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## Use of Internet of Things to Improve Educational Environment

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### ABSTRACT

IoT (Internet of Things) is being used in different contexts, there are so many applications used for different purpose such as the education, medical, homes, cities, industry and global environment and so on, but this study focused on IoT in education. IoT is a part of information technology in which various types of objects and methods communicate with each other to exchange information. The main purpose of IoT is to transform the objects of real world into virtual objects. From the literature review, it is observed that researchers still report a lot of problems faced by students and teachers in education. So the purpose of this research is to find problems in school education and then solve with the help of IoT technology. In this study to identify problems of education and limitation is this study only in Nawabshah schools through focus group discussions from students, teachers and administration staff. After investigation of identified problems an IoT base framework is proposed which solves different problems of education through IoT tools. In this framework an IoT end device placed in campus which done all works automatically without human intervention. This device consists of some online system tools, camera system an GPS (Global Positioning System). It is concluded from this study that technology is very important tool for all the sectors of society, no any sector gives best performance without the help of technology. From education perspective IoT gives a lot of benefits to the educational organization, it helps in increasing performance of education institutions; enhance quality of education, saving time and budget and so on.

**Key Words:** Internet of Things, Role of IoT in Education, Technology Enhanced Learning

### 1. INTRODUCTION

In smart technology the things are connected with each other anywhere and anytime through internet. These connected devices communicate and then share information for further processing. This entire concept is known as IoT. In 1999 Kevin Ashton is the first person who used this term, then many researchers defined the term of IoT is different ways like: Internet of people, Internet of data, Internet of anything, Internet of everything, Internet of sign [1-12].

According to Cisco, IoT is the network in which physical objects are connected and also used the term Internet of everything for both physical and virtual objects. For

making network connection more valuable IoT brings together the people, process, data and things, which create new opportunities, capabilities and good experience for businesses, education and medical and so on [13].

IoT play a vital role in the improvement of education. It is also known as a technological solution. Educational system is incomplete without the help of IoT technology because this technology gives a lot of benefits to the education system like: paperless environment, providing a helping aid to teachers and students, enhancing the performance of students, enhance the professional development of teachers, enhances the architecture of the educational organization, improve the quality of education, create a secure environment, brought changing in the standard teaching execution from school to university level, save time and budget of the school and so on [13].

It also allows the teachers and students to communicate with each other and share information just like: test result, annual examination result, checking upcoming events and so on. IoT also provide a secure network in which students save your specific ideas with full confidence without any worrying. Before coming of IoT the system of education is directionless. IoT gives a shape and particular direction to the education system and removes all the barriers in the field of education system which create difficulties for students and staff members [14].

### 2. RELATED STUDIES

Meola [15] provides a report about IoT education. According to author IoT has improved the quality of education it plays important role for educational up gradation and improvement from schools to university level. It facilitates the educational infrastructure in such a way that through this technology the process of teaching and learning become more enhanced. IoT is not only helps students, teachers but also changes the complete infrastructure of educational sector. Hence now education is far from the area of our lives that the IoT will transform. In the coming years not only the education but energy, medical transportation, homes, medical etc will all feel the touch of the IoT.

Augur [16] provides a daydream idea about IoT in education that in what way improved the education through IoT, which resources, ways and road maps provides by IoT for enhancing the teaching and learning. In what way it facilitate the parents to check status of students by viewing the class website what their child is

working on, they communication with teachers via email, and even they might evaluate child's attendance and grades via online systems and how IoT will be successfully integrated into the education system.

Peters [17] provides a report in which demonstrated the scope of IoT in education and how they fulfillment the requirements of student regarding learning, also described that the use of IoT in education is expected to increase due to the growth of online and blended educational programs as well as in traditional class rooms that increasingly use technology as a teaching tool.

Zeinab and Elmustafa [18] provide a review of many IoT applications and future possibilities for new related technologies in addition to the challenges that facing the implementation of the IoT. According to him, with the help of IoT technology the world will becomes smart in every aspects, every institute becomes smart. Just like: IoT will provide smart cities, smart healthcare, smart homes and building, smart education and so on.

Gul et. al. [19] provides the applications and usefulness of IoT in the field of education. Moreover, it tries to present the recent research works, challenges and impact of IoT in future education. Research is being conducted in designing IoT based teaching platforms including smart classrooms, smart labs and entire smart campuses. Studies have also been doing to investigate the usefulness of IoT based smart learning applications and still much more is left to study regarding IoT in education. Though there are various advantages of IoT in education but may have to compromise privacy and security. In the future new techniques may be introduced that can resolve all these issues.

**3. PROBLEM STATEMENT**

From literature review, it have been found in different studies still report a lot of problems faced by students in education such as taking attendance, security, checking behavior of students in classroom. Teachers and administrative staff are facing many problems present in the classrooms as well as in the school environment. So, in this situation it has been decided to explore the real issues in school education and to propose a solution to cope with the issues.

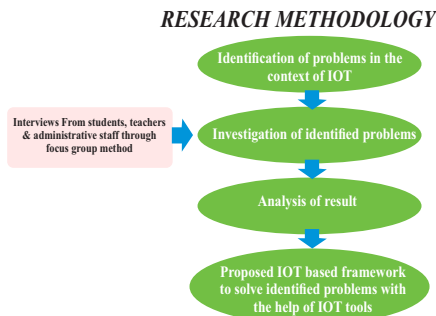


FIG. 1. IDENTIFICATION OF PROBLEMS IN THE CONTEXT OF IOT

**4. METHOD**

This study is aim to find the problems of school education and then solve these problems with the help of IoT technology as shown in Fig.1. These set of steps representing the methodology of the research that are going to be undertaken.

Problems of education are identified form the four phase in the context of IoT. There are so many problems in the school education which are faced by students, teachers and administration staff. From which some of them are mention in this paper and trying to solve through technology. These types of problems have been source of attraction for the researchers around the world for many years in the field of education.

Then Problems of education are investigated through focus group discussions from students, teachers and administration staff of Nawabshah schools. During government schools visit, meeting with headmistress and other staff members are arranged; main problems of the schools were discussed and informed the advantages of IoT technology. They were informed that the combination of IoT technology and education makes learning process faster and simpler, removes all the barriers in education such as physical location, languages and so on. Along with this technology improve the quality of education, save time and budget of the school and improve professional development of teachers and so on.

After investigation of identified problems an IoT base framework is proposed which solves different problems of school education with the help of IoT tools.

**5. EFFECT OF IOT ON SCHOOL SYSTEMS**

IoT is an excellent technology for all educational institutions because through this all school works done automatically within the seconds without human intervention. So this technology is also very necessary for all the government schools. Following Government Schools are visited.

- (1) Government Girls High School Afzal Shah, Nawabshah.
- (2) Government Girls High School Ghareeb Abad, Nawabshah.
- (3) Government High School Taj-e-Azam Colony, Nawabshah.
- (4) Government Boys Elementary School Awami Colony, Nawabshah.

During IoT base schools visit, meeting with principle, vice principle and other staff members are arranged; main problems of the school were discussed and ask them the advantages of IoT technology. Staff say that IoT is very good thing for the educational institutions because there are many benefits of this device in the school, through this

device not only enhance the quality of education but also improve the professional development of teachers hence students take interest in their studies and so on. Hence the facility of this technology is very necessary for all government and private schools as well.

Following IoT Base schools are visited

- (i) Kazi Jameel Public School, Nawabshah
- (ii) Fauji Foundation Model School, Nawabshah

**Existing Problems of Teachers:** Fig. 2(a-b) shows nine problems of school education. Section (a) consists of five problems and section (b) consists of four problems as under.

Section (a): According to survey Problem-1 “lack of quality education” has 50% frequency in government schools while IoT based schools have only 10%. Problem-2 “lack of professional development of teachers” has 65% frequency in government schools while IoT based schools have only 5%. Problem-3 “lack of teacher's innovation” has 70% frequency in government schools while IoT based schools have only 5%. Problem-4 “untrained teachers” has 55% frequency in government schools while IoT based schools have only 5%. Problem-5 “Lack of uniformity” has 70% frequency in government schools while IoT based schools have only 5%.

Section (b): Problem-6 “lack of teacher's dedication, motivation and interest in their profession” has 70% frequency in government schools while IoT based schools have only 5%. Problem-7 “overcrowded classrooms” has 95% frequency in government schools while IoT based schools is 5%. Problem-8 “education without direction” has 80% frequency in government schools while IoT based schools have only 0%. Problem-9 “smart interactive white board” has 90% in government schools while IoT based schools have only 50%.

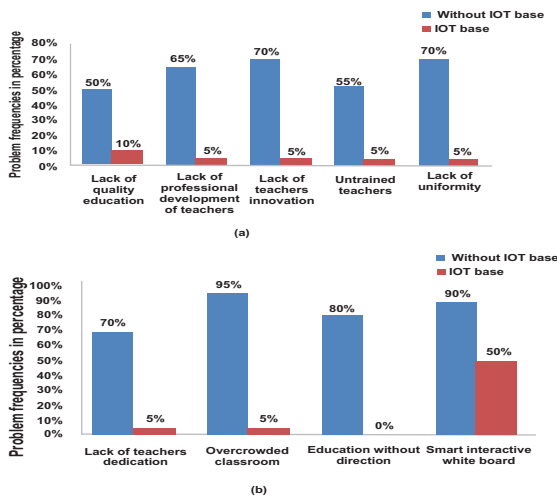


FIG. 2. EXISTING PROBLEMS OF TEACHERS IN SCHOOL EDUCATION

So the result shows that the minimum problem frequency in government schools was 50% in “lack of quality education” and the maximum problem frequency in government schools was 95% in “overcrowded classroom” while the minimum problem frequency in IoT based schools was 0% in “education without direction” and the maximum problem frequency in IoT based schools was 50% in “smart interactive white board” which faced by teachers.

**Existing Problems of Administration:** Fig. 3 shows six problems of school education. According to survey Problem-1 “Lack of funds” has 90% frequency in government schools while IoT based schools have only 10%. Problem-2 “Lack of resources” has 85% frequency in government schools while IoT based schools have only 5%. Problem-3 “Lack of proper planning” has 80% frequency in government schools while IoT based schools have only 5%. Problem-4 “uplifting administration” has 75% frequency in government schools while IoT based schools have only 5%. Problem-5 “Lack of physical facilities” has 60% in government schools while IoT based schools have only 10%. Problem-6 “High cost of education” has 55% frequency in government schools while IoT base schools have only 10%.

So the result shows that the minimum problem frequency in government schools was 55% in “high cost of education” and the maximum problem frequency in government schools was 90% in “lack of funds” while the minimum problem frequency in IoT based schools was 0% in “lack of proper planning” and the maximum problem frequency in IoT based schools was 15% in “lack of funds” which faced by administration.

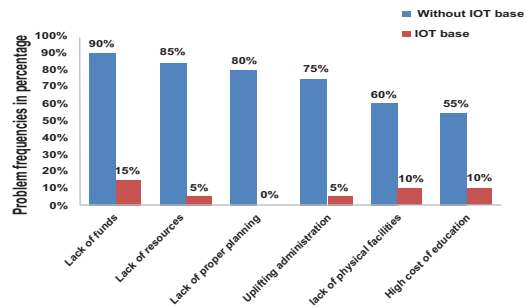


FIG. 3. EXISTING PROBLEMS OF ADMINISTRATION IN SCHOOL EDUCATION

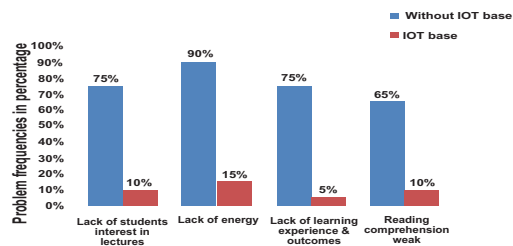


FIG. 4. EXISTING PROBLEMS OF STUDENTS IN SCHOOL EDUCATION



**Existing Problems of Students:** Fig. 4 shows Problem-1 “Lack students interest in lectures” has 75% frequency in government schools while IoT based schools have only 10%. Problem-2 “lack of energy” has 90% frequency in government schools while IoT based schools have only 15%. Problem-3 “lack of learning experience and outcomes” has 75% frequency in government schools while IoT based schools have only 5%. Problem-4 “Reading comprehension weak” has 65% frequency in government schools while IoT based schools have only 10%.

Study result shows that the minimum problem frequency in government schools was 65% in “reading comprehension weak” and the maximum problem frequency in government schools was 90% in “lack of energy”. While the minimum problem frequency in IoT based schools was 5% in “Lack of learning experience and outcomes” and the maximum problem frequency in IoT based schools was 15% in “Lack of energy” which faced by students.

**Existing Security Problems:** Fig. 5 shows two problems of school education. According to survey Problem-1 “Access door control mechanism” has 90% frequency in government schools while IoT based schools have only 10%. Problem-2 “war on terror” has 95% frequency in government schools while IoT based schools have only 10%.

So the result shows that the minimum problem frequency in government schools was 90% in “Access door lock control mechanism” and the maximum problem frequency in government schools was 95% in “war on terror” while the minimum problem frequency in IoT based schools was 5% in “Access door lock control mechanism” and the maximum problem frequency in IoT based schools was 10% in “war on terror” which faced by security staff.

## 6. ROLE OF IOT IN EDUCATION

IoT technology has an important impact on the field of education. IoT technology is playing a likely role for the improvement of education at all levels including school, college and university teaching. From student to teacher, classroom to campus, everything can get benefitted with

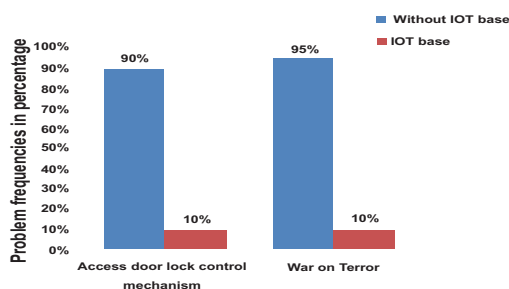


FIG. 5. EXISTING SECURITY ISSUES IN SCHOOL EDUCATION

this technology. It has greater importance for the education to make the learning experience smart and enhanced for the students. Thus IoT is making the transforming the education sector and providing the safe and sound learning environment for the students. The IoT has the potential to impact every aspect of student learning. It also helps in decision making, automatic execution and providing security features.

## 7. CONCLUSION

It was concluded from this study that IoT is very necessary for all the sectors of society but here in education perspective IoT helps to increase performance of the education system, enhance quality of education, helps in saving budget and time of the school. Additionally students, teachers, administrators and parents may see a range of other benefits which coming soon arising from this technology.

## 8. FUTURE WORK

In this paper, the importance of IoT has been explored in school education. In future, the similar study can be performed to explore the problems of students and teachers in universities and colleges education as well.

## ACKNOWLEDGEMENT

Authors are thankful to the Quaid-e-Awam University of Engineering, Science & Technology, Nawabshah, Pakistan, for providing facilities to conduct this research paper.

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