

Promises and Challenges of IoT in Education

Dr. Muhammad Safdar
Directorate of Distance Education
International Islamic University
Islamabad, PAKISTAN
safdar.phdedu34@iiu.edu.pk

Gulfam Ali Safdar
Faculty of Engineering and Technology
International Islamic University
Islamabad, PAKISTAN
gulfam.bsme372@iiu.edu.pk

Dr. Amtul Hafeez
Assistant Professor
Faculty of Education
Allama Iqbal Open University
Islamabad, PAKISTAN
amtulhafeezch@yahoo.com

Dr. Muhammad Abdul Malik
Faculty of Education
Preston University
Islamabad, PAKISTAN
muhammad.abdul83@yahoo.com

Abstract

Internet of Things (IoT) in education is a hot topic and is getting ever increasing popularity over the globe because it is effective, quick, dynamic, empowering, individual and comprehensive. IoT has also posed some vital challenges to students, educators and administrators. Main purpose of the study was to assess the role of IoT in education. Moreover, issues and challenges regarding IoT in education were also analyzed in this study. A sample of 200 faculty members and PhD scholars was taken randomly. A questionnaire on five points Lickert scale was used as a research tool for the collection of data and its reliability was .86 (Chronbach's Alpha). Collected data were analyzed through SPSS XVIII. The study revealed that IoT helps in shaping smart lesson plans, smart classrooms and smart campuses. This technology allows connectivity of students and educators around the globe. IoT reduces gender disparity and increases students' engagement and teachers' efficiency. This technology promotes collaboration and creativity, enhances access to information, improves safety and enriches teaching learning process. Though this technology helps in improving performance of education system yet some challenges and issues were also witnessed in this study. Lack of financial resources, development, complexity and implementation of IoT, ethics, trust and privacy, quality and data security were major challenges of IoT in education.

Keywords: IoT in Education, Improving Performance, development and implementation of IoT

INTRODUCTION

Rapid advancement in Information and Communication Technologies (ICTs) has revolutionized every aspect of human life especially education and training. Recent developments in these technologies have provided foundations for Internet of Things (IoT) and Internet of Everything (IET). IoT has potential for making things smarter and more connected and resultantly, attaining ever increasing importance in every walk of life. Interestingly, students of kindergarten class are using their own smart phones

connected to the Internet as IoT in the developed countries (1).

IoT helps in improving quality of teaching learning process by providing students an engaging, collaborating, and content creating environment. It has promoted collaborative teaching learning process. It also helps students in creating smart learning environment. Similarly, IoT helps teachers in teachers in preparing smart lesson plans and providing personalized content and understanding students' learning aspects and performance. This system has introduced new channels of communication and is equipping students with 21st century skills.

Both teachers and students can use IoT devices in classrooms for the improvement of teaching learning process. Students can get guidance and help from their teachers for the solution of their academic problems during this unique interaction with teachers. IoT system is very beneficial for students during their remote presence without any gender disparity. This system has enabled students to learn at any place and at any time inside the campus or outside the campus.

It has promoted personalized learning by watching lectures at their own choice and again and again. It increases efficiency of institutions, buildings, classrooms, students and even administrators due to its connectivity characteristics (2). Students and teachers can get advantages of IoT devices such as interactive white boards, tablets, smart phones, e-books, 3D printers, virtual and augmented reality headsets, sensors, fitness bands, cameras and videos etc. The IoT devices make their learning process faster, efficient and effective (3).

IoT equipments increase efficiency of students, teachers and administrators by providing them comfortable environment. IoT devices are very helpful in record keeping and record provision for students, teachers and the administrators as well (4). This

system also saves time of students, teachers and administrators by ensuring quick feedback system among them.

Different parts of the building can be watched and monitored by central connected system. However, these devices can reduce the cost incurred by an institution by turning off the lights, cooling or heating systems automatically (3). Surveillance system of the institution can be developed effectively and efficiently by proper connectivity.

In this way, need for security personnel decreases and consequently proves cost effective system. Several studies have expressed benefits of IoT in the following ways:

- Wireless storage of lessons, assignments and grades
- Efficient accountability of students
- Enhanced student performance
- Improved physical security
- Efficient management of energy
- Promoted collaboration students and teachers
- Controlled availability and mobility
- Increased connectivity Increased interactivity during teaching learning process
- Effective organization and improved safety measures
- Performance optimization
- A single connected network
- Increased co-curricular activities
- Real world experience and learning opportunities
- Faster learning
- Efficient job performance by teachers. (1), (5) & (6)

Financial resources play crucial role in the integration of IoT devices and equipment in classroom environment. Sufficient budget will allow usage of suitable IoT paraphernalia. In this system, data is collected, stored and shared among students and teachers through a network of connected devices and sometimes, due to security breach, students' personal information are disclosed to other people. High-speed connectivity is required for audio and video streaming of lectures and materials.

Proper management of IoT devices for all users is another challenge for the institution. During the integration of IoT devices in education, several difficulties like financial resources, development, complexity, implementation and availability of devices, teachers training, sufficient bandwidth, reliable Wi-Fi connectivity, web analytics, trust, privacy, security and ethics etc. have been witnessed during different studies (7). Along with the above mentioned benefits, researchers have also expressed following challenges and issues of IoT:

- Security and Privacy
- Reliable Wi-Fi Connection

- Management Expressed information may be misused.
- Cost
- Ethics
- Network bandwidth
- Web analytics
- Availability of devices for students
- Teacher training. (7), (8), (9) and (10)

MAIN PURPOSE OF THE STUDY

Main purpose of the study was to role of IoT in education was assessed. Moreover, this study was conducted to ascertain the problems and challenges arise during the use of IoT system in education.

1. RESEARCH METHODOLOGY

It was a descriptive study and survey approach was considered appropriate for the collection of data. This study was conducted in Islamabad (the capital of), Pakistan. A sample of 200 faculty members and PhD scholars in the faculty of education and faculty of social sciences from International Islamic University Islamabad and Allama Iqbal Open University Islamabad was taken randomly. A questionnaire on five points Lickert scale was used as a research tool for the collection of data. Focus of the research tool was on role of IoT in education and challenges arise during the use of IoT in education. The questionnaire was validated and its reliability was .86 (Chronbach's Alpha). Data were collected personally and analyzed through SPSS XVIII.

DATA ANALYSIS

Collected data were fed into SPSS spread sheet and verified. The data were analyzed through SPSS XVII version by running percentages, mean scores and t-test formulas.

Table 1: Significance of difference between the mean scores of male and female respondents

| Group | Number | Mean | Std. Deviation | df | t-Value |
|--------|--------|---------|----------------|-----|---------|
| Male | 100 | 11.3800 | 3.3022 | 198 | |
| Female | 100 | 10.9700 | 2.0863 | 198 | 1.050* |

*Not Significant

Table Value at 0.05=1.97

Table 1 shows that the value of t (1.050) was found lesser than the table value of t (1.97) at 0.05 levels. Therefore, there was no significant difference between the mean scores of male and female respondents on role of IoT in education. Hence, both the groups have similar opinions about IoT in education.

Table 2: Significance of difference between the mean scores of faculty members and research scholars

| Group | Number | Mean | Std. Deviation | df | t-Value |
|-------|--------|---------|----------------|-----|---------|
| Male | 100 | 11.5800 | 3.2020 | 198 | |

| | | | | | |
|--------|-----|---------|--------|-----|--------|
| Female | 100 | 10.9900 | 2.0820 | 198 | 1.056* |
|--------|-----|---------|--------|-----|--------|

*Not Significant
Table Value at 0.05=1.97

Table 2 shows that the value of t (1.056) was found lesser than the table value of t (1.97) at 0.05 levels. Therefore, there was no significant difference between the mean scores of faculty members and research scholars on role of IoT in education. Hence, both the groups have similar opinions about IoT in education.

Table 3: Significance of difference between the mean scores of IIUI and AIOU personnel

| Group | Number | Mean | Std. Deviation | df | t- Value |
|-------|--------|---------|----------------|-----|----------|
| IIUI | 100 | 11.0500 | 3.4020 | 198 | |
| AIOU | 100 | 10.9900 | 3.0503 | 198 | 1.055* |

*Not Significant
Table Value at 0.05=1.97

Table 3 shows that the value of t (1.055) was found lesser than the table value of t (1.97) at 0.05 levels. Therefore, there was no significant difference between the mean scores of IIUI and AIOU personnel on role of IoT in education. Hence, both the groups have similar opinions about IoT in education.

DISCUSSION

This study was conducted to examine the role and challenges of IoT in education. Results of this study revealed that majority of the respondents have awareness of this system. This system is attaining ever increasing importance. It prepares students according to the needs of 21st century.

IoT is very interesting and valuable for students and teachers. These results are aligned with the studies of (1), (3) & (7). These studies also found that IoT is getting popularity very swiftly. This system is very important for both students and teachers. IoT ensures to equip students with 21st century digital skills.

It engages students and promotes environment of collaboration among students. It helps students in developing creativity skills. These findings are similar with results of the studies conducting on the role of IoT by (1), (3), (4), (6) & (7). These studies revealed that IoT promotes communication, cooperation and collaboration among students and teachers as well. This system is promoting smart classrooms, smart campuses, smart institutions, smart lesson plans and smart e-learning environments.

Similarly, IoT helps teachers in teachers in providing personalized content and understanding students' learning aspects and performance with the help of IoT devices. It has changed the ways of communication among students. These results are aligned with the studies conducted on role of IoT by (1), (3), (4) (7) and (12). These studies revealed that

IoT has potential to make things smarter, effective and efficient. This system has promoted connectivity hence; it is very useful for students living in remote areas without any gender disparity. This system has disseminated distances among students and institutions. Due to this opportunity they can learn at any time and at anywhere.

These findings are similar with the results of the studies conducted on role of IoT by (1), (2) & (4). These studies also found that IoT has capability to connect the people of scattered and far flung areas and offers education at their threshold.

IoT devices make their learning process faster, efficient and effective. IoT equipments increase efficiency of students, teachers and administrators by providing them comfortable environment. Same was revealed by (3), (5), (7) & (12) in their studies conducted on the role of IoT in education. These studies affirmed that use of IoT devices increases the efficiency of students, teachers and the administrators as well.

This system also saves time of students, teachers and administrators by ensuring quick feedback system among them. Similarly, (4) & (12) in their studies conducted on the role of IoT in education found that IoT ensures prompt feedback and saves time of all the stakeholders. IoT devices are very helpful in record keeping and record provision for students, teachers and the administrators as well. Similar findings were revealed by (4) conducted on the role of IoT in distance education. This research found that IoT devices are very useful for preparing, keeping and providing records of institutions.

Different parts of the building can be watched and monitored by central connected system. Moreover, these devices can reduce the cost incurred by an institution by launching an automatic control system of turning off the lights, cooling or heating in the institutions. IoT devices enhance efficiency of surveillance system.

Monitoring of the campus by IoT paraphernalia decreases the need for security personnel and consequently becomes cost effective system of education. These results are in line with the studies conducted by (3) & (7). These studies affirmed that IoT devices enhance surveillance system of system at low cost. Integration of IoT modern and advanced paraphernalia require huge amount of money which is really a big challenge for developing countries. Similarly, (7) & (8) revealed that establishment of IoT based educational system is costly. Another difficulty arose during the study was proper management of IoT paraphernalia.

Due to enormous data trafficking, there is danger of security breach of personal information of students. These results are aligned with the studies conducted by (2), (7), (8) & (12). These studies found that privacy was a challenge during immense data

trafficking. This study revealed that keeping trust and ethics was a serious problem for all the stakeholders. These results are aligned with the studies conducted by (9) & (10). These studies also confirmed serious concerns about trust, privacy and ethical issues and problems.

CONCLUSION

Internet of Things is increasing at unprecedented and unparalleled pace especially in developed countries. High speed connectivity with modern digital devices has enabled IOT to revolutionize every aspect of life. Undoubtedly, it is swift, dynamic, empowering and effective. This system empowers students, teachers and administrators. IoT enriches teaching learning process improves student's performance and enhances quality of education. Resultantly, this system is changing the development direction of higher education around the globe. Though it has wonderful uses yet there are many challenges in the integration of IoT in education especially for developing countries. For getting maximum benefits from IoT in education, attention may be given to the solution of ethics, trust and privacy challenges.

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