Civitas : Jurnal Pengabdian Masyarakat
Volume. 1 Issue 1 September 2024
Page No: 21-27

Education on the Contextual Utilization of Information Technology Based on the IoT in the Daily Lives of Senior High School Students

Nurcahyo Yogyanto[1], Siti Atwano Pisriwati[2], Deny Hadi Siswanto[3]
Muhammadiyah Mlati High School, Indonesia [1,2,3]
Correspondent: sitipisriwati51@guru.sma.belajar.id [2]

Received : August 15, 2024
Accepted : September 10, 2024
Published : September 27, 2024

Citation: Yogyanto, N., Pisriwati, S, A., & Siswanto, D, H. (2024). Education on the Contextual Utilization of Information Technology Based on the IoT in the Daily Lives of Senior High School Students. Civitas : Jurnal Pengabdian Masyarakat , 1(1), 21-27

ABSTRACT: The implementation of the Internet of Things (IoT) can be applied across various sectors in Indonesia, such as agriculture and healthcare, which demonstrate significant potential for utilizing this technology. To keep pace with technological trends, it is crucial to introduce the concept of IoT early in schools to spark students' interest in this field. This educational program aims to cultivate students' interest in IoT through presentations and live demonstrations using simple IoT-based tools. The event was held at Muhammadiyah Mlati Senior High School on July 27, 2024, involving 30 students. The method used was direct demonstrations of simple IoT tools, supported by effective communication between the educational team and the school. The results showed an improvement in students' understanding of the contextual use of IoT in daily life, with pre-test scores increasing from 53.5 to 78 in the post-test. In conclusion, this program successfully enhanced students' knowledge of IoT, and it is hoped that they will continue to understand its application in solving everyday problems while becoming more skilled in identifying issues and finding solutions using IoT-based technology in the future.

Keywords: Education, Information Technology, Internet of Things, High School

INTRODUCTION

The rapid advancement of technology in the digital era has brought significant changes to various aspects of life, including the field of education (Haleem et al., 2022). Among these developments, one technology that has emerged and grown rapidly with the potential to transform human lifestyles is the Internet of Things (IoT) (Nimodiya & Ajankar, 2022). According to (Pal & Yasar, 2023), IoT technology allows various physical devices to connect to the internet, facilitating real-time data exchange and automating various processes in daily life. The application of IoT is not limited to a single sector but extends across various fields such as healthcare, transportation, and education, making it increasingly relevant in modern life.

In the context of education, particularly at the high school level, IoT technology has tremendous potential to provide remarkable benefits (Rasul et al., 2023). It is crucial for today's youth to understand and utilize IoT technology in their daily lives . A deep understanding of IoT will not only equip students with relevant technological skills but also contribute to enhancing their critical thinking, problem-solving, and innovation capabilities (Marcela et al., 2020). Consequently, students

who effectively leverage IoT are expected to be better prepared to face future challenges, both in their educational and professional lives.

However, despite the vast potential of IoT, the reality on the ground shows that high school students' understanding of this technology remains very limited. This limitation is not without reason. One major factor is the lack of specific educational materials on IoT within school curricula (Costan et al., 2021). According to (Malik et al., 2019; Putri & Siswanto, 2024), the average curriculum still focuses on more conventional technologies, resulting in minimal student knowledge about IoT. This leads to students lacking a clear understanding of how IoT can be applied in their daily lives.

In addition to curriculum issues, the scarcity of direct educational activities that teach IoT utilization is also a significant challenge (Shofiyyah et al., 2023)(Siswanto, 2024). Currently, few schools offer programs or educational opportunities that provide practical understanding of this technology to students. Without adequate education, students lack the chance to explore IoT in depth and integrate it into their daily lives. This exacerbates the gap between students' existing knowledge and the future need for technological skills (Siswanto, Alghiffari, et al., 2024).

The challenge is not limited to students but also affects teachers. Many educators currently lack sufficient knowledge and skills regarding IoT technology (Timotheou et al., 2023). According to (Lin, 2024; Sikhosana & Mudau, 2024) and (Pisriwati et al., 2024), this situation hinders their ability to integrate IoT into classroom instruction. The lack of knowledge not only restricts teachers in teaching IoT-related material but also reduces opportunities to optimize the potential of this technology to enhance overall teaching quality. As a result, students miss out on innovative and relevant learning experiences that align with current technological developments.

Given these issues, a more structured effort is needed to enhance technological literacy among students, particularly concerning IoT technology. One potential solution is contextual education, designed not only to provide theoretical understanding of IoT but also to demonstrate how this technology can be applied to real-life situations that students encounter daily. Such education is expected to be an effective means of improving students' understanding of IoT.

Contextual education has several advantages. First, students will learn about IoT concepts in contexts relevant to their lives, making the learning experience more engaging and meaningful. Second, this education will help students see the relevance of IoT technology in their daily lives, ultimately encouraging them to explore and utilize this technology more actively. As a result, students will not only become passive technology users but also active innovators in applying technology to solve everyday problems.

Therefore, this educational approach is expected to address the limitations in students' understanding of IoT and enhance their technological literacy. With appropriate education, students will gain not only new knowledge but also practical skills that they can apply in their daily lives. Based on this, it is necessary to conduct introduction activities to foster interest in IoT among students through presentations and hands-on demonstrations using simple IoT-based tools. The results of this research are anticipated to positively contribute to the development of future curricula and teaching strategies, particularly concerning digital technology and IoT.

METHOD

Educating teenagers about Internet of Things (IoT) technology is a crucial step in preparing them for an increasingly digital future. This education was provided to 30 students at Muhammadiyah Mlati Senior High School on July 27, 2024, with the aim of delivering a fundamental understanding of IoT, including its goals, functions, concepts, and workings. The material covered an introduction to IoT devices as key components within IoT modules, and included demonstrations of simple IoT-based products used in daily life. To reinforce comprehension, active learning techniques such as demonstrations were employed, allowing participants to see and try IoT applications firsthand. Prior to the presentation, participants completed a questionnaire to assess their understanding before and after the activity(Pisriwati et al., n.d.; Wang et al., 2024).

The implementation of this activity was conducted in several stages. First, a presentation on the basic concepts of IoT was given, covering the components used in the development of this technology, with the expectation that participants would grasp the fundamental IoT concepts and develop a technology-based problem-solving mindset(Ruiz et al., 2024; Tian et al., 2024). The next stage involved showcasing IoT applications, where examples such as IoT-based attendance systems and waste management were demonstrated to the participants. The activity concluded with a question-and-answer session, providing students with the opportunity to ask questions about the presented material. The team then addressed these questions to deepen participants' understanding.

RESULT AND DISCUSSION

The educational activity conducted for the students of Muhammadiyah Mlati Senior High School revealed that their knowledge about utilizing internet technology, especially applied to everyday objects through the Internet of Things (IoT) concept, was still very limited. Most students were only familiar with using the internet for basic tasks such as searching for school assignments, entertainment, and social media. This finding aligns with (Siswanto, Listyanti, et al., 2024), highlighting the need for more significant efforts to introduce technologies that can help them use the internet for more productive and innovative purposes.

During the activity, students demonstrated high enthusiasm when they realized that the internet technology they commonly use daily has greater potential for solving various problems around them. With a solid understanding of IoT technology, students can learn to identify issues in their environment and transform them into innovative IoT-based solutions. To clarify this concept, a demonstration of a simple IoT system was provided, offering a tangible example of how this technology can be applied in everyday life. According to (Astiwi et al., 2024; Siswanto, Samsinar, et al., 2024), the interactive atmosphere during the presentation of material and hands-on trials indicated active student engagement in the learning process.

The success of this activity was evident from the positive reception from the school and the high level of interest shown by the students towards the material presented. The students' enthusiasm was reflected in the numerous questions asked, particularly about how the IoT concept could be used to

address problems in their surroundings. This interest indicates the significant potential students have to develop relevant and practical technological skills for the future.

To assess student understanding and the effectiveness of the activity, a questionnaire was administered at the end of the event to measure how well the material had been grasped. The results showed that all participants had understood the basic concepts and applications of IoT in daily life. This was reflected in the graph showing the increase from the pre-test to the post-test, serving as an indicator of the activity's success in introducing and promoting the use of IoT technology among students. The graph illustrating this improvement can be seen in the following figure.

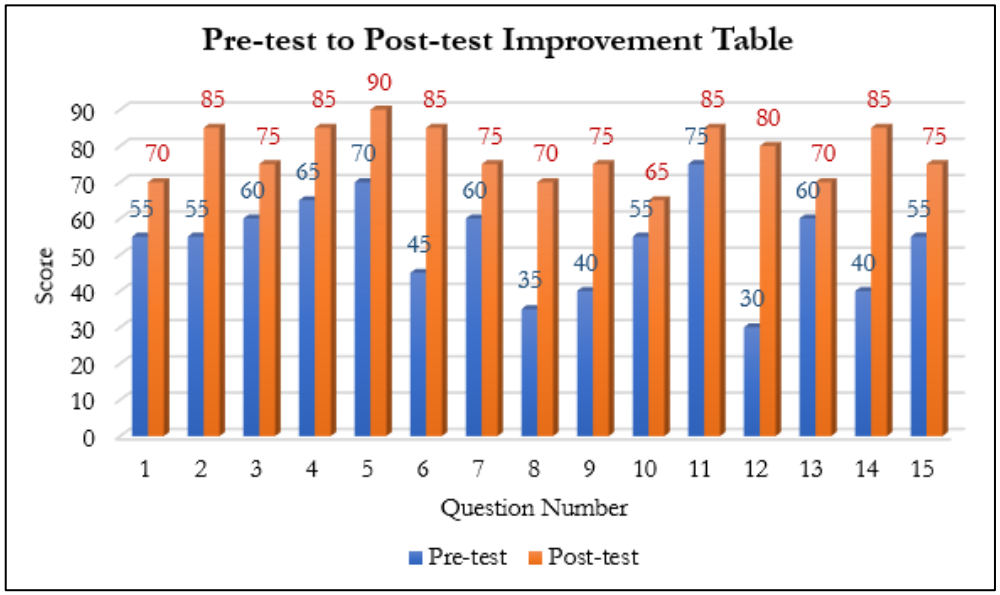

Figure 1. Graph of Pre-test to Post-test Improvement

The graph above illustrates that before participating in the educational activity, many students had a limited understanding of the fundamental concepts of the Internet of Things (IoT) in a technology-based problem-solving context. This is evident from the participants' pre-test score of only 53.3. However, following the contextual IoT educational activity, there was a significant increase in understanding, with the post-test score rising to 78. This improvement aligns with findings from (Asad et al., 2022; El-Haggar et al., 2023; Mhlongo et al., 2023), which suggest that the content delivered effectively enhanced students' awareness and understanding of IoT's potential for solving everyday problems.

This data highlights the positive impact of the educational activity. The increase in understanding not only reflects the success of the material delivery but also confirms that the students at Muhammadiyah Mlati Senior High School gained new insights into how IoT technology can be applied in their daily lives. The results indicate that such activities hold substantial potential for improving technology literacy among students, which is crucial in keeping up with the rapid technological advancements.

It is also hoped that the students who participated in this activity will apply the knowledge they have acquired to identify and address issues in their surroundings using IoT technology. With a better

understanding of IoT, they are expected to view this technology as an effective tool for developing innovative solutions that are beneficial both personally and on a broader scale. Despite the positive outcomes of this educational activity, several limitations were observed. Firstly, although students were introduced to the concept of IoT, their prior knowledge was limited to basic internet usage. Secondly, while there was significant enthusiasm, this interest may not necessarily translate into long-term technological competence without further support. Thirdly, the context-specific nature of the demonstrations might limit the transferability of the acquired knowledge to other contexts or more complex IoT applications.

CONCLUSION

Based on the conducted educational activity, it can be concluded that the event was successful, owing to effective communication between the educational team and Muhammadiyah Mlati Senior High School. The program was designed to educate students on the positive use of internet technology, and the presented material successfully engaged the participants, ensuring that the main objectives of the activity were effectively achieved. The success of the activity heavily relied on student feedback and positive reception from the school, highlighting the need for further research to evaluate the sustainability of interest and the practical application of IoT concepts beyond this activity.

REFERENCE

Asad, M. M., Naz, A., Shaikh, A., Alrizq, M., Akram, M., & Alghamdi, A. (2022). Investigating the impact of IoT-Based smart laboratories on students' academic performance in higher education. *Universal Access in the Information Society*, *23*(3), 1135–1149. https://doi.org/10.1007/s10209-022-00944-1

Astiwi, W., Siswanto, D. H., & Suryatama, H. (2024). Description Regarding the Influence of Teacher Qualifications and Competence on Early Childhood Learning Achievement. *Asian Journal of Applied Education (AJAE)*, *3*(3), 347–358. https://doi.org/https://doi.org/10.55927/ajae.v3i3.10360

Costan, E., Gonzales, G., Gonzales, R., Enriquez, L., Costan, F., Suladay, D., Atibing, N. M., Aro, J. L., Evangelista, S. S., Maturan, F., Selerio, E., & Ocampo, L. (2021). Education 4.0 in developing economies: A systematic literature review of implementation barriers and future research agenda. *Sustainability (Switzerland)*, *13*(22). https://doi.org/10.3390/su132212763

El-Haggar, N., Amouri, L., Alsumayt, A., Alghamedy, F. H., & Aljameel, S. S. (2023). The Effectiveness and Privacy Preservation of IoT on Ubiquitous Learning: Modern Learning Paradigm to Enhance Higher Education. *Applied Sciences (Switzerland)*, *13*(15). https://doi.org/10.3390/app13159003

Haleem, A., Javaid, M., Qadri, M. A., & Suman, R. (2022). Understanding the role of digital technologies in education: A review. *Sustainable Operations and Computers*, *3*(May), 275–285. https://doi.org/10.1016/j.susoc.2022.05.004

Lin, Y. (2024). Application and Challenges of Computer Networks in Distance Education. *Computing, Performance and Communication Systems*, *8*(1), 17–24. https://doi.org/10.23977/cpcs.2024.080103

Malik, M. N., Khan, H. H., Chofreh, A. G., Goni, F. A., Klemeš, J. J., & Alotaibi, Y. (2019). Investigating students' sustainability awareness and the curriculum of technology education in Pakistan. *Sustainability (Switzerland)*, *11*(9), 1–18. https://doi.org/10.3390/su11092651

Marcela, H.-M., Díaz, C. E., & Morales-Menendez, R. (2020). Technologies for the future of learning: state of the art. *International Journal on Interactive Design and Manufacturing*, *14*(2), 683–695. https://doi.org/10.1007/s12008-019-00640-0

Mhlongo, S., Mbatha, K., Ramatsetse, B., & Dlamini, R. (2023). Challenges, opportunities, and prospects of adopting and using smart digital technologies in learning environments: An iterative review. *Heliyon*, *9*(6), e16348. https://doi.org/10.1016/j.heliyon.2023.e16348

Nimodiya, A. R., & Ajankar, S. S. (2022). A Review on Internet of Things. *International Journal of Advanced Research in Science, Communication and Technology*, *2*(1), 135–144. https://doi.org/10.48175/ijarsct-2251

Pal, K., & Yasar, A. U. H. (2023). Internet of Things Impact on Supply Chain Management. *Procedia Computer Science*, *220*, 478–485. https://doi.org/10.1016/j.procs.2023.03.061

Pisriwati, S. A., Siswanto, D. H., Hardi, Y., & Alghiffari, E. K. (n.d.). Question Making Training with LOTS , MOTS , and HOTS Cognitive Levels for High School Teachers. *Journal of Social and Community Development*, *1*(1), 9–19. https://doi.org/10.56741/jscd.v1i01.666

Pisriwati, S. A., Siswanto, D. H., Hardi, Y., & Alghiffari, E. K. (2024). Question Making Training with LOTS , MOTS , and HOTS Cognitive Levels for High School Teachers. *Journal of Social and Community Development*, *1*(1), 9–19. https://doi.org/10.56741/jscd.v1i01.666

Putri, H. A., & Siswanto, D. H. (2024). Teaching at The Right Level (TaRL) as an Implementation of New Education Concepts in the Insights of Ki Hajar Dewantara. *Indonesian Journal of Educational Science and Technology (Nurture)*, *3*(2), 89–100. https://doi.org/https://doi.org/10.55927/nurture.v3i2.9297

Rasul, T., Nair, S., Kalendra, D., Robin, M., Santini, F. de O., Ladeira, W. J., Sun, M., Day, I., Rather, R. A., & Heathcote, L. (2023). The role of ChatGPT in higher education: Benefits, challenges, and future research directions. *Journal of Applied Learning and Teaching*, *6*(1), 41–56. https://doi.org/10.37074/jalt.2023.6.1.29

Ruiz, O. A., Gortari, M., Maguire, V. G., Arese, R. P., Campestre, M. P., Antonelli, C. J., Calzadilla, P. I., Menéndez, A. B., Escaray, F. J., Carrasco Sorli, P. M., Bailleres, M. A., Ezquiaga, J. P., Paolocci, F., Garriz, A., & Nieva, A. S. D. V. (2024). Lotus spp.: a Mediterranean genus with high environment and economic impact in the Salado River Basin (Argentina). *Discover Life*, *54*(1). https://doi.org/10.1007/s11084-024-09646-5

Shofiyyah, N. A., Komarudin, T. S., & Hasan, Moch. S. (2023). Innovations in Islamic Education Management within the University Context: Addressing Challenges and Exploring Future Prospects. *Nidhomul Haq : Jurnal Manajemen Pendidikan Islam*, *8*(2), 193–209. https://doi.org/10.31538/ndh.v8i2.3625

Sikhosana, L., & Mudau, A. V. (2024). Integration of Fourth Industrial Revolution in teaching and learning during COVID-19 pandemic. *International Journal of Information and Communication Technology*, *1*(1), 35–55. https://doi.org/10.1504/ijict.2024.10063468

Siswanto, D. H. (2024). *Analisi Kebutuhan Flip LKPD Matriks Bermodel PBL untuk Merangsang Kemampuan Berpikir Kritis*. *24*(1), 1–8.

Siswanto, D. H., Alghiffari, E. K., & Pujiastuti, N. I. (2024). Implementation of the CTL Model as a Strategy to Increase Interest in Learning Mathematics. *Indonesian Journal of Educational Science and Technology (Nurture)*, *3*(2), 61–74. https://doi.org/https://doi.org/10.55927/nurture.v3i2.9168

Siswanto, D. H., Listyanti, F. S., Firmansyah, A. B. P. D. A., Pisriwati, S. A., & Setiawan, A. (2024). Enhancing Teachers ' Competence in Designing Computer- Based Test Questions through In House Training. *JOELI: Journal of Educational and Learning Innovation*, *1*(1), 75–84. https://doi.org/https://doi.org/10.72204/g66ex11

Siswanto, D. H., Samsinar, Alam, S. R., & Andriyani. (2024). Peran Kompetensi Guru dalam Menerapkan Kurikulum Merdeka. *Jurnal Pendidikan DIDAXEI*, *5*(1), 763–773.

Tian, X., Sun, A., Wang, C., & Ding, K. (2024). Removal of quinoline in aqueous solutions using chemically modified and unmodified hydrochars from lotus seedpods: A comprehensive experimental study. *Colloids and Surfaces A: Physicochemical and Engineering Aspects*, *702*. https://doi.org/10.1016/j.colsurfa.2024.135166

Timotheou, S., Miliou, O., Dimitriadis, Y., Sobrino, S. V., Giannoutsou, N., Cachia, R., Monés, A. M., & Ioannou, A. (2023). Impacts of digital technologies on education and factors influencing schools' digital capacity and transformation: A literature review. In *Education and Information Technologies* (Vol. 28, Issue 6). Springer US. https://doi.org/10.1007/s10639-022-11431-8

Wang, L., Shu, L., Hu, Q., Jiang, X., Yang, H., Wang, H., & Rao, L. (2024). Mechanism of self-recovery of hydrophobicity after surface damage of lotus leaf. *Plant Methods*, *20*(1). https://doi.org/10.1186/s13007-024-01174-7