



## Internet of Things (IOT) as Future Education

<sup>1</sup>Dr. Sheeraz Ahmad Peerzada , <sup>2</sup>Dr. Tahir Ahmad Shiekh

*Department of Education, Jammu and Kashmir, India*

<sup>1</sup>[sheerazmphil@gmail.com](mailto:sheerazmphil@gmail.com) <sup>2</sup>[ShiekhTahir2@gmail.com](mailto:ShiekhTahir2@gmail.com)

### Abstract

*Covid 19 pandemic and continue of schooling became impossible in usual class room environment .The Implementation of Internet of things (IoT) in the field of education became need of hour. It is a best time to introduce innovative digital technology for learning activities. The Internet of things introduces certain objects things also known as IoT devices. The main goal of Internet of things in education is make learning easier and comfortable at remote locations.*

*Internet of things has introduced the concept of mobile and remote e-learning, which has proved beneficial for both educators and students. It has helped re-direct the face of education in the right direction, where more focus is given on student's learning plan instead of classroom attendance.*

**Keywords: Digital Technology, IoT, E-Learning, Digital class room, ICT, ICT Enabled Learning.**

### 1. INTRODUCTION

The education sector can take greatest advantage of the increased use of technology, especially the Internet, in delivering the educational product. Distance learning via the Internet will drive tremendous growth (Cappelli, 2003). Usage of new technologies, internet and e-learning in education especially in educational programs, can increase speed of development, and educate citizen familiar with ICT and needs of living in 21 century.

### 2. Literature Review

The Internet of Things, or IoT, refers to the billions of physical devices around the world that are now connected to the internet, all collecting and sharing data.

Thanks to the arrival of super-cheap computer chips and the ubiquity of wireless networks, it's possible to turn anything, from something as small as a pill to something as big as an aero plane, into a part of the IoT. Connecting up all these different objects and adding sensors to them adds a level of digital intelligence to devices that would be otherwise dumb, enabling them to communicate real-time data without involving a human being. The Internet of Things is making the fabric of the world around us smarter and more responsive, merging the digital and physical universes.

### 3. Example of an Internet of Things device

Pretty much any physical object can be transformed into an IoT device if it can be connected to the internet to be controlled or communicate information.



A light bulb that can be switched on using a smart phone app is an IoT device, as is a motion sensor or a smart thermostat in your office or a connected streetlight. An IoT device could be as fluffy as a child's toy or as serious as a driverless truck. Some larger objects may themselves be filled with many smaller IoT components, such as a jet engine that's now filled with thousands of sensors collecting and transmitting data back to make sure it is operating efficiently. At an even bigger scale, smart cities projects are filling entire regions with sensors to help us understand and control the environment.

#### **4. IoT and its impact on education**

Almost a decade ago, the term IoT (Internet of Things) began to circulate publicly, with the inherent promise of perfecting and idealizing our lives. Fast forward to the present, IoT is already showing its dynamic potential. Thanks to this new concept, every conceivable object, device and machine is now equipped with intelligent consoles, connected via multiple network and / or Internet channels that provide innovative communication and data collection techniques.

#### **5. IoT is, in its true sense, is unfolding the power of wireless connectivity.**

IoT technology has had a significant impact on our daily lives. It facilitates remote connection, thus enabling people to interact with machine and machine and human without any effort. Integrated home / office / car safety systems, mobile device management and instant energy storage devices improve our daily lives; not only in terms of high control and dexterity reduction by our endpoint but also in terms of high safety, optimum performance, power efficiency and cost saving value.

The most notable impact of IoT can be seen in the field of education and learning. Many colleges and universities have already realized its value and are embracing this technology due to many factors ranging from better information to updated security. Let's take a look at how IoT helps improve the education system, as we know it, better.

#### **6. Smart teaching plans**

IoT has introduced the concept of mobile and remote e-learning, which has proved beneficial for both educators and students. It has helped re-direct the face of education in the right direction, where more focus is given on students' learning plan instead of classroom attendance.

The students can now go to classes via live blogs and record one for a home tour. Teachers also find it easier to connect students and focus their attention on a more fun teaching strategy. External links also allow teachers to bring in students who have experts on other topics from different backgrounds to develop their own teaching plans that are tailored to the definition.

Online discussions have become an active part of the seminar; where students can engage with students and teachers from all over the world. This e-learning platform allows students to expand their access to important information and lessons. If students are not physically able to attend the class, they can learn, test and get teacher feedback via the web.



## 7. Improved campus safety

Student safety is a major concern for schools and universities around the world. Fortunately, the IoT also serves as a solution to this. There is currently a digitized ID card that helps governments identify where teachers, students and other employees are. A unique digitized ID or fingerprint can be used to accompany each guest. All information is stored on the server and can only be accessed by the necessary administrators, which also helps to overcome privacy concerns.

Similarly, the vehicle is made safer by installing a GPS system. These GPS systems allow authorities to track the location and route of school buses. In other words, school officials and parents can be sure that student safety will go to and from school.

## 8. Enhanced energy and cost efficiency

Integrated communication also allows consumers to reduce energy consumption by reducing costs for better maintenance opportunities. For example, if participants forget to turn off a computer, air conditioner, or lights before leaving the classroom, supervisors can easily control and do so with a single click from their mobile devices. Wherever they are right now, at the gym, at home or somewhere else.

In addition, this smart technology is designed to detect applied patterns and can be set to run seamlessly. For example, you can pre-program your devices to turn on and off automatically at specific times.

The costs saved in this way can help fill the budget and budget gap, allowing school/campus officials to spend more. to real-world educational activities, and to further improve the learning environment.

All in all, the IoT enables educators to do their jobs better and create a more dynamic and more dynamic learning environment. The IoT will last and there is no denying that we will see more and more schools being deployed in the coming years.

## 9. Scope of IoT for Education

When the coronavirus emerged, the education sector had long been using the technology. This significant change has also accelerated the industry's efforts to explore and adopt new technologies. It offers the ability to further assist and assist in efforts to provide quality education. This discovery has led to the emergence of a new and potentially new technology for the education sector: the Internet of Things.

Listed below are some of the key benefits of IoT for education to help explain why it is fast becoming an important tool for the industry.

### 9.1. Adaptive learning

IoT allows educational institutions to monitor student performance and collect relevant data. Then analyze to help teachers understand problem areas where students need more practice and then adapt the lesson and materials in ways that help.

### 9.2. Help students with disabilities

IoT helps students with disabilities use text-to-speech converters, VR headsets, etc. It helps them learn better at their own pace through machines. Oh, it also eliminates the need to develop different disciplines for this genre. Students, thus providing together for them.



## 9.3. Smart classrooms

IoT allows classrooms to be integrated with avant-garde technologies such as augmented reality, reality, and more. This facilitates an immersive learning experience, helping to increase the effectiveness of the activity through a variety of entertainment media. And if classroom equipment is connected to students 'and teachers' personal equipment, it will be easier to use traditional equipment in the classroom. a meaningful way, even beyond the classroom.

The IoT has a lot to offer the education industry. Before you rush to integrate it into your training offer, it is important to understand the key factors that affect the success of the IoT in this business.

1. **Policies:** IoT in this sector means a significant change in the current education system's fundamental structure. Hence, the support of policies is imperative for success. To boost the implementation of IoT in educational institutions, the relevant authorities must bring in policies aimed at accelerating and encouraging increased adoption.

2. **Security:** Given that the concept involves children and the internet, high levels of security are non-negotiable here. Plus, the general privacy concerns and security of sensitive data must be tended to as well. And the endeavors in this regard must not end at simple assurances to parents and the institutions that rely on such technology-driven solutions. Service providers must also set up and ensure strict implementation of appropriate measures to safeguard security and privacy while using their offerings.

3. **Integrity:** The final factor at play here is the integrity of the data, for which a carefully-curated selection of technologies is a must.

It is amply clear that IoT has a healthy future in the education sector. And any institution that intends to keep with the times and deliver A-grade education must adopt an education software solution fortified with technologies such as this one.

The development of information and communication technology (ICT) is making a difference in all areas of life, including the education system. At the same time, IoT (Internet of Things) is more important than ever in terms of the amount of benefits it brings to smart cities and the education system. Since March 2020, the COVID-19 epidemic has led to rapid changes in education and encouraged the integration of ICT into higher education. However, the IoT is still in its infancy in the education system and the impact of its adoption is not fully understood. This article aims to describe a smart learning environment and how much IoT contributes to this need. The paper presents and describes the most important benefits and challenges associated with the adoption of IoT in higher education. To analyze the impact of IoT use on the educational environment, the authors present an analytical model based on six concepts, including their data and information. These findings are evident in the context of a wide range of research data as well as the Romanian higher education system. The study aims to validate the modeling model and also ensure that the use of IoT is linked to communication within the university, attraction from other resources, training and education, training policies, as well as data security and dishonesty. The last part of the article focuses on the analysis of a set of research data and information organized therein. The article also contains key conclusions, guidelines and recommendations as well as



instructions for future research. It contributes to the development of future intelligent, professional and technical universities.

## 10. How Internet of Things Impacts Schooling

The Internet of Things (IoT) has already simplified our lives and bettered the healthcare industry by making it work more efficiently... So why not implement applications of IoT in education as well? It's the best moment to introduce innovative digital technologies into learning activities! Moreover, the first educational institutions to follow this trend are likely to become top market leaders. And being a leader means a lot in our time.

Of course, teachers (and sometimes students) remain skeptical about the Internet of Things; IoT solutions are still new and unfamiliar. However, they have a great future and bright prospects.

Let's take a look at examples of IoT in education and find out how these systems help schools and universities.

### Internet of Things: What Is It All About

In short, the IoT involves the interaction of certain objects (things, also known as IoT devices) with each other and with the outside world through Internet technologies. The main goal is to make our life easier, more comfortable, and relieve us from performing a number of routine monotonous tasks.

Anything has a chance to become an IoT (smart) device, any object, provided it can be connected to the Internet and transformed in such a way as to transmit information. The Internet of Things system processes and analyzes this information, then draws some conclusions based on it and takes the necessary steps to achieve the goal set (without human participation, but in our favor!).

There are all kinds of smart devices, from a light bulb that turns on and off via a mobile application to a truck driven by robotic technologies (these are just generalities; as concerning IoT applications in education, we'll discuss them below).

### 10.2 Why does education need to go digital

More than one and a half million children of different ages and in different parts of the world are homeschooled today (their number has increased significantly since 2020 due to the pandemic, which hardly surprises you). Such a learning format still leaves much to be desired, though... leastwise, in the opinion of almost 50% of the parents surveyed.

However, schooling within the walls of educational facilities isn't as productive as it used to be too, which is confirmed by statistics.

Let's briefly list the main problems of schools and universities (most of them are quite solvable by implementing IoT solutions for education):

### 10.3 An outdated approach to education

We live in the 21st century when the dreams of 20th-century science fiction writers are becoming reality... and nevertheless, we're still being taught in an old-fashioned way. Students are forced to learn to use programs, which have long gone out of demand and have been replaced by more modern solutions. This means these



young people will enter the labor market ill-prepared. They'll have knowledge no employer really wants and needs. Therefore, they'll have no choice but to acquire new skills on their own. Have all these years of education been for nothing? What a ridiculous waste of time (and life)!

**10.3.1 Standardized testing.** Testing students' knowledge is also based on outdated methods and doesn't always reflect the real situation. Besides, such things as teacher bias and anxiety of the student who may fail the exam due to emotional distress negatively affect the test result too. None of the above will happen if an examiner uses the latest technology (such as the IoT platform for education) to test the skills of his students.

**10.3.2 Boring learning process.** Students constantly complain that the lessons are boring, and the new material is uninteresting... so it's hardly surprising that they're reluctant to go to school or university and have absolutely no desire to learn.

**10.3.3 Anxious parents.** Lately, life has become more hectic, and therefore parents are afraid to send their children to boarding schools and university campuses. They aren't sure about their safety within the walls of the educational institution.

**10.3.4 Unqualified teachers.** Unfortunately, schools and universities are full of poorly trained specialists who don't want to master new educational programs. As a result, students are being taught according to unqualified methods. Below, describing the benefits of IoT technology in the education process, we'll offer you a couple of ways to solve such a sad problem.

**10.3.5 The time-consuming process of organizing lessons.** According to research conducted in the United States, at least a third of the lesson time is being spent by teachers trying to organize the educational process (say, roll-call of students, and the like). The whole thing seems to be highly unproductive.

**10.3.6 Improved school management.** Managing a school or university is rather challenging. Dealing with all the documentation, tracking the movement of funds, and other activities of the sort take a lot of time and effort. And process digitalization is capable of automating a number of these tasks (albeit simple, but no less tedious).

**10.3.7 Real -time data collection:** IoT applications in training are constantly collecting and processing data from different devices. And this information can improve the learning experience. Here are a few examples of how you can benefit from data collection and analysis:

Monitor student progress.

Having found a reduction in student progress, you can make appropriate times to change the situation.

Keep an eye on the professionalism of teachers.

First we talked about the problem of poorly taught teachers. Fortunately, you will have the opportunity to solve this by implementing IoT solutions for training. After that, you will start receiving unbiased information about the professional status of your employees (which is very unbiased because digital algorithms have no idea of their own, they collect and process data). So you always know which teachers should be sent for refresher or higher education.



If needed, you can give your staff and even your students access to personal information (only non -confidential information, such as educational material, of course).

**11. Worldwide coverage.** IoT in education means globalization. To be precise, the application software and IoT devices are available all over the world. Therefore, we have the opportunity to bring together educational programs and establish common learning standards (meaning a better exchange of experiences between students and teachers around the world).

**11.1 A fascinating learning format.** When discussing problems in education, we explained to you that students get bored in lessons and lectures. The Internet of Things opens up a lot of opportunities to diversify the learning process by adding a game element to it and making it more fun. In other words, we inspire students to enjoy learning.

**11.2 Digitalization of the organizational process.** Also, IoT applications in schools and universities allow automating many organizational arrangements during lessons (the problem mentioned above as well). We mean the introduction of individual attendance trackers, student cloud logs, automatic test checking, smart microphones to support lesson teaching, and other similar solutions.

**11.3 No emotional pressure.** A lot of students suffer from emotional pressure when the teacher becomes something of a bully and begins to scold the chosen victim, criticize his progress or behavior, and does so in front of everyone. Internet of Things technology can save young folks from the need to be reprimanded in public. Communication between students and teachers takes place through their personal devices in the Silent Messages mode.

**11.4 Enhanced security.** Parents are worried about their children and their well-being, which is totally okay. And it is the responsibility of the school or university management to ensure the safety of the students. There are many examples of IoT in Education able to provide the desired effect and set the older generation's minds at rest: CCTV cameras and IoT sensors installed in key locations (classrooms, cafeterias, stadiums, etc.), drones flying around the campus, and so on. Thus, the supervising staff of the educational institution will always know where this or that student is and what he or she is doing.

**11.5 Remote education.** Given the situation with the pandemic, no one is able to predict when we might again be forced to return to maximum social distancing. Fortunately, the modern world offers us a great many options to maintain a normal lifestyle without even leaving our home. And education is no exception! Lessons in the format of webinars, online chatting, working on educational material using special software: these are just some of the IoT features worthy of attention. By the way, IoT solutions in educational environments give teachers the ability to control the class remotely (say, if he is sick, but doesn't want to deprive students of his lecture) using voice or gesture commands.



**11.6 Improving the learning experience.** By collecting student feedback, the school or university management gets a real opportunity to analyze the data (reviews) received and determine a further growth strategy.

**11.7 Contactless payments.** The creation of a cashless environment can also be listed among the benefits of IoT in education. After all, students won't have to carry cash around the campus, which might reduce lines at canteens and cafes and minimize theft of pocket money.

**11.8 Individual approach.** In addition to less emotional bullying and a variety of learning formats, the Internet of Things helps to personalize the educational process (which also positively affects the desire of students to acquire new knowledge). Special devices record the student's achievements in different disciplines, after which the software analyzes the data obtained and draws up an educational program depending on his abilities. Meeting the needs of children with disabilities is a great example of how innovative technologies are improving the lives of students (as an individualized approach to teaching such children is key).

**12. Monitoring the health of students.** Perhaps you sometimes hear on the news that a certain student became ill during the lesson and was urgently hospitalized. Alas, such cases aren't as rare as one might hope. And many of them could be prevented with the help of the Internet of Things (namely, by introducing IoT solutions in schools and universities). Special sensors would regularly monitor the basic health indicators of each student and signal the slightest deviation from the norm before it leads to serious consequences.

**12.1 Better resource management.** Most often, the Internet of Things is used to maintain an energy-saving mode, control water and electricity costs, etc. (one just needs to program the system so that it follows a certain algorithm to turn various household devices on and off). The management of any educational institution can also resort to smart technology to reduce its operating costs.

## 13. Real-life examples of IoT in Education

**13.1 Interactive screens.** Perhaps we should start with special screens (touchpads) built into teachers' boards and students' desks. They allow the teacher to eliminate the tedious and time-consuming need to write something on a regular blackboard with chalk. And why should he act in such an old-fashioned manner if he now has a touch screen at his service? Moreover, students react to learning material in the same way (by touching a desk with a built-in interactive screen).

**13.2 Voice-to-text technology.** Students may use a voice-featured IoT platform for education to take notes while learning some new material. The voice application converts their speech to text and saves it in a digital notepad.

**13.3 Webcams in classrooms.** Webcams do more than just keep the students safe by secretly monitoring their movements and activities (which is rather a task of CCTV cameras). And as to webcams, you should install them to help broadcast lectures online and organize virtual classrooms.





**13.4 Electronic bracelets.** In describing the benefits of IoT technology in the education system, we talked about the possibility to implement a personalized teaching approach and control over students' attendance and progress. All this is possible thanks to special electronic bracelets.

**13.5 Head sensors.** Attached to the student's head, the sensor monitors his brain activity and emotional state. It makes no sense to constantly wear such a device, but in certain situations, it might be very handy.

**13.6 Smart classrooms.** And, of course, you're welcome to create smart classrooms for students and thereby combine all of the above technologies into a single coherent system. A smart classroom is able to identify students, record their attendance and progress, control devices such as interactive whiteboards, projectors, personal computers (turn them on and off according to a given algorithm), and perform other similar tasks. Say, why not give your teaching staff the opportunity to remotely monitor and manage classrooms?

## **14. Education is far from the only area where the Internet of Things can be successfully used. Any business would benefit from the introduction of IoT technology.**

We discussed the IoT-based campus and mentioned the digital learning platform... and the only thing left to do is to give an instance of the smart device, which is used in many offices and universities. Thus, we'll complete our rather short (but impressive!) list of IoT education examples.

## **15. Conclusion**

IoT has many advantages and challenges that need to be thoroughly analyzed and understood. ICT-related events, knowledge-intensive societies and current pandemics are putting additional pressure on the education system in the sense that intensive ICT adoption and education will be transformed into smart education. As research reveals, the adoption of IoT in Secondary and higher education has a positive impact on educational excellence.

Sure, various IoT devices and feelings are very important, but they don't work properly on themselves or give you more experience than learning computing. You need efficient software to help you manage the whole process.

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