Exploring the Impact of E-Learning and Internet of Things in Education: Applications and challenges

Dr. Mahboob Ali Dehraj
Department of Education SBBU, SBA
mehboobali@sbbusba.edu.pk

Aneela Hanif Rao
M.Phil. Scholar
Department of Education SBBU, SBA
Anu_taurus91@yahoo.com

Gulzar Ali Kaka
M.Phil. Scholar
Department of Education SBBU, SBA
Kakagulzar87@gamil.com

Javed Iqbal Mirani
MS English Linguistics
English Department SBBU,SBA
javediqbalmirani@gmail.com

Mehmood Hashim Detho
Assistant Professor
SBBU – SBA

Abstract

Education is the source of achievement in the world of competition. It is playing an important role in the life of human beings. Before it was thought that education only means able to write and read, but now the concept is totally changed. Modern trends in teaching and learning have been introduced. The emerging world arises technology which has billions of connected devices today in the world even twice than the human population. IoT is things oriented (objects), internet-oriented (middleware) and semantic oriented (information) network of objects. Technical learning or E-learning is a way by which people get benefits as it is mini software that we keep in our phones and electronic devices too. This study intended to explore the importance of E-learning and IoT in Education.

Keywords: Internet of things, e-learning, education, ICT, technical learning

1. INTRODUCTION

Education is the source of achievement in the modern world education system. It is playing an important role in the life of human beings. Before, it was thought that education only means able to write and read, but now the concept is totally changed. Modern trends in teaching and learning have been introduced. The increasing number of educators in tertiary instruction try different things with innovation, searching for better approaches to improve their customary methods for

instructing, the need for adaptable devices arranged mixed learning situations. Learning Management Systems, particularly those which depend on open-source programming, have demonstrated to be extremely useful to reach this objective. By and by, modernization is not only enough in the brightness of the reality that instructors need to see in advance the possibilities but it offers so as to have the option to utilize it successfully in overhauling their instructive situations. As time passed, it is realized that education is the key to success.

To understand this phenomenon, education is evaluated and distributed in different subjects and specializations. In the current scenario, education has multi concepts and these concepts already predicted by the philosophers of the past. Plato, the pioneer of the idealism philosophy, defines education in sense of achieving social justice because if individuals have equal opportunities, they would achieve unanimously. Education is divided into formal, informal and non-formal education. Formal education required proper school boundaries and proper places like school, college, and universities, where individuals get registered and certified after the completion while informal education is not pre-planned, no specific place and time table is required. Non-formal education is also called distance learning. Since the Stone Age to the digital world, the definition of learning has remained in a transition stage.

First the learning was limited to change in behavior, however, in this global and technological era, learning is the development of skills. Gaining knowledge is a powerful tool that enhances the ability and makes the performance reliable for the new generation. (Ambrose et al, 2010, p.3). In the modern era, different learning styles have been introduced by using technology. Here the question arises; why we discuss modern learning? The best answer is that now we have the modern learner. Modern learning doesn't rely only on traditional methods like strict classroom-based and teacher-centered. Beyond this, modern learning includes innovative methods, current techniques, ideas, and procedures. Modern learning needs information quickly and for that, they use different tools of technology. In simple, modern learning derived things from theory to practice without wasting time.

1.1 Internet of Things (IoT) in Education

The emerging world arises technology which has billions of connected devices today in the world even twice than the human population. Currently, there are more than 10 billion interconnected devices and further increasing day by day which expect to cross more than 25

billion devices by 2021. In spite of several advancement and improvement in context-aware data gathering approaches it is observed that these devices are small, scalable, limited battery life supports heterogeneity. IoT is things oriented (objects), internet-oriented (middleware) and semantic oriented (information) network of objects in (S. Cuomo 2016). These three paradigms (e.g. objects, internet, and semantics) are important to consider IoT enabled devices which can sense, process and communicate in a real-time environment.

Objects with additional internet connectivity having different functionalities can communicate each other without any interference. It consists of a series of connected devices that can share sensitive data to optimize performance. Objects having limited battery life, smile size and having an active processing speed monitor environment without any interference in the desired area of application. In education institutes IoT brought a revolution for the teaching and learning process. IoT made easy to control and coordinate activities of educational institutes and provides ease of usage.

1.2 PROBLEM STATEMENT

In the education and research field modern trends of teaching and learning have been introduced all over the world. Technology like E-learning and IoT made a revolution in research and development. It is important to make an aware educationist other than the IT & computer science field to introduce the latest methods of learning and teaching.

1.3 RESEARCH OBJECTIVES

- To understand the importance E-learning and IoT in Education
- To Explore methods and techniques of E-learning and ICT

2. LITERATURE REVIEW

Internet of Things (IoT) learning enhances the skills of students and provides easy observation to check out the performance of students. If staff is fully equipped and trained, IoT is the best source to increase the level of the student in their strong leadership. No doubt that it developed challenges, but it also reduces our working time and improved efficiency of work.

Aldowah and Rehman (2017) mention that the number of devices used in life to improve the life quality of an individual, different versions of a single thing is introduced day by day. IoT is leading different industries and several departments by its tremendous work. IoT is basically

helpful in the adaptation of new technologies and to improve the standard of working in different fields. Especially in education, it helps students to develop excellent outcomes.

Domínguez and Ochoa (2017) explain that IoT is actually learning for extraordinary time and it facilitates the long-time life learning. It increases the self-confidence of students and it allows students to learn according to their interests. Zhang (2017) states that the best thing about IoT is that it provides us network connection y the help of wire and without wire. It is feasible for students to work with wireless devices at anytime and anywhere because students are now able to carry their laptops and handheld devices with them.

Kaur (2017) elaborates that IOT brought revolution in the world of technology, sometimes when studying deep by using IoT it feels that talking is taken place with objects and devices. Even this condition leads to the extreme level at which it realizes that everything is communicated through the language which we can listen to.

Alkuhlani and Thorat (2015) states that whenever people have interaction with IOT many security issues are also faced by the people, sometimes it lost the whole work done by an individual and it develops the need for security threats. People who are using the internet of things must have solutions at the time of the problem.

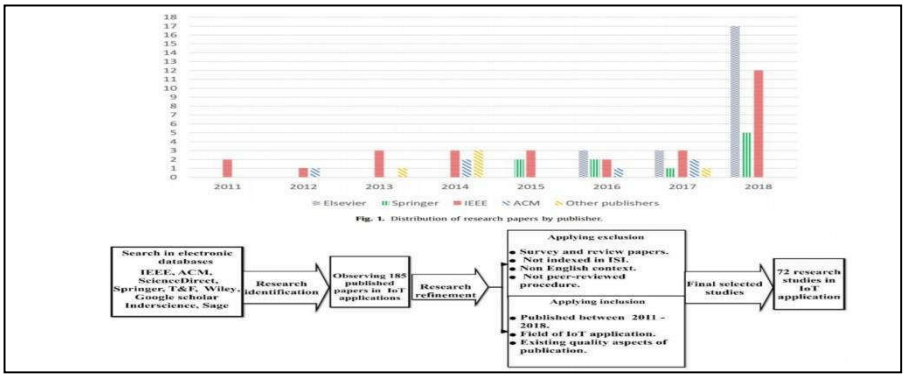

Fig 1: Shows the distribution of research papers by publishers (Parvenah 2019)

3. MODERN TRENDS OF IT USED IN EDUCATION

Technology introduced different teaching and learning modes included, Multimedia Usage, blogs exploring the qualitative educational research, distance learning (open learning), online courses, video training programs and E-Learning. These modes of learning have been following by

different universities with more effective way by the implementation of ICT modern trends. Each of them is discussed in detail below.

3.1 Multimedia Usage

Multimedia is a source of improving teaching and learning skills in a systematic and organized way. The paradigm shifts from teacher-centered to student-centered and offers a great deal to change the old traditional methods. It bases on instructional procedure which changes pointless sense information into data. Our sensing organs in relationship to mind form an impressive framework by the usage of multimedia. The significant difficulties are outlining direction through media and its application for enhancing human learning for target learning. The implementation of multimedia is effective and can prove equal to the task.

3.2 Distance Learning (Open Learning)

Distance learning is a method for adapting remotely without being in normal up close and personal contact with an instructor in the classroom. For created nations, it is extremely hard to give formal instruction to each person. Separation instruction is getting increasingly significance. In separate training instructor and students remain far from each other yet stay in contact with each other through features of media. In spite of the fact that instructors and understudies are absent at a similar place in this framework, yet with arranging they stay near each other. At display the AIOU offers distinctive courses and a more elevated amount of degrees up to Ph.D. Henceforth keeping in see the instance of Allama Iqbal Open University Pakistan it might be guaranteed with certainty that the University has demonstrated its potential in the conveyance of instruction at the more elevated amount.

3.3 Online Courses

There are many online courses through which learning availability is very easy. Online courses facilitate learners with a remarkable approach. Because people who are busy in their jobs and homes they are able to continue their studies online. In Pakistan many universities offering online courses for professional development. These courses based on exercises after the end of each lesson, by attempting them and completing the final exam it is decided that a person is eligible for a certificate/degree.

3.4 Video Training Programs

As compare to communication-based on text, videos are considered a more reliable source of understanding. It reduces the cost of traveling for face to face communication especially when people are at different locations. It is affected in enhancing thoughts, ideas, behavior, and mental attainment. The video additionally enables members to learn at their own pace with the chance to rewatch anything they missed. It is said that individuals recall just 10% of what they hear, 30% of what they read, and 80% of what they see. Beyond any doubt, video is fundamentally visual, yet it really fuses an assortment of learning styles.

3.5 Technical Learning (E-Learning)

Technical learning or E-learning is a way by which people get benefits as it is mini software which we keep in our phones and electronic devices too. In the old era this technique was not so much known by the people as with the passage of time, when the people come across the development of the generations of the computer, they entered into the new era of technology and their way of learning is enhanced day by day. As the development of the apps is increasing and utilize by downloading in cell phones, computers, tablet and laptops. This help people by giving them greater advantage in less time, this means less investment more advantages.

Fig 2: E-learning in education

4. METHODS OF E-LEARNING

Today's learner needs to authenticate information within a short span of time. This needs rapid methods to satisfy modern learners. E-Learning methods are divided into different sections. A lot

of content types are there that focus on E-learning. These are designed on the basis of the learners' needs. Learner-centered content should be according to the needs of learners. This will facilitate the learners and they will focus on their targets. Information delivering methods and techniques are designed in such a way that the learning engages in the content whatever it is delivered. Interactive content using different technology-integrated tools are needed to satisfy the learners. Learners' interests and needs are the basic requirements. Different learners' pyramids help learners to find different ways.

Many methods of E-Learning are created with the latest technology that suits modern workplaces. In the last few years e-learning has brought revolutionary changes and lifelong learning. Mohammadyari and Singh (2015) highlighted that the utilization of information technology is improving the quality of learning and teaching. E-learning utilizes internet technology to promote learning, information, skills and also diverts the chances for learners and instructors. The instructors provide online stuff to the students and assist the learners without meeting physically. In the 21st century, e-learning promotes adhere, comprehensive and empirical oriented structure for learners. Garrison (2016) mentions that the modern era provides practical models that pedagogues utilize them to understand the influence of e-learning. A large portion of the eLearning techniques are Synchronous and Asynchronous in nature, it relies on the student's need and the learning destinations you choose.

Synchronous occasions occur progressively. Synchronous correspondence between two individuals expects them to both be available at a given time. Instances of Synchronous Learning are talk and IM, video and sound meeting, live webcasting, application sharing, whiteboard, surveying, and virtual classrooms. Asynchronous occasions are time-free. A self-guided course is a case of Asynchronous Learning in light of the fact that web-based learning happens whenever. Email or talk discussions are instances of offbeat specialized apparatuses. In such cases, understudies in a perfect world complete the course at their own pace, by utilizing a Learning Platform like an LMS. Instances of Asynchronous Learning are Self-paced (SCORM), Audio/Video, E-mail, Discussion gathering, Wiki/Blog, Webcasting/Conferencing, CBT and WBT, Simulations, Game-based learning.

4.1 Self-Paced

Self-paced learning enables the student to search and work properly by using Wikipedia, Blogs and from different sources, they utilized achieved material in a systematic way to prepare their

presentations and worksheets for learning purposes. Self-paced knowledge is also called self-assessment because it helps the student in a broader way to keep their work in a perspective manner.

4.2 Auditory/Recordings

Technical learning is very helpful in seminars as we can approach the scholar person to live and records their speeches for later use. It is another policy in terms of verbal and face to face communication. This is the basic approach for students to achieve their goals by learning in a systematic way.

4.3 Blended E-Learning

This consolidates both the Synchronous and the Asynchronous methods for learning. Some preparation, as delicate aptitudes or deals preparing, must have an up close and personal part so as to be really significant. A mixed methodology works best here - where the study hall is used to direct activities and cooperation's. These activities can't be led in eLearning conveyance as friend association is constrained. Short e-courses can be made to enable students to set up a foundation for the exercise before they come to class.

4.4 Learning by Cell Phone

The cell phone is the cheapest and most reliable device. It provides access to the internet and connects with the world. It has the capacity to hold data in it and many of the books can be installed in it, which helps the learner to save money and time. The smartphone is also used as a projector and multimedia. It is used for audiovisual learning purposes. The individual can store their presentations of business, lectures for students and huge project accessories that are also done by the help of this small device called a smartphone. According to the present time, this technology has vast effect on the learning environment.

4.5 E-Learning by Social Discussion Gathering

The effect of online networking is solid and it tends to be used for corporate learning too. An ever-increasing number of associations understand the genuine intensity of social learning and urging their representatives to interface more inside themselves and other similarly invested individuals. Representatives team up and organize on social stages to talk about issues, inquiries, and encounters. Social coordinated effort stages are likewise worked inside the LMS so the

students don't need to talk about on open stages and the taking in which rises up out of common joint effort dwells and develops inside the LMS.

4.6 E-Learning by Games

In the past, Games were not valid for educational purposes, but now as time is passing day by day the advancement has been seen in E-learning gaming. For instance games like word shuffling; jumble words etc. are part learning according to modern technology use in education to develop the vocabulary of students. Gamification improves the learning skills and abilities of the learner. Understudies take the game as fun so, this is the source of knowledge for students. Beside that different competition are organized for students in which they actively participate and learn new things with pleasure.

4.7 Technology Based Learning

E-learning refers to technology-based learning in which technology is integrated with delivering resources. E-Learning sound has been reaching on our ears for a decade. E-Learning is the integration of electronic resources with traditional learning. Modern learners don't want to limit the learning within the boundary of classrooms but they need it formally as well as informally. The quick developments in technology and progress in learning systems pushed the masses towards a new era where they demand things on an urgent basis. In that age it has been flourished in multiple dimensions. It is the base of almost all business as well as for learning techniques. Old techniques have been replaced with modern techniques.

In this age, the electronic educational stuff has taken the place of books. Youth needs things quickly without going physically in libraries. Youth don't rely on assumptions but they have their own technological tools to verify and authenticate the information. E-learning is considered as a virtual mentor as it creates an atmosphere in which the electronic and digital technology in well-structured discipline is synchronized. Learners take more interest in such an environment. A teacher is limited to the classroom only but through electronic learning, learners don't need help from the teachers every time.

Zhang et.al (2018) noted that traditional methods of learning are replaced with e-learning. He further elaborated that e-learning has decreased the stress upon the students which they take in

the classrooms because a learner in the traditional classroom knows that only the classroom is the place of learning, however, the e-learning system rejected this concept in such a way that a learner can learn things at home. Nowadays interest in e-learning is increasing with the passage of time because of its advancement and involvement in education.

4.8 E-Learning Modes Characteristics

Mode of learning	Characteristics	Advantages	Disadvantages	Applications
1.Blended Learning	Synchronous and Asynchronous	Pave the way to integrate the teachers and students	Lack of confidence due to not face people.	Used in formal and non-formal education.
2.Electronic Whiteboards	Electronic whiteboards are interactive.Project a diagram from a laptop onto the board.	Whiteboards are used to teach Mathematics, Languages, Social Studies, and Sciences. They also used for group discussion.	If lead to group learning, People rely on a single person for their work.	Teachers use it draw different diagram from their laptops to white boards.
3.Flipped Learning	This technology connects students personal computers to school server	Students use this technology to watch lectures and discuss with teachers and themselves.	Mostly students waste time in other internet activities by involving themselves in games and social networks etc.	This is a connection between students and teachers. This technology is used in large class rooms.
4.Projectors	Provides large screen	Teachers use this in large class rooms in order to cover large number of students.	Back benchers feel difficult to see, Students with low eyesight also not able to view.	Used in smart class rooms. Lectures are delivered with visual facility.
5.Videoconferencing Classroom	Provides opportunity to attend different seminars, sessions and lectures sitting in different geographical positions.	Students get lot of information through online courses etc. Foreign lectures are also delivered by foreign faculty through this mode.	Sometimes it is difficult for students to understand the proper knowledge of the video due to the continuity of video.	Different applications are used like Skypeetc. to conduct the lectures visually. Different sessions are organized from foreign faculties.

6.Mobile Learning	Learning isn't limited to class rooms. Different devices are used like iPod, tablets, android phones to learn everywhere.	This is the easiest mode learning. No matter where the geographical position of the students is; but they learn every through mobile devices.	Mobile learning is harmful to health due to the posture in which you are using phone.	It is the easiest way to deliver the knowledge through mobile devices like iPods, tablets, mobile phones etc. learning has become so easy. Digital library is in the hand of students.

Table 1: E-learning modes characteristics

5. CHALLENGES USING IOT AND E-LEARNING

Technology-based learning provides a lot of modern learning modes. IoT and E-Learning have brought revolution in education however lot of challenges are there in promoting technology applications in the real world. Those challenges include:

5.1 Lack of Sufficient Training

Training provides an opportunity to avail of the expertise and skills. Every technology requires proper training to take the fullest advantage of technology. Technology has made people so busy that they are striving for better things in a short time. This will only possible with the proper use of technology in short time otherwise it will waste the time. Wang, Y. (2019) said that lack of sufficient training in IoT and E-Learning has created hindrances in front of people. This is the reason that we are still in a struggling position in technology.

5.2Unawareness of technology

The population of Pakistan is divided into rural and urban. Rural areas are still unaware of technology-oriented applications. It is a big challenge in promoting the advancement of technology. This is the reason that people have a fear of new technology like robotic advancement, artificial intelligence. Briz (2015) opined that people are fearful that with the integration of technology in education the human efforts will reduce resulting in unemployment will increase. This is unawareness of technology as Stephen Hawking said "People are afraid of technology but it is under the control of man like on or off the machines"

5.3Internet of Things Usage Cause Health Damage

It is also a big challenge in the propagation of technology. Reyna and Soler (2018) noted that Continuous use of technology makes people habitual of such things may cause health hazards. Farahani, et.al (2018) highlighted that continuous use of the computer may cause many vision issues, neck strain. It has also a lot of impacts on mental and physical health. New researches have acknowledged that technology has become the cause of depression because the people spent most of the time with technology and social contacts decrease.

5.4 Government Support in ITSkills Improvements

The government plays a vital role in providing opportunities to enhance technology-oriented skills among the masses. The lack of support decreases the interest of people towards the technology side. Mahmood (2019) noted that a great step taken by the government to integrate ICT in education provided opportunities for the learners and teachers. But due to lack of interest in that area has not brought fruitful results in education. The main reason behind this failure was the lack of interest in Government.

6. CONCLUSION

On the whole, this study is exploring E-learning and IoT implications in Education and research development. E-learning modes are discussed in detail which can be more effective for readers. This study is purely related to E-learning and IoT tools and techniques which encourages educationists to implement modern trends of education and research. The importance of IoT devices and tools are important area of concern these days to furnish technical and professional skills.

References

1. S. Cuomo, P. De Michele, A. Galletti, and F. Piccialli, “A Cultural Heritage Case Studyof Visitor Experiences Shared on a Social Network,” Proc. - 2015 10th Int. Conf. P2P, Parallel, Grid, Cloud Internet Comput. 3PGCIC 2015, pp. 539–544, 2016

2. Aldowah and Rehman(2017, September). Internet of Things in higher education: a study on future learning. In *Journal of Physics: Conference Series* (Vol. 892, No. 1, p. 012017). IOP Publishing

3. Domínguez (2017, April). Smart objects in education: An early surveyto assess opportunities and challenges. In *2017 Fourth International Conference on democracy&government (ICEDEG)* (pp. 216-220). IEEE.

4. Zhang (2017, June). Exploration of blended teaching pattern based on star and smart classroom. In *2017 International Symposium on Educational Technology (ISET)* (pp. 3-7). IEEE.

5. Kaur (2017). Internet of Things: a review on technologies, architecture, challenges, applications, future trends. *International Journal of Computer Network and Information Security*, *9*(4), 57.

6. Alkuhlani (2015). Internet of Things (IOT) standards, protocols and security issues. *Int. J. Adv. Res. Comput. Commun. Eng.*, *4*(11), 491-495.

7. Swamy(2017, February). Security threats in the application layer in IOT applications. In *2017 International Conference on I-SMAC (IoT in Social, Mobile, Analytics and Cloud) (I-SMAC)* (pp. 477-480). IEEE.

8. Arkorful(2015). The role of e-learning, advantages and disadvantages of its adoption in higher education. *International Journal of Instructional Technology and Distance Learning,* 12(1), 29-42.

9. Mohammadyari (2015). Understanding the effect of e-learning on individual performance: The role of digital literacy. Computers & Education, 82, 11-25.

10. Sarwar(2015). Impact of eLearning perception and eLearning advantages on eLearning for stress management (Mediating role of eLearning for corporate training). Pakistan Journal of Statistics and Operation Research, 11(2), 241-258.

11. Garrison, D. R. (2016). E-learning in the 21st century: A community of inquiry framework for research and practice. *Routledge.*

12. Gros (2016). Future trends in the design strategies and technological affordances of e-learning. Learning, Design, and Technology: An International Compendium of Theory, Research, Practice, and Policy, 1-23.

13. Al-Samarraie(2018). E-learning continuance satisfaction in higher education: a unified perspective from instructors and students. Studies in higher education, 43(11), 2003-2019.

14. Reyna, A., Martín, C., Chen, J., Soler, E., Díaz, M. (2018). On blockchain and its integration with IoT. Challenges and opportunities. Future Generation Computer Systems, 88, 173-190.

15. Farahani, B., Firouzi, F., Chang, V., Badaroglu, M., Constant, N., Mankodiya, K. (2018). Towards fog-driven IoT health: Promises and challenges of IoT in medicine and healthcare. Future Generation Computer Systems, 78, 659-676.

16. Wang, Y. (2019). Exploration and Practice of Digital Media Technology in Innovation and Entrepreneurship Training Program.

17. Briz-Ponce, L., García-Peñalvo, F. J. (2015). An empirical assessment of a technology acceptance model for apps in medical education. Journal of medical systems, 39(11), 176.

18. Mahmood, M.,Weerakkody, V., Chen, W. (2019). The role of information and communications technology in the transformation of government and citizen trust. International Review of Administrative Sciences, 0020852318816798.