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Internet Of Things (IoT) In The Education Sector

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Abstract

Education around the world is experiencing major paradigm shifts in educational practices of teaching and learning under the umbrella of ICT enabled learning environment. The world is witnessing a spontaneous growth in communication technology, computer network and information technology. Development of new broadband communication services and convergence of telecommunication with computers, which can be said to be Internet of Things, have created numerous possibilities to use a variety of new technology tools for teaching and learning system.

Internet of Things is so much into everything these days that it has started to be called as Internet of Everything. It is not very surprising that IoT or IoE, as it is now called, has made its way into the education industry as well. Keeping in mind the intervention of computers and smart phones into our lives and its effect on the educational system today, it sounds a bit farfetched at first for IoT to do anything with the education industry. While some of the effects that IoT can bring into the education sector are apparent but some will be implicit and are likely to make a silent change from the inside. The Internet of Things can begin disrupting the education procedure as early as kindergarten and can continue to do so through 12th standard, but perhaps the most profound effects occur in higher education. This article discusses the changes that IoT can bring into the field of education. This article also tries to present the challenges and impact of IoT in 21st century Education sector.

Key Words: Internet of Things, Internet, Education,

Internet of Things (IoT) - Introduction

The concept of connected/linked devices or things has given a new rise of the Internet, anything, anywhere can get connected with the Internet and becomes 'Smart.' Connected devices can communicate with each other and share information which can then further be processed to take some decisions. This whole concept is named as 'Internet of Things.' IoT (Internet of Things) is an automation and analytics system which exploits networking, sensing, big data, and artificial intelligence technology to deliver complete systems for a product or service. These systems allow superior transparency, control, and performance when applied to any industry or system. IoT systems have applications across industries through their unique flexibility and ability to be suitable in any environment. They enhance data collection, automation, operations, and much more through smart devices and powerful enabling technology.

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Key features of Internet of Things

The most significant features of IoT include artificial intelligence, connectivity, sensors, active engagement, and small device use. A brief review of these features is given below:

- **Artificial Intelligence (AI):** IoT essentially makes virtually anything "smart", meaning it enhances every aspect of life with the power of data collection, artificial intelligence algorithms, and networks.
- **Connectivity:** New enabling technologies for networking, and specifically IoT networking, mean networks are no longer exclusively tied to major providers. Networks can exist on a much smaller and cheaper scale while still being practical. IoT creates these small networks between its system devices.
- **Sensors:** IoT loses its distinction without sensors. They act as defining instruments which transform IoT from a standard passive network of devices into an active system capable of real-world integration.
- **Smart Devices:** Devices, as predicted, have become smaller, cheaper, and more powerful over time. IoT exploits purpose-built small devices to deliver its precision, scalability, and versatility.
- **Active Engagement:** Much of today's interaction with connected technology happens through passive engagement. IoT introduces a new paradigm for active content, product, or service engagement.

Internet of Things (IoT) in Education

Internet of Things (IoT) customizes and enhances education by allowing optimization of all content and forms of delivery. IoT enables educators to give focus to individuals and their method. It also reduces costs and labor of education through automation of common tasks outside of the actual education process. The Internet of Things, the connection of devices to the Internet, is in the process of transforming numerous areas of our daily lives. The Internet has deeply rooted itself into our academic institutions, and electronic learning has become common practice in the Academic institutions system. The rise of mobile technology and the Internet of Things allows academic institutions to improve the safety of their campuses, keep track of key resources, and enhance access to information. Academicians can even use this technology to create "smart / digital lesson plans," rather than the traditional stoic plans of yesteryear.

The Internet of Things will be successfully incorporated into the education system, but slowly and in much nuanced ways. Some academic institutions may utilize it to save money or harness data; some will prepare students to be extremely tech-literate; others will find creative uses for their

specific needs. Dreams of personalized, detailed instruction and seamlessly interactive technology will run head-to-head with funding issues and current test-based accountability systems. In order to include the Internet of Things in education, our understanding of education must shift.

Many educational institutions vigorously incorporate technology into learning, least of all reach out and connect to each other. Massive adoption of technology in education is required so that the power of IoE can be realized and learning can become more authentic and relevant through engagement beyond the classroom. The proliferation of mobile devices will also enable educational institutions to collect data to interpret a learner's behaviors and activities. Used intelligently, such data will result in personalized learning targeted to individual needs, learning styles, and aspirations. There are myriad uses for technology in education, but many are piecemeal and ad hoc with little informed thinking. IoE has the potential to integrate technology with learning in many ways.

Impact of Internet of Things in the Education Sector

The following are the some of the impact of Internet of Things in the Education sector.

Promote Personalized Education: Internet of Things (IoT) facilitates the customization of education to give every student access to what they need. Each student can control their experience and participate in instructional design, and much of this happens passively. The student simply utilizes the system, and performance data primarily shapes their design. This combined with organizational and educator optimization delivers highly effective education while reducing costs.

Create Global Networking: Learners can interact with peers, mentors and educators worldwide using connected devices such as interactive boards and digital highlighters, while sitting in the comfort of their classroom or home. Digital scanners aid the learning experience by digitally transferring text to smartphones. In this way Internet of Things creates a Global networking among learners and educators.

Enrichment of Smart QR Code Utilization: Quick Response (QR) codes have made their way into the academic textbooks. Feedback, assignments and additional information resources become easily available to students when they scan the QR codes with their smart phones. Have students use QR to create resumes that link to other content such as their professional website or portfolio. All institutions do some level of resume building and technical writing. Help them bring it into the 21st century by creating a resume that requires interaction. Not only will this help engage them in technical writing, but also their work will be innovative. In a lab, a Quick Response (QR) code could launch a virtual tour of the lab or a video showing how to operate the equipment.

Easier of Data collection and analysis: Learners use Radio-frequency Identification (RFID) chips/Bluetooth to tag and track physical objects or even birds and animals round the clock,

irrespective of the weather or other conditions and schools / colleges have started to initiate automatic data analysis using applications based on the cloud. Learners gain a richer learning experience as they can get real-time insights into subjects they would otherwise only learn from their textbooks. Using RFID ID cards, students can be automatically identified for multiple purposes on campus to reduce administration costs and ensure accuracy. Using RFID / Bluetooth valuable assets such as tablets and laptops can be tagged and tracked for real-time locating.

Collaboration in group works: Educational institutions encourage a collaborative atmosphere with the help of the Internet of Things. While working in groups, students are encouraged to transmit their data to a collaborative work area by simply scanning an RFID tag or a QR code, using their smart phones.

Superior safety in campuses: Digitised identity cards and wristbands are used to track staff, students and visitors. Data on the last-known locations are stored on a server which ensures that every area on campus is accessed only by the right people. The cards and wristbands also act as digital wallets and enable cashless payments. Institutions buses are also enabled with GPs tracking, which makes the journey to and from school safer and lets parents know their child's whereabouts. Institutional officials are under increased pressure to ensure their campuses are safe. The IoT's ability to track objects, staff and students, and to connect devices across campus brings a new level of safety to institutions. A GPS-enabled bus organism means that bus routes can be tracked, so that parents and administrators can know where a given bus is at any given time. In addition to making the school journey safer for students (and a lot less stressful for parents), students can be notified when the bus is near their pickup location; no more waiting outside for a late bus.

Enhanced Learning Experiences and Outcomes: The pressure is on to prepare learners for an increasingly competitive workplace in a hyper-connected world. With the Internet of Things, institutions can enhance educational outcomes by providing richer learning experiences and by gaining real-time, actionable insight into student performance. Whether it's a tablet they brought from home or an institutional-issued laptop, more and more student learning is taking place on wireless devices. These online lesson plans have the potential to characteristic highly engaging interactive content. However, they also have the potential to "crash" archaic internet networks. With e-learning applications, students can work at their own speed, which allows the teacher to provide one-to-one instruction to those who need it most.

Efficient Institutional Management: Streamlining day-to-day operations using the Internet of Things helps the institutional management and teachers focus more on teaching. It allows them to automate tasks that would require considerable time and effort when performed manually. For example, connected devices can detect students' presence in the school and eliminate the need for taking attendance manually and submitting the information at a central office. Identity cards

and wristbands allow educational organizations to store the last-known location of a student or visitor, helping to make sure the right people are accessing the right areas on campus. They also enable cashless payments at the institution cafeteria or campus store, which creates a more smooth transaction and has the potential to discourage bullying and theft. Finally, the convergence of campus communications allows staff to react more speedily in an emergency situation.

Factors to Influence the integration of IoT in Education

For successful integration of IoT devices in a classroom environment, an education provider may have to face many difficulties like network bandwidth, reliable Wi-Fi Connection, web analytics, security, privacy, availability of devices for students, teacher training and cost of equipment, etc. The following are some of the factors that will enhance wide spread and adoption of internet of things in education:

Security and Privacy: Educational Institutions are frequent victims of data breach. With research data, student and alumni personal records, health center records, payment information for tuitions, housing, food and books, the data security needs of the education market are widespread. Beyond providing a secure environment for students and faculty, there are many government, industry and state regulations that mandate data security for every type of information stored by educational institutions. This might pose a great threat to IoT security particularly in education. Without assurances, pervasive development of IoT will not take place across educational institutions.

Data Integrity: Integrity of data must also be assured, as well as its accuracy, authenticity, timelines, and completeness. Success will be predicated on an "open platform" that allows all partners working together to use the same baseline technologies. Educators will need to work closely with government to ensure the development of IoT in education; at the same time, government must preserve the safety and security of its citizens. Another aspect of data integrity that is becoming increasingly important is related to the use technology in research projects for data collection, storage, analysis, archival, etc. These technologies include electronic instruments or hand-held devices for collecting data, computer systems for storing and sharing data, and software for analyzing data. But the use of technology can create additional integrity concerns that researchers must be prepared to deal with and act responsibly. Adequate training of teachers and students in the application and implications of technology use can help to prevent technology-related integrity violations.

Reliable Wi-Fi Connection: There is a continuous need for new technologies for education, like high-speed wireless networks which provide the bandwidth for audio and video streaming of lessons.

Cost: The whole setup of an IoT-based educational institution can be expensive. Therefore the cost of devices and equipment is another challenge.

Lack of qualified teachers to teach ICT: The demand for ICT learning has been tremendous and the number of teachers who are trained to teach ICT cannot meet the demand. There are more students willing to be taught computing skills than there are teaches to transfer the skills.

Unavailability of resources: Computers are still very expensive especially in developing countries and despite spirited efforts by the government agencies, NGO, corporate organizations and individuals to donate computers to as many schools as possible, there still remains a big percentage of the students unable to purchase computers for their use.

Educational Policies: Policies that encourage adoption of technology in the classroom by students and its effective integration into curricula are crucial. Such policies must include sound change management practices among educational institutions to reduce the barriers to technology adoption and increase its scale. Professional development programs for educators should incorporate IoE tools to encourage early adoption and help educators develop innovative methodologies and appropriate pedagogies for the learning environment.

School Curriculum: Curriculum is a vital part of any school sitting and as such should be taken with outmost concern. It is therefore advisable for school administrators to imbibe IoT into their curriculum design so as to enhance its adoption by creating an environment that will promote its usage.

Conclusion

There is tremendous value in connecting the unconnected with intelligent networks across education. This paper demonstrates IoE's potential impact on making education more relevant, engaging and motivating learners, and enabling faster time to mastery. However, to realize the benefits from connecting people, processes, data, and things, reliable connectivity and continuous access must be guaranteed. Additionally for IoE to be accepted, both policymakers and educators must be well-prepared not only to exploit, but also to understand potential risks. IoT has a greater potential to remove all the barriers in education such as physical location, geography, language and economic status. Combination of technology and education not only makes learning faster and simpler but also enhances the impact and quality among the students. There is still tough and long road ahead for the IoT to bring more transformations in the education sector.

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