseware	Adobe Captivate
Tools for synchronous life teaching	All types of live streaming software, including software on interactive teaching, remote office, online course	Suitable for live teaching courses; different kinds of the software can be chosen to satisfy various demands for interaction, network quality or convenience	Teaching interaction: Rain-classroom, ZOOM, etc
Tools for knowledge construction	Cognitive tools, collaborative editing tools, virtual simulation tools, etc.	Suitable for the courses in need of collaborative learning for the construction of knowledge; from various aspects of the construction of knowledge, tools selection and learning activities design can be conducted by combining course contents	Cognitive tools: mind mapping, GeoGebra Collaborative editing tools: Knowledge forum, wiki, The document, Google Docs,

The following elements are suggested in terms of the use of resources to promote cognitive development and interactive knowledge building for students:

(a) the use of various tools for information processing, mind mapping, document control, presentation, media tools, and other tools to help students access information and compare different viewpoints and articulate their own opinions, and to form or express their own opinions.

(b) the use of instant message software, networking media, and sharing groups to help students discuss, discuss and achieve consensus with group members or members of the learning community, and the full creation of information through conversation or collective engagement online;

(c) the use of all sorts of software to include input and appraisal in real-time, review of the learning situation. This will assist students to perform internal consultation and create meaning by focusing on learning outcomes and learning processes, facilitating the development of customized meaning, and eventually cultivating higher-level thought.

VI. Conclusions

Learning anytime, anywhere is not a novel concept. However, where such processes are considered a common activity during life, it is important to explicitly design and intentionally support them. As mentioned above, smart learning environments must integrate formal and informal learning to create autonomous adaptive learning environments to support individual learners. These environments need to use big data and learning analytics techniques to integrate real-time information about learners' location and historical data to identify meaningful learning patterns.

The study reported in this paper focused on understanding factors contributing to the successful integration of e-learning in higher education in the Nigerian context. This awareness is significant because it sheds light on how to address e-learning integration successfully for the delivery of education in Nigerian institution. "What factors contribute to the Development Of E-Learning Design Strategies towards Effectives University Smart Learning Environment?" was the key driving issue for the study. "

The study has also identified the following as major factors that contribute to successful e-learning integration in higher education in Nigeria such as institutional factors, instructors and students factors, and support factors (Fisser, 2001; Mnyanyi, Bakari and Mbwette, 2010; Moyo, 2003; Siritongthaworm*et al.,* 2006; Huang, R.H., et al. 2020).

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