INTEGRATION OF INFORMATION AND COMMUNICATION TECHNOLOGY IN EDUCATIONAL DEVELOPMENT IN NIGERIA

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Abstract
The revolution in technology in the 21st century plays an important role in educational development of every nation. With Information and Communication Technology in education, the teaching and learning process become entertaining and holistically enthusiastic as it tends to enhance students' performance and increase productivity in the school system. It is however observed that in Nigeria, education of the citizens is not placed on the frontline and the deployment of technology in teaching and learning is at the lowest minimum. This study seeks to develop a social network based e-learning system that integrates social networking platforms such as Facebook and Twitter, Learning Management System (LMS) and video Computer-Based Training (CBT). Macromedia Dreamweaver, Firework, Image gif and PHP was used as the front-end engines while the back-end engine utilized mySQL Server for the database and Wamp 5.0 Server used for system implementation. With the support of ICT resources such as productivity tools, online collaboration tools, digital contents, communication tools and other classroom technologies, an e-learning Application known as ATutor, integrated into Facebook and Twitter accounts has been developed for use in teaching and learning activities. The traditional education method of learning from text books and classroom based instructions have proven ineffective in this generation. Thus, contemporary educational approaches need to be developed for the country. The developed system contributes an easy-to-use application integrating Facebook and Twitter accounts for electronic learning in our educational institutions. The study makes several recommendations that borders on the integration of ICT in education system in Nigeria.

Keywords: Education, development, information and communication technology, integration, e-learning, ATutor.

1.0 Introduction

As Information and communication Technology (ICT) evolves at a fast rate and becomes more and more integrated into every aspect of daily life, teaching and learning professionals are challenged with the task of successfully integrating it into education. The Nigerian educational system suffers neglect as a result non-integration of ICT tools to ease teaching and learning. Also, the onset of COVID-19 pandemic has rendered the traditional educational system in Nigeria unfashionable as people are not encouraged to stay close to each other anymore. ICT is a technological tool and a resource used for transmitting, storing, creating sharing or exchanging data or

information(Ireti, 2014). Broadly speaking, ICT in education consists of computers and devices, networks, application tools, and digital content. The integration of ICT in education is not only limited to the use of internet-enabled devices but also it takes different dimensions ranging from online learning, blended learning and web –based technologies. Online learning has become extremely popular with the advent of internet and web applications. It takes the form of simply posting articles to blogging, to using wikis, by subject matter experts that then become indexed by search engines for learners to find out. Social media such as Facebook, Youtube, LinkedIn etc are gaining momentum among people who would like to stay connected with one another. These sites allow individuals to build communities. In these communities, individuals meet each other; make friends, share information, interest and activities.

Kaplan & Haenlein (2010) define social media as "a group of internet-based applications that build on the ideological and technological foundations of Web 2.0 and that allow the creation and exchange of user-generated content." Integrating ICT in education depends on four essential pillars: Infrastructure, services, education and management. The breath of ICT that can be used in education and the diverse nature of the topic is highlighted by the many different terms used to describe the use of ICT in education. ICT in education could be expressed with terms such as computer-based learning, learning technologies, technology-enhanced learning, educational technology, online learning, or e-learning. The term is generally used to refer to the use of technology in learning in a much broader sense than the computer-based training or Computer-Aided Instruction of the 1980s. It is also broader than such terms as Online Learning or Online Education which generally refer to purely web-based learning. In cases where mobile technologies are used, the term M-learning has become more common. E-learning, however, has implications beyond just the technology and refers to the actual learning that takes place using these systems.

E-learning is naturally suited to distance learning and flexible learning, but can also be used in conjunction with face-to-face teaching and learning known as blended learning. In higher education especially, the increasing tendency is to create a Virtual Learning Environment (VLE) (which is sometimes combined with a Management Information System (MIS) to create a Managed Learning Environment) in which all aspects of a course are handled through a consistent user interface standard throughout the institution. A growing number of physical universities, as well as newer online-only colleges, have begun to offer a select set of academic degree and certificate programs via the Internet at a wide range of levels and in a wide range of disciplines. While some programs require students to attend some campus classes, many are delivered completely online. In addition, several universities offer online student support services, such as online advising and registration, e-counseling, online textbook purchase, student governments and student newspapers.

Several organizations and institutions provide different forms of training and instruction to their employees or learners. Typically, they providethe needed training by sending people to school, holding in-house training classes, or providing manuals and self-study guides. In some situations, it is advantageous to use e-learning instead of the traditional face-to-face training. The challenges of the traditional method of learning is its lack of skill- based education, less learning outcome, less involvement of teacher and student, non-availability of quality teachers and the limitations of non-competent students (Onwuagboke*et al*., 2015; Afzal*et al*., 2015). It is on this back drop, that the research on the integration of ICT in educational development is

eminent to reduce travel cost and time to and from school thereby eliminating chalkboard and promoting interactive digital whiteboard in a blended environment.

2.0 Conceptual and Theoretical Framework

2.1 Pedagogy and ICT

a. ICT and Leaning Styles

There are many learning styles, theories and models, which classify learning styles or preferences in many different ways. One is to determine which learning style or model fits the teaching context. There are three different learning styles, namely, the auditory which helps learning by listening using audio-enabled digital content such as audio books, podcast, video, television, radio, and audio enabled e-learning courses; the visual learning which helps learning

through visual depictions using image and video formats such as video and graphic-rich contents, presentations/online demonstrations, video calls to remote human experts and modeling software; and the kinesthetic (or tactical learning), where learners prefer to learn by practicing and relating things to their own experience using simulations, interactive games and quizzes (Atsari, 2020).

b. ICT and teaching/learning Strategies

There are many approaches to using ICT to support and enhance traditional and new teaching and learning strategies. This includes learner-centred learning, collaborative learning and informal learning. In learner-centred learning approach, the teacher's focus is on tailoring learning to suit the individual student needs, background knowledge, abilities, interest, and learning style. In this model the students are active participants, constructing their own learning, at their own pace. In collaborative learning approaches, the teacher's focus is on facilitating two or more students or a whole group to work together to discuss topics and create information together. Integration of ICT in classroom enhances students' collaborative learning skills and also develop skills that promote social skills, problem solving and self reliance. In informal learning, students are active participants in their own learning. They use their own approaches to learn and set their own learning goals. ICT provides tools that can support this through internet, and mobile technologies (Ghavifekr & Rosdy, 2015).

c. ICT and learning Environment

ICT can support a variety of learning environment including traditional teaching environments, blended environments and online learning environments (Tavangarian *et al*., 2004). In traditional teaching environments, the teacher's focus is on transferring knowledge to students and enabling learning within a classroom environment. Here technologies such as interactive whiteboard, digital projectors and screen sharing software or other digital resources like tablets could be used. In blended learning the teacher combines the traditional classroom environment with online learning practice. A teacher might introduce a topic in a class and follow up with a simulation in class or an online discussion after class. In online learning all the teaching and learning takes place online using internet-enabled computers and devices, including mobile devices.

2.2 Approaches to e-Learning Services

E-learning services have evolved since computers were first used in education. There is a trend to move towards blended learning services, where computer-based activities are integrated with practical or classroom-based situations. According to Bates & Poole (2003) and the OECD (2005), different types of e-learning can be considered as a continuum, starting from no e-learning, to laptop programs and to hybrid learning and to fully online learning, which is a form of distance education.

a. Computer-based learning

According to Whyte (1989), Computer-Based Learning (CBL) is the use of computers as a key component of the educational environment. While this can refer to the use of computers in a classroom, the term more broadly refers to a structured environment in which computers are used for teaching purposes. The type of computers has changed over the years from cumbersome, slow devices taking up much space in the classroom, home, and office to laptops and handheld devices that are more portable in form and size.

b. Computer-Based Training

Computer Based Training (CBT) is a form of education in which students learn by using special training programs while on a computer. This system worked well in the pre-internet days, but with the explosive use of the internet, the scope of CBTs is forced to expand. It has several advantages over traditional classroom learning methods and over self-taught books. Web Based Training (WBT) which is a subset of CBTs in which the material is made accessible on the internet by applying web technologies. Typically, it has text and graphics, animation, audio and video, and needs additional bandwidth and software to work optimally. WBT is also referred to as online courses and Web-based instruction that presents the latest content of any topic that can be modified and is set in a framework of self-directed and self-paced instruction. Both training can be in the form of individual or group and the CBT technology breaks down complex software into bite sized modules for easy and quick understanding for the learners. (Schwaninger, 2011).

c. Computer-Supported Collaborative Learning

Computer-supported collaborative learning (CSCL) is one of the most promising innovations to improve teaching and learning with the help of modern information and communication technology. Most recent developments in CSCL have been E-Learning 2.0. It is widely agreed to distinguish collaborative learning from the traditional model in which the instructor is assumed to be the distributor of knowledge and skills.

Johnson-Eilola, (2005) stated that a “Smart Board system provides a 72-inch, rear projection, touchscreen, intelligent whiteboard surface for work”. The study also asserted that in Datacloud, we are attempting to understand how users move within information spaces, how users can exist within information spaces rather than merely gaze at them, and how information spaces must be shared with others rather than being private, lived within rather than simply visited. It explains how the Smart Board system offers an information space that allows his students to engage in active collaboration. Locus of control remains an important consideration in successful engagement of E-learners whether using the Smart Board or another E-learning modality. Whyte & Lauridsen (1980) opined that the continuing attention to aspects

of motivation and success in regard to e-learning should be kept in context and in concert with other educational efforts. Information about motivational tendencies can help educators, psychologists, and technologists develop insights to help students perform better academically. Other approaches to e-learning services are technology enhanced learning (TEL), mobile learning, asynchronous e-learning, discussion groups, self-paced coursed synchronous e-learning, audio and video conferencing, online chat application sharing, instant messaging , shared white board , virtual classroom or meeting and learning platforms (Afzal, *et al*., 2015).

2.3 E-learning design components

There are five e-learning design components that are very essential for all successful online courses namely: audience, courses structure, page design, usability and content management with pedagogical elements that will define structures or units of educational material into a lesson, an assignment, a multiple choice question, a quiz a discussion group or a case study.

Interactive whiteboards (IWBs) is one of the many technologies that can be used in a classroom to support and enhance teaching. It is an interactive display technology that is used instead of traditional blackboards. It typically includes a large wall mounted whiteboard that works with a computer and a digital projector to display what's on the computer screen. The electronic stylus pen or a finger can be used to interact with computer by interacting with images on the whiteboard. IWbs come with application tools for searching websites for information on the internet and some come with ready-made educational resources and teacher support. Example, SMART technology, Team Board. Key features include whole class display, interaction, dual or multiple users, screen recording, note taking, handwriting recognition, interactive authoring, device integration. Digital visualizers also known as document cameras are useful for classroom teaching along with digital projector or Personal Computers (PC) to show physical objects such as small artifacts on the screen to the whole-class such as text, images and objects. Screen sharing tools are used to share a screen across one or more computers or devices or to gain access to another person's screen in real-time through a network.Key features include real-time screen sharing, multiple connections file transfer and remote control(Nedeva & Dineva, 2013).

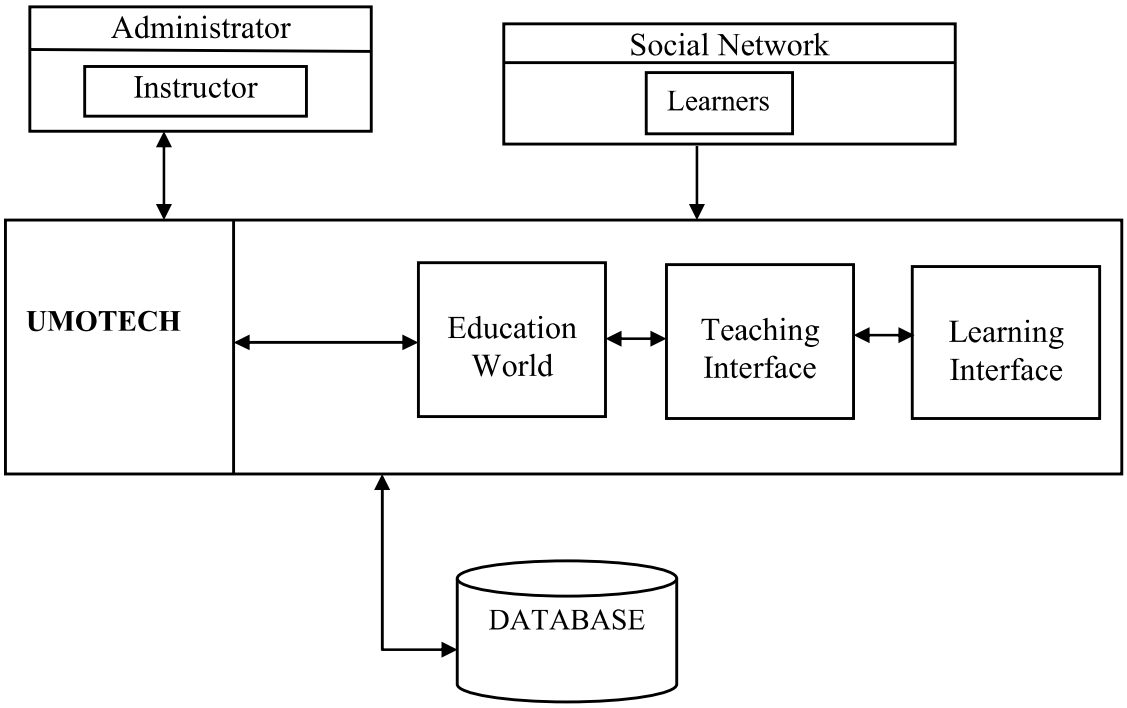
3.0 System Design Methodology

The design methodology employed in the development of the system is the Object Oriented Analysis and Design Method which is a model-driven technique that integrates data and processes into constructs called objects. These objects are of three types, namely, Students, Instructors and Learning Interface comprising screen and dialog boxes. In the first phase of the methodology the design of a website is carried out and the site is made to incorporate interfaces for both teaching and learning. The second phase integrates the functionality for enabling users get access to the electronic learning site through their social network accounts such as Twitter or Facebook since they are the two commonly used social media in our locality. The third phase is the design of the backend engine which stores the contents of the e-learning site in a database.

The architecture of the system is shown in Figure 1 which is made up of the electronic learning website (UMOTECH) comprising Education World, Teaching

Interface and Learning Interface. Education World is the platform where teaching and learning are implemented. The Administrator module helps the Instructor to deliver teaching contents which can be sent to the database module for storage. The Social Network module authenticates social network users' accounts and grants them access to the system for learning purposes.

Figure 1: Architecture of the Electronic Learning System

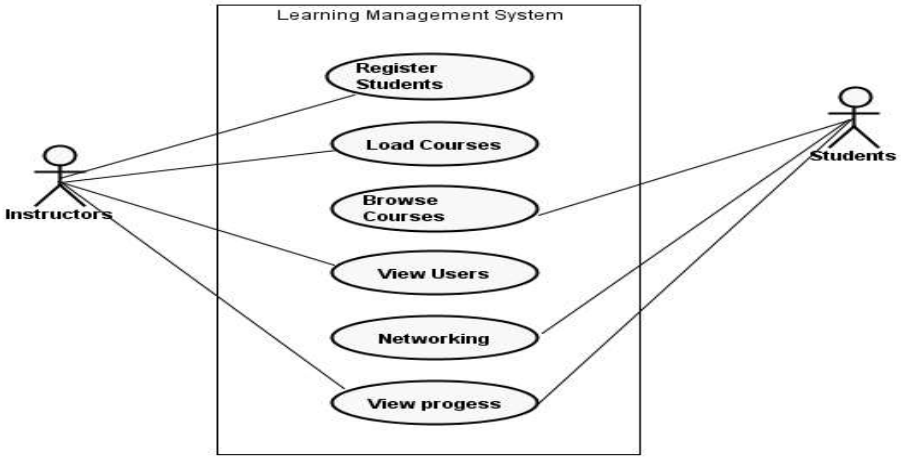


Source: Designed by the authors, 2021

In the design, the system administrator oversees and manages the entire system while the Instructor carries out the teaching process. Learners are students who benefit from the system.

We design the Use Case diagram of the learning management system shown in Figure 2 where the interactions between the actors and the use cases are shown.

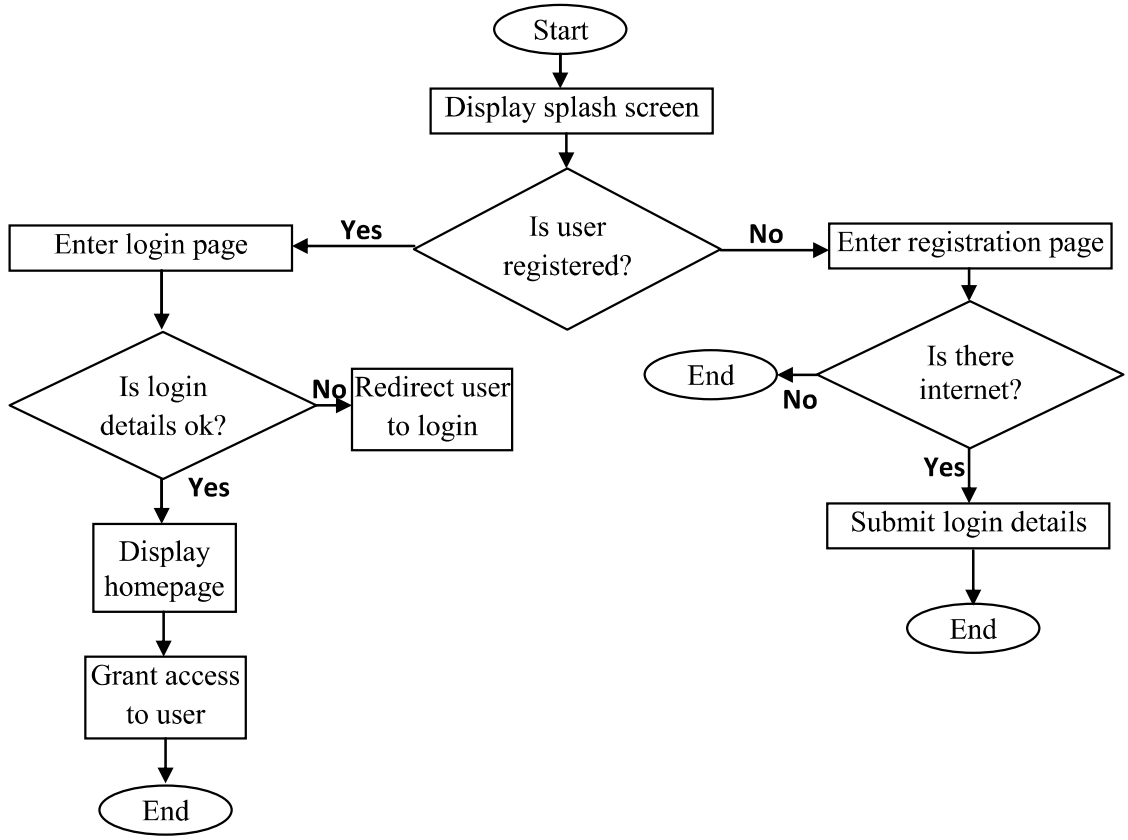
Figure 2: Use Case Diagram of the System



Source: Designed by the authors, 2021

The algorithm for the execution of the system is as follows:
Step 1: Start
Step 2: Display splash screen
Step 3: Is user registered? If yes go to step 4 else go to Step 2
Step 4: Enter login details
Step 5: Is login details correct? If yes go to step 6 else go to Step 4
Step 6: Open and display the Learning Management System
Step 7: Is any section clicked? If yes open the section, else stay on Step 6
Step 8 Is the Load Courses button clicked? If yes open, else to to Step 6
Step 9: Is the Browse Courses button clicked? If yes open, else go to Step 7
Step 10: Is the Networking button clicked? If yes open, else go to Step 7
Step 11: Is The View Users' button clicked? If yes open, else go to Step 6
Step 12: Is the View Progress button clicked? If yes open, else go to Step 6
Step 13: Exit
The flowchart for the system is shown in Figure 3.

Figure 3: Flowchart of the System



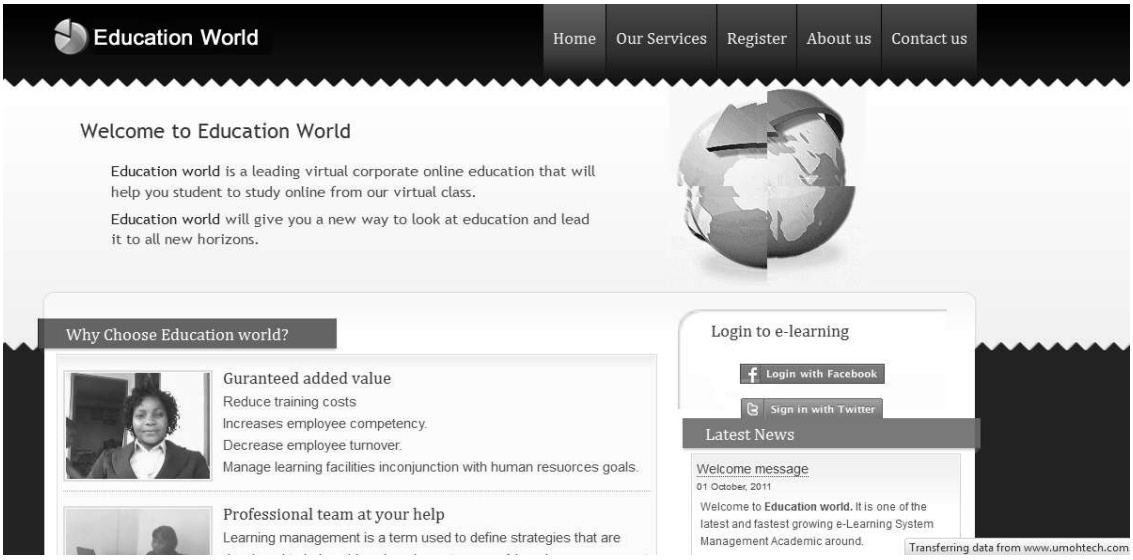
Source: Designed by the authors, 2021

4.0 System Implementation

The system, developed by the authors, was implemented using suitable application development tools such as Macromedia Dreamweaver, Firework for the graphics, Image gif for the animation and PHP as the front-end engine while the back-end engine, mySQL Server, was used for the database. Figure 4 shows the Home page

of the e-learning system where several activities are carried out such as logging in and registering for courses.

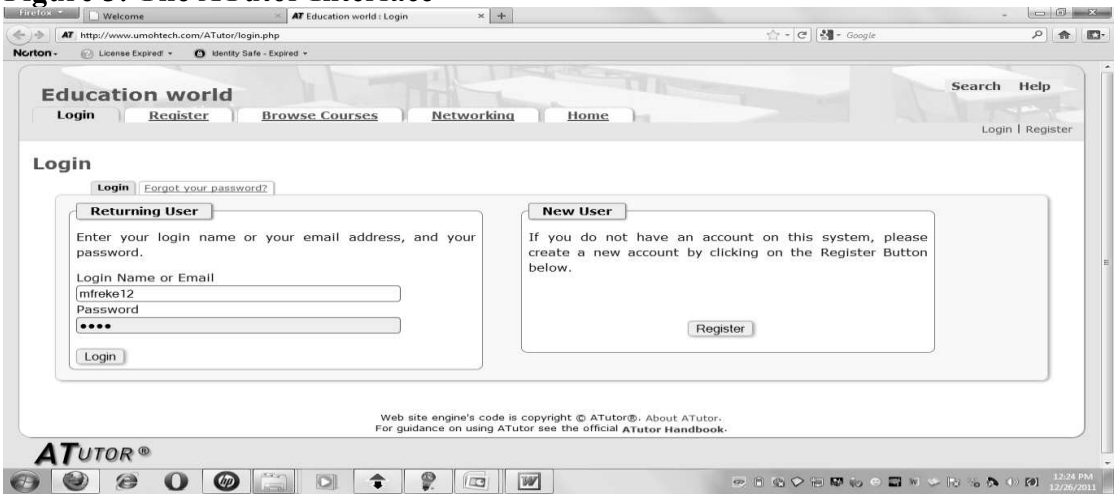
Figure 4: The Education World Interface.



Source: Developed by the authors, 2021

The ATutor interface allows users to login and register for courses as shown in Figure 5.

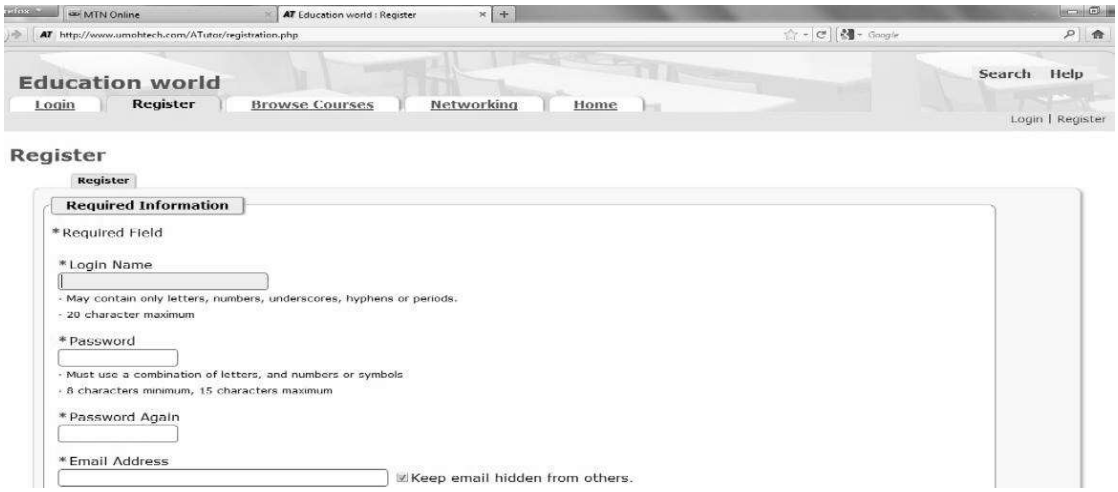
Figure 5: The ATutor Interface



Source: Developed by the authors, 2021

In order for a user to login to the system, a unique system account needs to be created using the *Register* link in the main navigation to access the registration form as shown in Figure 6. If email-confirmation has been enabled by the System Administrator, a message will be sent to the email address entered, containing a link that must be followed to confirm the new account. Once this is done, the login name or email address, and the password entered during registration can now be used on the Login screen.

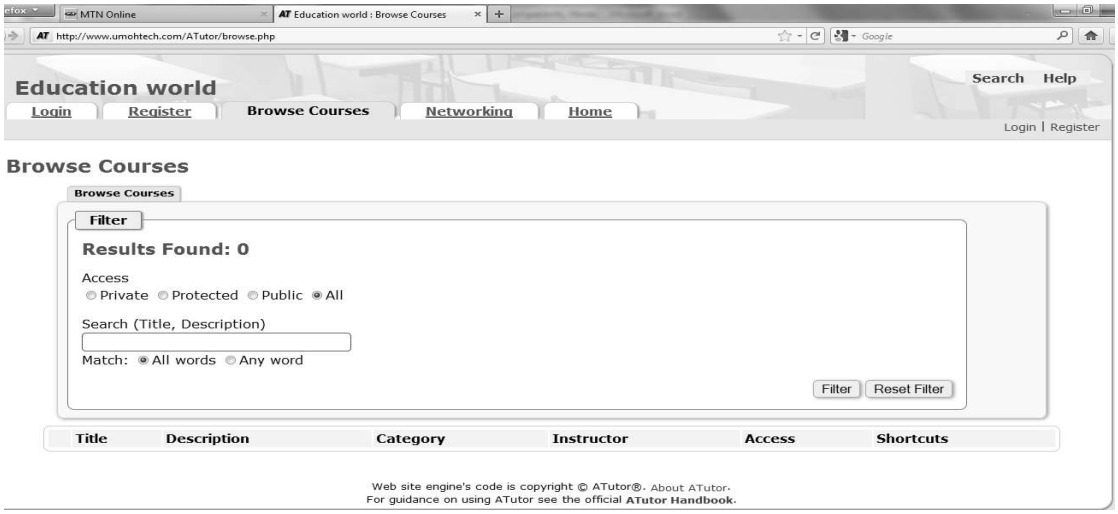
Figure 6: The Registration Interface



Source: Developed by the authors, 2021

The Browse Courses page shown in Figure 7 lists all courses presently available in the system. If a course is Public, it may be accessed without logging in. Protected and Private courses require that you log in. Private courses are available only to those who have been approved and enrolled in the courses.

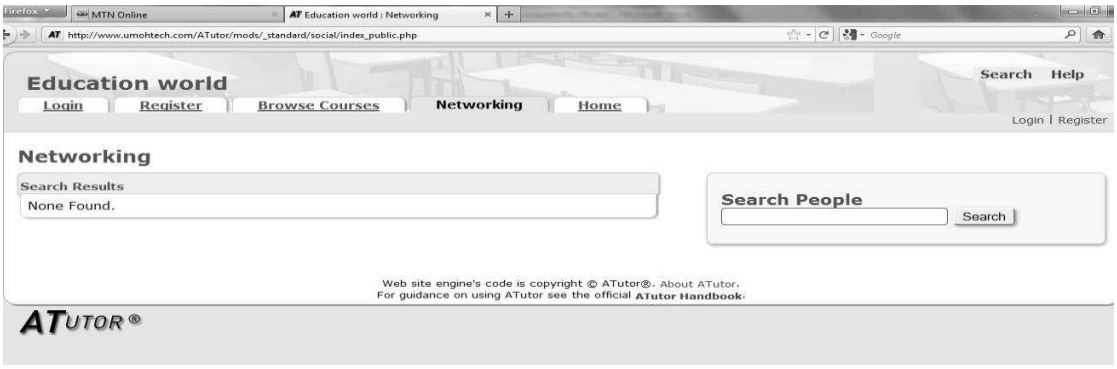
Figure 7: The Browse Courses Interface



Source: Developed by the authors, 2021

ATutor Social is a social networking environment that allows users to develop a network of contacts, create and participate in social groups as well as develop a social profile. It is based on the Google Open Social Standard. Many Open Social applications are available around the Internet and can be linked to the social networking environment in order to customize it to one's preference as shown below in Figure 8.

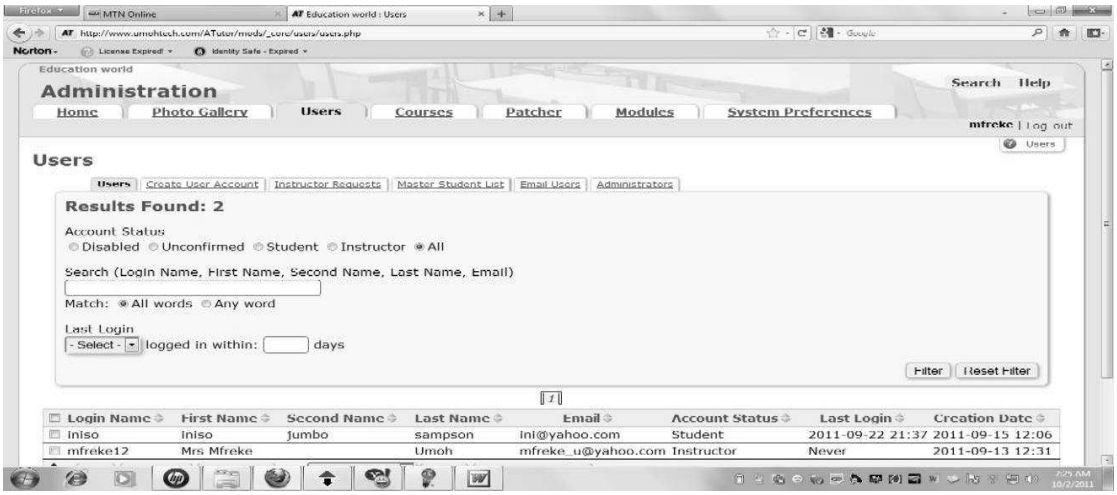
Figure 8: The Networking Interface



Source: Developed by the authors, 2021

The System Administrator manages and monitors the system using components shown in Figure 9.

Figure 9: The Administrator's Interface



Source: Developed by the authors, 2021

The Inbox Interface shown in Figure 10 is used for privately messaging other users in your courses. Inbox messages appear in a table, with new messages flagged. Selecting a message will display its contents at the top of the screen. In the sub-navigation there is a link to send a message. Choose the recipient, enter a subject and a message, and use the Send button. Use the *Inbox Notification*preference to receive emails when a new Inbox message is received.

Figure 10: The Inbox Interface



Source: Developed by the authors, 2021

5.0 Conclusion

The use of technology in education provides a more suitable environment to teach and learn. It serves to develop interest and motivate students, therefore positively impacting on their performances. A well-designed information and communication technology solutionsuch as the one developed here can be used to disseminate resources, connect students to information, enhance teacher's practices and students' performance in all subject areas as well as improving management decision and data-driven policy making. This research unifies two technologies, namely e-learning and Social Network. It explores some of the ideas behind e-learning technologies and communication technologies to provide an application known as the ATutor. The architectural model of the system was developed with the necessary descriptions of the basic components. Both the Social network and our Learning Management System have some commonality such as account creation, user authentication, group creation and facilities for users to identify and communicate with one another.

6.0 Recommendations

From the findings of this study, the following recommendationsare made**:**

1. Government should subsidize the price of internet facilities so that people can afford it at home for learning in order to enhance knowledge and skills.
2. Government should establish a "one laptop per child" initiative in the country.
3. Academic institutions should vigorously embrace ICT to improve performance.
4. Tablets, audio-visual and learning tools via computers and mobile devices should be provided to assist teachers in assessing individual students' needs.

References

Afzal, M. T., Safdar, A. & Ambreen M. (2015). Teachers Perceptions and Needs towards the Use of E-Learning in Teaching of Physics at Secondary Level. *American Journal of Educational Research*, 3(8), 1045-1051.

Atsari, F. (2020). Learning Styles and the Role of Technology in Second Language Learning.*Advances in Social Science, Education and Humanities Research*, 434, 23-27.

Bates, A. & Poole, G. (2003). A framework for selecting and using technology In *Effective teaching with technology in higher education: Foundations for success*. San Francisco: John Wiley & Sons, Inc., 1st Edition, 75-105.

Ghavifekr, S. & Rosdy, W.A.W. (2015). Teaching and learning with technology: Effectiveness of ICT integration in schools. *International Journal of Research in Education and Science,*1(2), 175-191.

Gross, R., Acquisti, A. & Heinz, H. J. (2005). Information revelation and privacy in online social networks (The Facebook Case). *Conference Proceedings of the 2005 ACM Workshop on Privacy in the Electronic Society, Alexandria*, VA, USA.

Ireti, F. A. (2014). A review on Implementation of ICT-Based Education in Nigeria: Limitation and Challenges. *International Journal of Scientific & Engineering Research,* 5(10), 685-691.

Johnson-Eilola, J. (2005). Datacloud: Toward a New Theory of Online Work. Cresskill, NJ: Hampton Press, Inc., USA.

Kaplan, A. & Haenlein, M. (2010), Users of the world, unite! The Challenges and Opportunities of Social media, *Business Horizons*, 53(1), 59-68.

Nedeva, V. &, Dineva, S. (2013). Design and Development of Efficient E-learning Courses. The 8th International Conference on Virtual Learning (ICVL), 108-114.

OECD (2005). E-Learning in Tertiary Education: Where Do We Stand? Paris: OECD.

Onwuagboke, B. B. C., Singh, T. K. R. & Fook, F. S. (2015). Need for ICT Integration for Effective Instructional Delivery in Nigerian Colleges of Education.*Journal of Education and Practice*, 6(3), 51-56.

Schwaninger, A. (2011). Computer-based Training: Advantages and Considerations. Aviation Security International, December, 18-23.

Tavangarian, D., Leypold, M. E., Nölting, K., Röser, M. & Voigt, D. (2004). Is e-Learning the Solution for Individual Learning? *Electronic Journal of e-Learning*, 2(2), 273-280.

Whyte, C. B. & Lauridsen, K. (Eds.) (1980). *An Integrated Learning Assistance Center*. New Directions Sourcebook, Jossey-Bass, Inc.

Whyte, C. B. (1989). Student Affairs. *The Future: Journal of College Student Development*. 30, 86-89.