Role of Internet of Things (IoT) for Smart Classroom to Improve Teaching and Learning Approach

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***Abstract*—Internet of Things (IoT) is very important sectors in teaching, learning and business today. IoT is expected to give strong impacts on different areas of life including healthcare, transportation, smart homes, smart campus, and the important role in the context of Information and Communication Technologies. In this research, there is a role of Internet of Things (IoT) based technology in possible solutions for use in Education sector. Other objectives of this research are (1) learning the usefulness and applications of IoT (2) can study what is the effect of IoT technology in the field of education (3) having a good relationship with students, teachers offer them the chance to be motivated and feel engaged in the learning process and (4) the analysis of the smart classroom to improve teaching and learning approach for universities. This research will help teachers learn about how an effective relationship between teacher and students can support to increase the learning process using IoT.**

***Keywords*—IoT, applications, smart classroom, universities, education, learning, analysis, teaching.**

I. INTRODUCTION

The most effective classroom management involves the design and implementation of classroom rules and procedures. The goal of effective classroom management is to create and maintain a positive, productive learning environment, to support and foster a safe classroom community, to assist students to keep task focused, to reduce distraction from learning, to organize and facilitate the flow of learning activities. Managing a classroom is not an easy task. Teacher also needs to personally connect with each student in the classroom in order to make students feel comfortable and welcome. By having a good relationship with students, teachers offer them the chance to be motivated and feel engaged in the learning process.[1]

As an educator and administrator for over twenty years, I believe there is another factor that determines the failure or success of student achievement. It is called classroom management. Classroom management can be defined as the process by which teachers create, important and maintain an environment in the classroom that allows students the best opportunity to learn. Teachers are faced with classroom issues such as excessive talking during instruction, getting out of seat without permission, throwing objects across the room, sleeping during classroom instruction and disrespect to the teacher. It is important that teachers find creative ways to deal with the issues as well as provide quality instruction in the classroom. Classroom management and classroom instruction are connected.[1]

The Internet of things (IoT) is the network of physical devices, vehicles, home appliances, and other items embedded with electronics, software, sensors, actuators, and connectivity which enables these things to connect, collect and exchange data, creating opportunities for more direct integration of the physical world into computer-based systems, resulting in efficiency improvements, economic benefits, and reduced human exertions. The number of IoT devices increased 31% year-over-year to 8.4 billion in the year 2017 and it is estimated that there will be 30 billion devices by 2020.The global market value of IoT is projected to reach $7.1 trillion by 2020.

IoT involves extending Internet connectivity beyond standard devices, such as desktops, laptops, smartphones and tablets, to any range of traditionally dumb or non-internet-enabled physical devices and everyday objects. Embedded with technology, these devices can communicate and interact over the Internet, and they can be remotely monitored and controlled. With the arrival of driverless vehicles, a branch of IoT, i.e. the Internet of Vehicle starts to gain more attention. [2]

In Myanmar has signaled its readiness to reintegrate with the world economy through recent socioeconomic and political reforms. These reforms allow Myanmar to achieve strong and sustainable economic growth and improve the standard of living of its population.

Myanmar recognizes ICT has a key enabler and a priority for socioeconomic development. The Framework for Economic and Social Reform, formulated in 2013, sets out policy priorities until 2016, which include the development of mobile telephony and internet.

Among the ICT-related reform objectives are:

1. To increase mobile penetration from 6.99% in 2012 to 89.38% in 2016
2. Allowing for full sector liberalization by opening the ICT market to both foreign and domestic investors on a nondiscriminatory basis.
3. Upgrading internet infrastructure to allow a comprehensive e-strategy for leapfrogging.

Currently, the bulk of IT spending lies in hardware sales, which reached USD 165.9 million in 2015 and has been expected to increase to USD 256.41 million by 2019. In contrast, software spending was USD 19.59 in 2015 and forecasted to reach USD 35.19 million in 2019.

Therefore, there will be opportunities for solution providers and system operators to work with ministries and agencies. With the changing landscape supported by the regulators, enterprises in the local market would need to adapt their business models to compete. [3]

Technology in education has played a significant role in connecting and educating the students. IoT technology has an important impact on education field. IoT has not only changed the traditional teaching practices but has also brought changes in the infrastructure of educational institutions [4]

IoT technology is playing an important 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 benefited with this IoT based technology in education society. In figure 1 shows the internet of things enabled teaching in education sector.

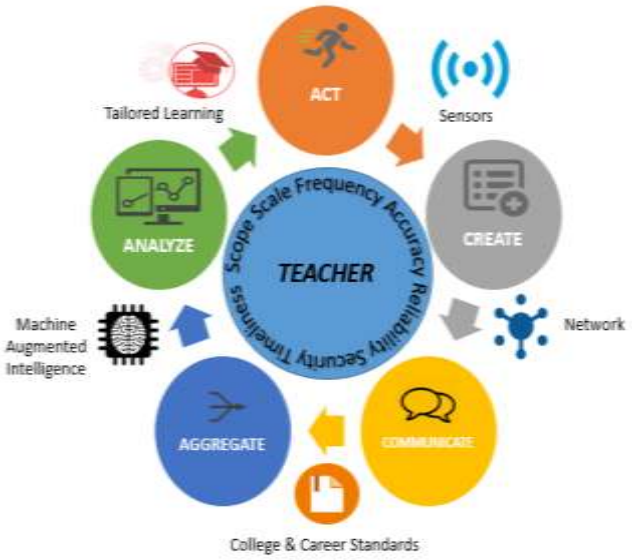

Figure 1. Internet of Things enabled Teaching [5]

II. Background Theory

Internet of Things (IoT) is the transformation process in numerous aspects of our daily life. IoT technologies differ from previous innovations as they are ubiquitous, and encourage solutions to be intelligent and autonomous. [6]

IoT is developing quickly and becoming an increasingly growing topic that creates excitement and anxiety around the world [7].

The IoT which links people, processes, devices and data augments the quantity and value of the information we can collect, allowing the stakeholders of educational sector to turn data into valuable information as never seen before. With the initiation of mobile technologies, the educational institutions can now keep track of overall resources pertaining to education. IoT is playing the key role in teaching, Learning and even in assessment. From KG to PG in all aspects of the education institution, the IoT is becoming the need of the hour. The implication of IoT will help the overall delivery of the resources in an innovative manner to the participants. The IoT has the potential to impact every aspect of student learning. This insight provides stakeholders with a real-time view of students, staff, and resources. It helps in decision making, automatic execution and providing security features. [8]

IoT affects the education sector directly and indirectly. Mainly it does the overall work ease and upgrades the quality of education. It affects the teaching and learning process broadly. The assessment area of education needs the real treatment and IoT is well suitable for the real implementation in this sector. Once the core areas such as teaching, learning, assessment are taken into consideration, the major aspect will be upgraded. [9]

Some of the normally installed IoT applications in our daily life include: [9]

- Multimedia sector for the easy manipulations.
- Home automation, components management and the security implementation.
- In tracking the logistic service this is very helpful
- The scheduling aspects can be done effectively through this
- To keep track of transportation units, the IoT is very much needy
- The health industry has ample benefit from this
- E-Health system spanning from blood pressure, heart rate monitoring to remote surgeries.
- Environmental monitoring including air, water quality, soil, wildlife monitoring.
- Infrastructure management and monitoring of urban and rural assets.
- Smart parking, smart traffic control, a vehicle to vehicle communication etc.
- Industrial projects in the food industry, agriculture, surveillance etc. [10]

An education is the single most powerful tool we have at our disposal. By educating more people in a better manner, we can drive greater positive social and technological change, and, therefore, create a more prosperous future. It's important that we constantly strive to enhance education in terms of quality and access.

IoT can help us make education more accessible in terms of geography, status, and ability. There are boundless opportunities to integrate IoT solutions into school environments. Let's explore some different use cases. They

will serve as a solid foundation on which to build a broader understanding of IoT applications in education. [11]

III. Smart Education and Applications of IoT

IoT plays an important position in constructing a network through the use of special internet-based systems. A robust faculty attendance gadget guarantees the safety of an academic enterprise and may assist colleges and education facilities in many methods.[15]

A. Smart Education

In smart campus sector, the learning process is conducted through e-Learning system, that makes it possible for students to be able to join learning from anywhere, anytime with the internet connection. E-learning equips with video conference facility so that it is possible for students to face the teacher from different place. Besides, virtual class feature can help simulation for students to solve problem in learning. Virtual class can be used for practicum lessons.

B. Smart Room

It uses the sensor of PIR, RFID, and camera. The concept of smart room is giving information about the vacant room, and the amount of the students being present on it. The data about amount and the name of the students are saved on the database. In this system, the students use RFID, so that the data of the students are in database. Smart system is being used in smart room. By using the sensor of PIR, the lights will be off automatically if there is no human in the room. On the other hand, the lights will be automatically on if there is or there are people in it.[12]

C. Smart Classroom

IoT can help us make education more accessible in terms of geography, status, and ability. IoT applications in education will be the foundation on which these classrooms operate. Students will be automatically counted as present or tardy when the bell rings. Wearable devices will determine when the class is too tired or disengaged and may need a break, and whiteboards will record all notes taken in a class. Smart-microphones may even recognize when a teacher mentions there is a homework assignment due and update students' planners accordingly.[11]

Figure 2. IoT based Smart Classroom

D. Better Learning Experience

The core functionality of IoT is a device to device communication. As digital learning involves a vast number of e-devices, the most of the time will be taken for the device management and decision making. As IoT is a right platform for this, it manages the way device interacts with other device and hence the better learning experience can be imparted to the learners.

E. Improved Operational Efficiency

Educational institutions have a lot of participating stakeholders. To get the desired outcome, one should keep track of students, staff, and resources. The operation of each device can be managed effectively, diligently through the implementation of IoT technology. The effective operational management leads to the success of the overall system. The system comprises of various components. The keen concentrated individualized management of each object leads to the overall growth of the progress of the system. Hence the IoT implementation will be a successful strategy in uplifting the effectiveness of the system.

F. Reduced Cost

The major expenditure in an educational organization is the management of various units related to Institute. When IoT is implemented, the automatic communication that happens between the units will reflect the cost reduction. As minute observation will be done automatically this leads to the reduction of overall expenditure.

G. Reliability

Reliable systems will lead the greater outcome. The reliability of the entire system depends upon the individual components that are present in the system. As IoT leads the component management, it reflects the reliability.

H. Safety Considerations

The overall safety of the institution can be tracked through the IoT system. Fire safety, prohibited entry, student's limited movements, external people entry and many more aspects can

be easily tracked and an eye can be kept on these. As automatic communication happens between participating safeties devices it's easy to have specific surveillance in the campus. It also helps us to manage outdoor, out campus security through the specific wireless devices. The vehicles can be managed and the security can be provided.

I. Advantages of IoT

Technologies can work wonders and application of IoT education proves it. In fact, IoT is a technology that has many ways to make use of, so everything depends on requirements of government or educational institution administration. Internet of Things predicts the future that, the advance digital world and the physical world will get linked by means of proper information and wireless communication system technologies. The machine-to-machine interaction provides better efficiency, hence; accurate results can be obtained fast. This results in saving valuable time. Instead of repeating the same tasks every day, it enables people to do other creative jobs.

IV. Effect of IoT Technology in Education

IoT also has many opportunities for Science, Technology, Engineering, and Mathematics (STEM) disciplines, such as computer programming and physical computing. It is easy to foresee how IoT capabilities can be used in STEM disciplines, robotics, and anything having to do with collecting specific data. It is all in the potential of the IoT. Education has changed from a knowledge-transfer model to an active collaborative self-directed model by the disruptive influence of technology in today's educational institutions. This has forced many institutions to rethink teaching and learning [10]

The application of IoT in education into four groups: energy management and real time ecosystem monitoring, monitoring student's healthcare, classroom access control and improving teaching and learning. We will investigate and analyze how this platform has changed the Education Business Model and added new value propositions in such organizations based on the Canvas Business Model.[11]

The influence of technology can be seen in many aspects of education from student engagement in learning and content creation to helping teachers provide personalized content and improving student outcomes. [12].

IoT is a subcategory of Internet technology, which supports education in many ways. IoT solutions enable educational institutions to collect a vast amount of data from sensors and wearable devices more easily and to perform meaningful actions based on these data. Such systems allow students to explore an environment by using embedded sensors, QR codes and other technologies. They can access learning materials and other information from anywhere at any time. Teachers also can use wearable devices and smart phones in the classrooms to improve teaching and learning.[13]

One of the very smart components of present-day colleges and classrooms is that the IoT improves schooling itself and brings advanced fee to the physical surroundings and systems. A clever college has the facilities functioning easily that provide a better stage of getting to know personally. The smart gadgets that are used within the campus employ wi-fi community to ship facts and acquire commands. A computational internet of things gadget for faculties and studying facilities enables to create smarter lesson plans, maintain a tune of critical resources, improves admission records, design safer campuses and much more.[14]

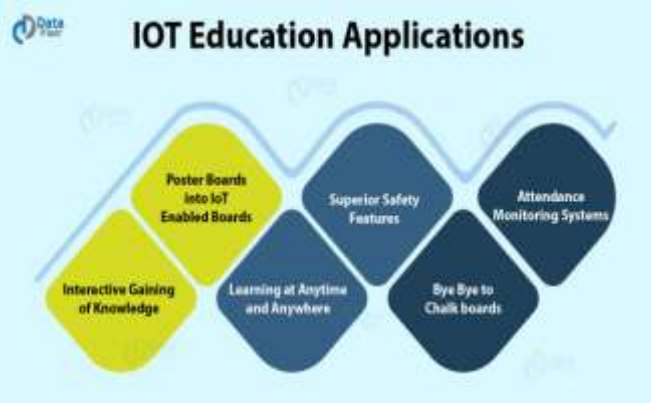

Figure 3. Internet of Things education Applications

Students in recent times make use of a very powerful platform which includes smart boards. It facilitates the lecturers to provide an explanation for the lectures more without problems with the assist of online displays and films. Students are an advocate for interactive gaming as an effective platform. Web-based tools and packages help to educate the scholars more efficaciously that were once paper or chalkboard primarily based. Clever generation allows instructors and students surf the internet or even edit video and share assignments.[15]

V. Conclusions

IoT can support classroom instruction by improving learning setting, enhance learning resources, improve methods and techniques of learning, raise management efficiency, and save management costs[17]. Smart classroom is an emerging and challenging concept for the technology to bring it in reality. The resources available for learning on devices, like e-books, are more engaging and interactive. This research can learn the usefulness and applications of IoT and what is the effect of IoT technology in the field of education. The future work will be to find out how can apply IoT in higher education and challenges of IoT implementation in smart campus system that includes smart education development, smart parking and smart room.

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REFERENCES

[1]. Hlaing Htake Khaung Tin, Phyu Sin Phwe, Yi Mon Thet, San Thida, "Effective Classroom Management Information System to Improve Teaching and Learning Approach", International Journal of Advanced Research in Computer Science and Software Engineering, Volume 8, Number 8, 2018.

[2]. https://en.wikipedia.org/wiki/Internet_of_things

[3]. http://iotbusiness-platform.com/iot-myanmar/

[4]. M. Mohanapriya, "IOT enabled Futurus Smart Campus with effective E-Learning : i-Campus," vol. 3, no. 4, pp. 81–87, 2016.

[5]. http://www.assignmenthelp.net/blog/new-edtech-trends/

[6]. Kahlert, M., Understanding customer acceptance of Internet of Things services in retailing: an empirical study about the moderating effect of degree of technological autonomy and shopping motivations. 2016, University of Twente.

[7]. Ning, H. and S. Hu, Technology classification, industry, and education for Future Internet of Things. International Journal of Communication Systems, 2012. 25(9): p. 1230-1241

[8]. Cisco, The Internet of Everything: Fueling Educational Innovation

[9]. IoT Applications, https://x-systems.com/mobile-iot-security-solutions/education

[10]. Shrinath, Vikhyath, Shivani, Sanket, Shruti, "IOT Application in Education", International Journal of Advance Research and Development.

[11]. M. Selinger, A. Sepulveda and J. Buchan, "Education and the intenet of Everything," Cisco Consulting Services and Cisco EMEAR Education Team, 2013.

[12]. https://www.iotforall.com/introduction-iot-applications-in-education/

[13]. Marti Widya Sari, Prahenusa Wahyu Ciptadi, R. Hafid Hardyanto, "Study of Smart Campus Development Using Internet of Things Technology", IAES International Conference on Electrical Engineering, Computer Science and Informatics, 2017.

[14]. BAGHERI, Maryam and HAGHIGHI MOVAHED, Siavosh, "The Effect of the Internet of Things (IoT) on Education Business Model", Sheffield Hallam University Research Archive (SHURA) at:http://shura.shu.ac.uk/14405/

[15]. https://data-flair.training/blogs/iot-in-education/

[16]. Nang NweNwe Soe, April Thet Su, Poe Ei Phyu, HlaingHtakeKhaungTin, "Circumstantial Analysis of Preferred Teaching Styles (A Case Study of Computer University, Loikaw)", International Journal of Advanced and Innovative Research (2278-7844) / # 193 / Volume 5 Issue 2, 2015.

[17]. Hlaing Htake Khaung Tin, Ko Ko Maung and Si Thu, " A Survey on Role of Internet of Things(IoT) Based Technology in Education", International Journal of Trend in Research and Development(IJTRD), Volume 5, Issue 6, December 2018.