ISSN PRINT 2319 1775 Online 2320 7876

Research paper

 UGC CARE Listed (Group -I) Journal Volume 8, Issue 4, 2019

An in-depth Analysis of IOT in Education

Dr. Munagala Madhu Sudhan Rao

Associate Professor of English, Department of English,

Koneru Lakshmaiah Education Foundation, Vaddeswaram, AP., India -522302.

madhu.css@kluniversity.in https://orcid.org/0000-0002-0383-4866

Abstract:

In contemporary culture, there is a widespread acceptance of emerging technologies, leading to the integration of various control systems, such as those in automobiles and home appliances, with the internet. The educational sector, mirroring this trend, actively embraces device interconnectivity to expedite tasks and improve the quality of output. This adoption is driven by a dual purpose: accelerating task completion and enhancing the overall quality of work. The objective is to elevate both the efficiency of workflow and the standard of produced content. This paper explores how the educational sector leverages technological advancements to not only increase the pace of task completion but also to elevate the calibre of work, thereby striving to augment both output quality and quantity. The integration of intelligent gadgets and the Internet.

Safety and Security: Ensuring the safety of students is a top priority for educational institutions. IoT devices can contribute to campus safety through smart surveillance systems, emergency response systems, and monitoring tools. However, the increased connectivity also raises concerns about the security of IoT devices. Educational institutions must implement robust cybersecurity measures to protect sensitive data and prevent unauthorized access.

Administrative Efficiency: Improving administrative systems is crucial for the smooth functioning of educational institutions. IoT can be applied to streamline administrative processes, such as asset tracking, facility management, and resource allocation. Efficient administrative systems can contribute to cost savings, resource optimization, and better overall management.

Market Growth and Projections: The projected growth of the IoT market in education, reaching $19.5 billion by 2027, suggests a significant increase in adoption and investment in intelligent gadgets. The compound annual growth rate (CAGR) of 17.7% from 2020 to 2027 indicates a

ISSN PRINT 2319 1775 Online 2320 7876

Research paper UGC CARE Listed (Group -I) Journal Volume 8, Issue 4, 2019

rapidly expanding market, driven by the recognition of the potential benefits of IoT in education.

Use Cases in Education: Smart classrooms equipped with IoT devices can enhance the learning experience through interactive displays, personalized content delivery, and real-time collaboration. IoT applications can extend beyond the classroom, including campus-wide connectivity for smart buildings, energy management, and student services.

Challenges and Considerations: The implementation of IoT in education requires careful planning to address privacy concerns, data security, and potential ethical issues. Educational institutions need to invest in staff training to manage and maintain IoT systems effectively.

Technological Advancements: Ongoing technological advancements will likely contribute to the refinement and expansion of IoT applications in education. Emerging technologies such as 5G connectivity and edge computing can further enhance the capabilities of IoT devices on campuses. Educational institutions need to navigate these considerations to harness the benefits of IoT while managing associated risks. The projected market growth underscores the increasing importance of intelligent gadgets in shaping the future of higher education.

Keywords—Digital Optimization, Artificial Intelligence, Internet Connectivity, Education, Internet of Things.

INTRODUCTION

The potential benefits of incorporating the Internet accessibility for students with special needs: Visual Impairments: Voice assistants can be used to provide audio information, helping students with visual impairments access educational content.

Hearing Impairments: Teachers can use IoT devices to translate lectures into texts for students with hearing impairments, making the content more accessible.

Personalized Learning: Interconnected Microphones, Tablets, and VR Gadgets: These devices can be utilized to create a personalized learning environment, allowing students with unique needs to learn at their own pace and achieve excellent results.

Challenges in Implementation: Incorporating IoT into Routine Classrooms: The integration of IoT into traditional classrooms is acknowledged as a process that will take time.

ISSN PRINT 2319 1775 Online 2320 7876

Research paper UGC CARE Listed (Group -I) Journal Volume 8, Issue 4, 2019

Accessibility and Intuitiveness: Making IoT technologies easily accessible and intuitive for users is identified as a priority for successful implementation.

Change in Perspectives: Views of Teachers, Parents, and Students: Perspectives need to be altered to embrace the potential of IoT in education. This includes understanding and supporting new educational policies.

Positive Moves in Education: Educational Institutions: Mention is made of educational institutions taking tentative steps toward implementing IoT platform integration solutions, with a favourable reaction.

Hope for the Future: Technological Advancement: The passage expresses hope that as technology continues to advance, more students, including those with special needs, will be able to benefit from the advantages offered by IoT in the classroom.

The overall message is optimistic about the potential transformative impact of IoT in education, particularly for creating more inclusive and personalized learning environments. It acknowledges the need for a gradual process of integration and emphasizes the importance of changing attitudes and perspectives to fully realize the benefits of IoT in education. The reference to tentative moves by educational institutions suggests a growing interest and awareness in leveraging IoT for improved learning outcomes.

OBJECTIVE

- The research aimed to fulfil the following objectives:
- To study the internet of things in education.
- Why the education sector absolutely must have access to the internet of things.
- To study Edtech IoT.
- The influence of the internet of things on learning.

METHODOLOGY

Traditional Education: Defined as the act of receiving or imparting systematic teaching, typically in a school or university setting. Described as a more formal and structured process, involving tools like notebooks, pencils, boards, and chalk.

Internet of Things in Education: Described as a more enjoyable process compared to traditional education. The Internet of Things is emphasized as playing a significant role in the educational

ISSN PRINT 2319 1775 Online 2320 7876

Research paper UGC CARE Listed (Group -I) Journal Volume 8, Issue 4, 2019

sector, especially in the year 2020 due to the challenges posed by the Covid-19 pandemic. The IoT is noted to have a transformative impact on the global educational landscape.

Challenges in Traditional Education: The passage suggests that there were obstacles in the traditional educational sector before the adoption of IoT. It implies that the introduction of IoT in education was a recent development, likely aimed at addressing these challenges.

Context of IoT Adoption: The deployment of IoT in the educational sector is positioned as a recent occurrence. The timing of the IoT adoption is associated with the challenges posed by the Covid-19 pandemic in 2020. Overall, the passage introduces the contrast between traditional and IoT-driven education, emphasizing the transformative potential of the Internet of Things, especially in response to the challenges faced by the educational sector in the context of the Covid-19 pandemic.

INTERNET OF THINGS IN EDUCATION

Mobile Technology in Education: Positive Impact: The passage highlights the positive impact of technology on teaching strategies, suggesting that educational institutions have embraced these changes enthusiastically. Mobile App Development Services: The focus on mobile app development services indicates a proactive approach to leveraging technology for educational purposes. These apps are designed to help students manage and advance their education in alignment with evolving educational standards.

Individualized Solutions: Efforts by Software Developers: The passage notes that software developers are actively working to provide individualized solutions for the education sector. This suggests a tailored approach to address the diverse needs of both students and teachers.

Internet of Things (IoT) in Education: Positive Impact of IoT: The most recent technological development mentioned is the Internet of Things (IoT), which is described as having a positive impact on the instructional sphere.

Game-Changer: The passage refers to the implementation of IoT as a game-changer in the school system, indicating a significant shift in the way education is delivered and managed.

Linked Smart Devices: Educational establishments are adopting linked smart devices as part of their e-learning and smartboard infrastructure. This integration is likely aimed at enhancing the overall learning experience through connected devices.

ISSN PRINT 2319 1775 Online 2320 7876

Research paper UGC CARE Listed (Group -I) Journal Volume 8, Issue 4, 2019

Drastic Alterations: The passage suggests that the implementation of IoT has led to drastic alterations in the school system, emphasizing the transformative nature of this technology.

Support for E-learning: The use of linked smart devices is specifically mentioned as a means to support e-learning, indicating a shift towards more digital and interactive learning experiences.

Many factors are contributing to the widespread adoption, including the following:

The rising popularity of Internet of Things-enabled devices may be attributed, in large part, to the fact that cloud services are becoming easier and more affordable to use. Rapid development is possible for customized app packages that are intended for use by educational establishments. The Internet of Things can make life easier for those in management positions, classroom teachers, students, and their parents. It is possible to efficiently optimize the use of the resources, and while maintaining the same level of work, a lucrative outcome may be achieved. (Arras et al., 2022).

The following facets of the educational sector are targeted through the development of applications for the internet of things:

- Using app management solutions to get the best possible pricing and feasibility.
- Providing helpful solutions for classroom management to enhance the learning experience.

WHY THE EDUCATION SECTOR ABSOLUTELY MUST HAVE ACCESS TO THE INTERNET OF THINGS

Embrace Technology: Integrate technology into the learning process to make education more dynamic and engaging. Invest in e-books, online resources, and interactive learning platforms that can be regularly updated to keep pace with evolving information.

Professional Development for Educators: Provide continuous training and professional development for educators to keep them updated on the latest teaching methods and technologies. Encourage educators to participate in conferences, workshops, and online courses to enhance their skills.

Flexible Curriculum Design: Develop a more flexible curriculum that allows for easy integration of new information and teaching methods. Encourage educators to adapt their teaching strategies based on the evolving needs of students and the demands of the job market.

ISSN PRINT 2319 1775 Online 2320 7876

Research paper UGC CARE Listed (Group -I) Journal Volume 8, Issue 4, 2019

Collaboration and Partnerships: Foster collaboration between educational institutions, industry experts, and technology providers to create a more holistic and up-to-date learning environment. Establish partnerships with companies to ensure that educational content aligns with industry requirements.

Budget Allocation: Reevaluate budget allocation to prioritize investments in modern teaching tools, technology infrastructure, and professional development rather than traditional resources that quickly become outdated.

Streamlined Policy Adoption: Simplify the process for adopting new educational policies and technologies to overcome the complexities associated with infrastructure changes Involve educators, administrators, and stakeholders in the decision-making process to ensure a smoother transition.

Student-Centric Approaches: Implement student-centred learning approaches that cater to individual learning styles and preferences. Encourage the development of critical thinking, problem-solving, and other skills that are essential for success in a rapidly changing world.

Continuous Feedback Mechanism: Establish a robust feedback system involving students, educators, and administrators to continuously assess and improve the quality of education. Use data analytics to identify areas of improvement and tailor educational strategies accordingly.

Adaptability and Innovation: Foster a culture of adaptability and innovation within educational institutions to respond quickly to emerging trends and challenges. Encourage experimentation with new teaching methods and technologies in controlled environments.

Advocacy and Policy Change: Advocate for changes in educational policies at both the institutional and governmental levels to create an environment conducive to innovation and improvement. Collaborate with policymakers to address barriers hindering the adoption of modern educational practices. By addressing these aspects, educational institutions can work towards creating a more adaptive, efficient, and quality-driven educational system that meets the needs of students in the 21st century. The potential of connected devices in the classroom

The Internet of Things is a network of computerized devices that can communicate with one another and share data over the internet. This network is referred to by the phrase Internet of Things. Internet of Things (IoT) technology is currently being implemented in elementary, secondary, and tertiary educational institutions with the goals of tracking students; attendance, ensuring their safety, including them in the learning process, and adapting course material to

ISSN PRINT 2319 1775 Online 2320 7876

Research paper UGC CARE Listed (Group -I) Journal Volume 8, Issue 4, 2019

meet the requirements of students who have specific requirements. Smart boards, door locks, fire alarms, security systems, mobile applications, and educational software are just some examples of devices that may be linked to the internet. (Senthil et al., 2022).

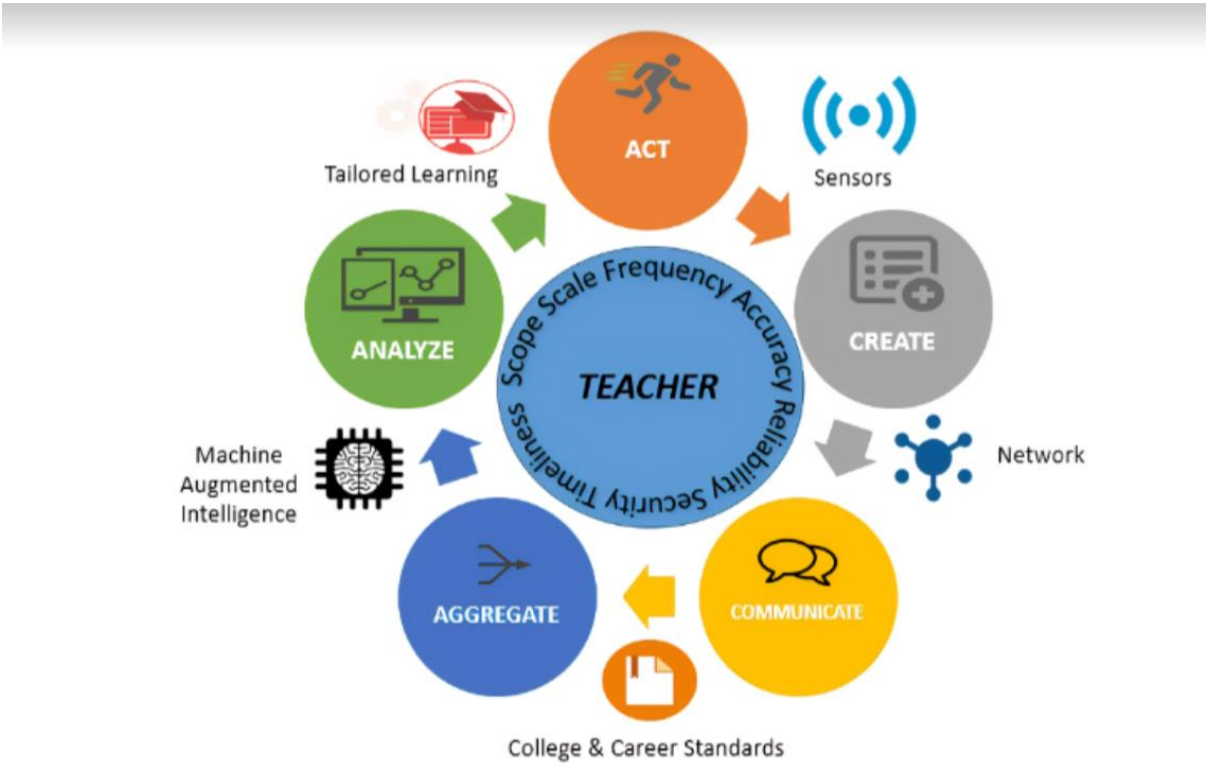

FIGURE 1. EDTECH I

THE INFLUENCE OF THE INTERNET OF THINGS ON LEARNING

A variety of instructional activities are made easier with the help of linked gadgets. With the help of smart classroom technology, security systems, and management software, teachers now have the resources they need to streamline the educational process for their students. Personalized learning is made possible by technological advancements, and it is this kind of learning that helps pupils develop marketable abilities like critical thinking, technical literacy, creativity, and adaptable problem-solving. Let us look at how the IoT may benefit classrooms. Enhanced Student Participation: In the contemporary era, the widespread availability of the Internet has led to a significant surge in the consumption of content. Particularly, the younger generation has developed a preference for communication through videos and visuals, largely facilitated by social media platforms. Consequently, conventional teaching methods relying solely on textbooks may no longer suffice to captivate and engage students in the classroom.

ISSN PRINT 2319 1775 Online 2320 7876

Research paper UGC CARE Listed (Group -I) Journal Volume 8, Issue 4, 2019

To address this challenge, educators are increasingly turning to IoT (Internet of Things) devices to create interactive learning experiences, aiming to enhance student engagement. One notable example is the utilization of interactive tables, which, when equipped with gamified software, transform the learning process into an exciting adventure across space and time. Students can navigate through a path of their choosing, participating in activities such as making historical predictions and completing assignments along the way (Wijaya et al., 2021). Recent survey data underscores the effectiveness of gamified learning, with a significant 67% majority of students expressing a preference for this approach over traditional instructional methods. The integration of IoT devices further contributes to making learning experiences more intriguing and enjoyable for students. As technology continues to play a pivotal role in education, educators are exploring innovative ways to leverage IoT to create dynamic and interactive learning environments that cater to the evolving preferences of today's students.

Improved Resources for Teachers: Educators' time can be more efficiently utilized through the implementation of management systems, such as Learning Management Systems (LMSs), to handle administrative tasks like document organization, test scoring, student attendance tracking, and resource monitoring in classrooms and laboratories. Wearables and smart sensors, as examples of Internet of Things (IoT) devices, play a crucial role in this transformation. They can monitor children's whereabouts and alert teachers to supply shortages, allowing for proactive intervention. As a result of these technological advancements, teachers find themselves with more available time. This surplus of time can then be dedicated to experimenting with novel teaching strategies and enhancing students' academic outcomes. Additionally, LMSs enable educators to provide immediate feedback to students on their work, further optimizing the teaching and learning process. In summary, the integration of technology not only streamlines administrative chores but also empowers educators to focus on innovative teaching methods, ultimately benefiting students' educational experiences.

Differentiated Instruction: Tailored learning plans for individual students are developed through the application of Big Data in personalized education. Information regarding students' assignment completion times, the questions they choose to omit in tests, the frequency of common errors, and other relevant metrics are gathered from any school-purpose device. Based on these insights, machine learning algorithms suggest adjustments to course content and the integration of new features to better align with each student's unique needs (Mohammadian,

ISSN PRINT 2319 1775 Online 2320 7876

Research paper UGC CARE Listed (Group -I) Journal Volume 8, Issue 4, 2019

2020). In the realm of personalized education, IoT devices play a crucial role by sharing the collected user information, thus contributing to the advancement of customized learning. The accuracy of the resulting learning paths is directly proportional to the volume of data processed by the algorithms. As the algorithms analyse an increasing quantity of data, they enhance the precision of recommended learning strategies.

Upgraded Security: Every educational institution bears the duty of safeguarding its students, and the integration of the Internet of Things (IoT) allows for the recording of each student's arrival through the school's security system. Every student and staff member could be equipped with a smart card serving as their building ID. Such a system has the capability to monitor student attendance and prevent unauthorized individuals from entering the premises. Additionally, a school can enhance security measures by implementing an access control system, extending protection to areas such as laboratories, libraries, and other restricted zones.

EDTECH IOT

IoT is a network of internet-connected devices. These items can send data wirelessly without human involvement. IoT technologies utilized in education are:

Smart Boards replaced blackboards: Smartboards let instructors write, educate, and illustrate using photos, sounds, and videos. This makes conversation entertaining, fascinating, and engaging. This eliminates any misunderstanding caused by a chalkboard and textbook where pupils can grasp the images. Teachers may quickly exchange notes/illustrations and lessons.

Tablets are replacing textbooks in many locations: Tablets replace textbooks, examinations, and homework. This transition minimizes paper use, which helps the environment. Tablets improve student-teacher interactions. Addiction and screen time are the two downsides. Almost every youngster nowadays has a cell phone. IoT specialists turned game-filled phones into instructional ones. This helps bring together individuals with similar interests from across the world. This increases student-teacher-student interactions. In many institutions, instructors and students use attendance monitors. This captures attendance and lets students monitor per-subject/overall attendance. No fraudulent attendance or proxy may be entered, ensuring students attend class. This offers the institution a formal record (Papaefstathiou, 2016).

AV or audiovisual technology is old. Pro AV has just been released and linked with IoT. AV rooms are popular in schools. Teachers utilize AVs to educate or analyse student work while presenting. IoT and AV go hand-in-hand in schools and outdoors, even if AV does not appear

ISSN PRINT 2319 1775 Online 2320 7876

Research paper UGC CARE Listed (Group -I) Journal Volume 8, Issue 4, 2019

like IoT. AV is used in schools, universities, corporations, retail businesses, and security. IoT is biggest function in AV is interacting with the building. Multiple IoT tools can control AV. Some are as easy as using a remote, while others need a touchpad.

Internet, however beneficial, constantly threatens the protection of our data. IoT provides emergency indications, audio augmentation, Wi-Fi clocks, and hearing-challenged warnings. This gives users a sense of security. It contains emergency tones, live bulletins, bell schedules, and pre-recorded educational messages. C-pen is a student-friendly gadget. It is a portable gadget for scanning and sharing textual or smartphone material. This is straightforward to use, so no notes will be lost or forgotten. This also defines a highlighted term, produces notes, and translates almost 40 languages with proper pronunciation. (Jogdand et al., 2018).

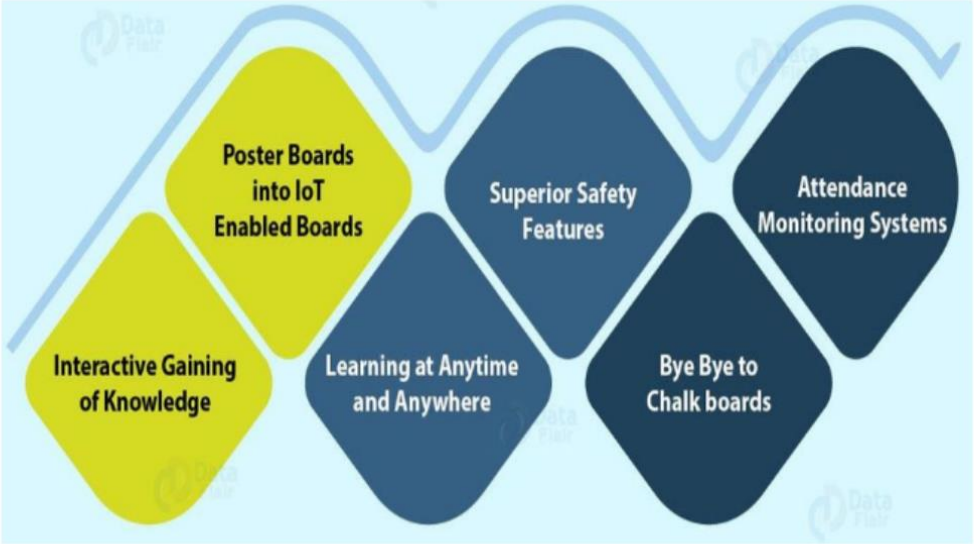

Figure 2: - application of IOT IN EDUCATION

CONCLUSION

The integration of the Internet of Things (IoT) into the educational system is gaining significance, albeit still in its early stages. Understanding the challenges educators faced prior to the availability of IoT is crucial. The digitization of education is rapidly advancing and inevitable in the modern era, presenting lucrative opportunities for IoT software development. Hybrid approaches can effectively address the immediate practical needs of the educational system. The IoT transforms learning, introducing numerous unprecedented possibilities. It enhances the learning experience, making it more engaging and tailored to individual students.

ISSN PRINT 2319 1775 Online 2320 7876

Research paper UGC CARE Listed (Group -I) Journal Volume 8, Issue 4, 2019

Educators benefit from the IoT as it streamlines their tasks through the automation of routine activities, simplifying their work. The interconnectedness of devices enables improved surveillance and control of specific areas, creating new educational prospects. Overall, the IoT in education not only simplifies processes but also opens up exciting avenues for enhanced and personalized learning.

REFERENCES

[1] Arras, P., Van Merode, D., & Tabunshchyk, G. (2019). Project-oriented teaching approach for IoT Education. Dependable IoT for Human and Industry, 515–533. https://doi.org/10.1201/9781003337843-30

[2] Jogdand, G., Kadam, S., Patil, K., & Mate, G. (2018). IoT transaction security. Journal of Advances and Scholarly Researches in Allied Education, 15(2), 711–716. https://doi.org/10.29070/15/57056

[3] Kalaiselvi, K. (2018). IoT application in Education. Securing IoT in Industry 4.0 Applications with Blockchain, 29–50. https://doi.org/10.1201/9781003175872-2

[4] Mohammadian, H. D. (2016). IOT-education technologies as solutions towards smes' educational challenges and I4.0 readiness. 2020 IEEE Global Engineering Education Conference (EDUCON). https://doi.org/10.1109/educon45650.2020.9125248

[5] Papaefstathiou, I. (2016). IoT design course using open-source tools. 2016 IEEE Global Engineering Education Conference (EDUCON). https://doi.org/10.1109/educon.2016.7474540

[6] Quezada-Sarmiento, P. A., Enciso, L., Washizaki, H., & Hernandez, W. (2018). Body of knowledge on IoT Education. Proceedings of the 14th International Conference on Web Information Systems and Technologies. https://doi.org/10.5220/0007232904490453

[7] Raghavan, K., Kang, J., & Natarajan, A. (2018). IOT-education technologies as solutions towards smes' educational challenges and I4.0 readiness. 2018 IEEE Custom Integrated Circuits Conference (CICC). https://doi.org/10.1109/cicc.2018.8357116

[8] Senthil, T., Deepika, J., & Rajan, C. (2015). Internet of things (IoT) in Education. Harnessing the Internet of Things (IoT) for a Hyper-Connected Smart World, 25–45. https://doi.org/10.1201/9781003277347-2

ISSN PRINT 2319 1775 Online 2320 7876

Research paper UGC CARE Listed (Group -I) Journal Volume 8, Issue 4, 2019

[9] Trabelsi, Z. (2014). IOT-based Smart Home Security Education using a hands-on approach. 2021 IEEE Global Engineering Education Conference (EDUCON). https://doi.org/10.1109/educon46332.2021.9454085

[10] Wijaya, I. D., Suprianto, D., & Hadid Firdaus, V. A. (2013). Design of IoT infrastructure as support empirical learning in IoT Laboratory. 2021 Universitas Riau International Conference on Education Technology (URICET)https://doi.org/10.1109/uricet53378.2021.9865890 the increasing importance of intelligent gadgets in shaping the future of higher education.

Top of Form