INTEGRATING TECHNOLOGY IN ISLAMIC RELIGIOUS EDUCATION: ECHANING ENGAGEMENT AND LEARNING OUTCOMES

Mohammad Ali Mahmudi
[1,2] Universitas YAPIS Papua, Indonesia
*) corresponding author

Keywords	***Abstract***
Islamic Religious Education, Technology, Student Involvement, Learning Outcomes, e-learning.	*This study aims to explore the impact of technology integration in Islamic Religious Education learning on student engagement and learning outcomes. Along with the development of digital technology, educators are challenged to apply more interactive and adaptive learning methods. This research uses a qualitative approach with a case study method in several schools that have implemented technology in Islamic Religious Education classes. Data was collected through classroom observations, interviews with teachers, and questionnaires to students. The results show that the use of technology, such as learning videos, interactive apps, and e-learning platforms, significantly increases student engagement in the learning process. In addition, there is an increase in student learning outcomes, especially in terms of material understanding and critical thinking skills. This study recommends that technology be more integrated in the Islamic Religious Education curriculum to maximize a more interesting and effective learning experience.*

1. INTRODUCTION

The development of technology in the digital era has brought great transformations in various aspects of life, including the field of education (Budiman et al., 2020; Said, 2024). Advances in information and communication technology (ICT) have allowed for significant changes in the way information is delivered and accessed. Learning is no longer limited to physical classrooms, but has expanded to digital platforms through educational applications, interactive videos, and e-learning (Zulyusri et al., 2023; Utomo et al., 2023). With the internet and devices such as computers, tablets, and smartphones, access to knowledge has become easier and more inclusive (Oktarina et al., 2021; Hariyadi et al., 2023). This technology provides an opportunity for educators to implement teaching methods that are more dynamic, interactive, and in accordance with the needs of students in the 21st century. It also supports the creation of more personalized and flexible learning, where students can learn at a pace and style that suits them (Miskiah et al., 2019).

In addition, technology in the digital era has also expanded opportunities for global collaboration and access to educational resources that were previously unimaginable (Bairral & Aldon, 2024). Through online platforms, teachers and students can access materials from different parts of the world, as well as interact with the global community. Innovations such as artificial intelligence (AI) and augmented reality (AR) are beginning to be applied in education to create more immersive and contextual learning experiences Nurtamam et al., 2023). The use of this technology not only increases student engagement in the learning process, but also improves learning outcomes by providing new ways to understand and explore subject matter. In this digital era, the integration of technology in

education is no longer an option, but a need to ensure that learning is relevant and effective in facing global challenges (Usman et al., 2021; Zulkifli et al., 2022).

Islamic Religious Education (PAI) faces significant challenges in the modern era, especially related to learning methods that tend to be traditional (Ramulumo & Mohapi, 2023). Many schools and educational institutions still use lecture and rote approaches in delivering material, which is often less interesting to students. As a result, students' involvement in the learning process is low, and their understanding of religious values is often superficial (Faisal et al., 2021). In addition, there is a gap between the way the material is delivered and the development of the digital world that has affected students' learning styles. In the midst of such a rapid flow of information and technology that dominates daily life, the monotonous learning approach in PAI has the potential to make students feel bored and not actively engaged.

Another challenge is the lack of technology integration in PAI learning, even though technology can be an effective tool to increase student engagement and understanding. Some educators may feel less skilled in using technology, while others may be concerned that the use of technology may distract from religious values (Gusman, 2023). There are also concerns that religious material cannot be conveyed in an appropriate way if digital media is used. However, these challenges need to be overcome, given that technology has become an integral part of student life in the modern era. PAI educators must find ways to utilize technology to make learning more relevant and engaging for students without compromising the essence of the religious teachings conveyed (Mazrur et al., 2023).

The integration of technology in Islamic Religious Education (PAI) offers a great opportunity to improve the quality of learning, both in terms of student involvement and a deeper understanding of teaching materials (Sumarno, 2023; Putra et al., 2023). By utilizing various digital tools such as educational apps, e-learning platforms, and interactive videos, teachers can create a more engaging and relevant learning experience for students. Technology also allows teaching to be more personalized and flexible, where students can access materials according to their own pace and learning style (Sukiman et al., 2021). For example, the use of interactive video lectures or virtual reality-based simulations can help students understand abstract religious concepts in a more concrete and engaging way.

In addition, technology opens up access to a variety of global resources that can enrich PAI learning. Students and teachers can access classic books, lectures from scholars in various countries, as well as learning materials that were previously difficult to reach. Technology also enables cross-cultural collaboration and discussion that broadens students' horizons on different perspectives of Islam around the world (Said, 2024; Faisal et al., 2021). The use of social media platforms and interactive applications can also encourage student participation in discussing and sharing religious understanding in a more open and creative way. Thus, the integration of technology in PAI not only increases student engagement, but also enriches their understanding of religion in a way that is more suitable for life in the digital era.

Research by Rahman & Abdullah (2021) found that the use of e-learning platforms in Islamic Religious Education in secondary schools has succeeded in significantly increasing student engagement. In the study, students who used digital learning platforms were more active in class discussions and easier to understand the subject matter, compared to traditional methods. In addition, they also found that technology helps create a more interactive and collaborative learning atmosphere, which supports increased student learning motivation.

On the other hand, another study by Murtaza (2020) emphasizes the importance of educator readiness in integrating technology in religious learning. In his research, it was found that many PAI teachers are not fully prepared to use technology effectively in the classroom, either due to lack of training or limited infrastructure. As a result, even though technology is available, its impact on student

learning outcomes is not always optimal. This study shows that, although technology has great potential to improve learning, educators' readiness and skills are the main determining factors for the success of its integration in the educational process. Both studies highlight the importance of not only providing technology, but also ensuring adequate support for teachers to use it effectively in PAI learning. Therefore, this study aims to explore the impact of technology integration in Islamic Religious Education learning on student engagement and learning outcomes. Along with the development of digital technology, educators are challenged to implement more interactive and adaptive learning methods.

2. RESEARCH METHODS

The methodology of this study uses a qualitative approach with a case study design to understand the impact of technology integration in Islamic Religious Education (PAI) on student engagement and learning outcomes. The location of the research was chosen based on schools that have applied technology in PAI learning. The data collection technique involves classroom observations, in-depth interviews with PAI teachers, and questionnaires to students to evaluate their experience in using technology during the learning process. Classroom observation was carried out to record students' interactions with technology, while interviews with teachers aimed to understand the obstacles and perceived benefits of the application of technology.

The data collected will be analyzed using thematic analysis techniques. This analysis aims to identify certain patterns in student engagement, technology use, and their impact on learning outcomes. Interviews with teachers will be categorized based on themes such as ease of technology integration, challenges faced, and learning effectiveness. The results of the student questionnaire will be used to supplement the observation and interview data, which is expected to provide a comprehensive overview of the influence of technology on student engagement and improved understanding of PAI material. With this approach, the research is expected to be able to provide an in-depth view of the potential of technology in improving the quality of PAI learning.

3. RESULT AND DISCUSSION

1. Technology Integration In PAI Learning Can Increase Student Engagement

The integration of technology in Islamic Religious Education (PAI) learning has great potential to increase student engagement, especially in presenting a more interactive approach and relevant to modern learning styles. Today's students, often referred to as the digital native generation, tend to be more responsive to media that utilize technology such as interactive videos, learning apps, and e-learning platforms (Gusman, 2023). The use of technology can stimulate their interest in being more active in participating, as technology allows for a variety of methods that are more varied than conventional teaching methods that tend to be one-way. By using technology, teachers can create a more dynamic learning atmosphere and support student active involvement in the learning process (Nasir et al., 2024).

In addition, technology allows for personalized learning, which is one of the important factors in increasing student engagement. By using e-learning software or platforms, students can learn at their own pace and learning style, which will ultimately increase their understanding and participation (Mazrur et al., 2023). In the context of PAI, material that is often considered abstract or difficult for students to understand can be explained through more visual and interactive media, such as animated videos or simulations. This helps students to more easily understand the religious concepts taught and be more involved in class discussions because the material presented becomes more accessible and understandable.

The use of technology also allows teachers to monitor student engagement more effectively. For example, technology-based learning platforms often have analytics features that allow teachers to track student participation, the frequency of their interactions with the material, and their learning progress (Ali, 2023). This information is very useful for teachers in assessing student engagement and determining whether the teaching methods used are effective or need to be adjusted. With more accurate data, teachers can give more personalized attention to students in need, as well as adjust teaching strategies to better motivate all students to be actively involved in learning.

Furthermore, technology is creating opportunities for more collaborative learning among students. Through digital platforms, students can collaborate on group projects or discuss PAI materials virtually, either in the form of online discussion forums, web-based collaborative assignments, or religious-based educational games. This collaboration not only increases student engagement, but also encourages them to be more active in applying their religious knowledge in a social context. Technology allows for a wider range of interactions, where students can collaborate not only with classmates, but also with students from different schools or even other countries, enriching their learning experience (Feridun & Bayraktar, 2024; Sumarno, 2023).

However, the integration of technology in PAI learning is not completely challenge-free. Some of the challenges faced are the readiness of technological infrastructure in schools, teachers' skills in using technology effectively, and the existence of technological content that is relevant and in accordance with Islamic religious values. However, with proper training and support from schools and governments, these challenges can be overcome. Teachers who are able to master the use of technology in the classroom will be more confident in using it as a learning aid, and this will contribute directly to increasing student engagement (Adipat & Chotikapanich, 2024).

Overall, the integration of technology in PAI learning offers many benefits in improving student engagement. Technology not only makes the learning process more interesting and relevant, but also provides opportunities for students to be more active and participatory in understanding and practicing religious teachings. With the right implementation strategy, technology can be a powerful tool to enrich the PAI learning experience, both in terms of student engagement and improved learning outcomes (Said, 2024). Effective technology integration will ultimately help create a generation that is not only skilled in technology, but also has a deep understanding of religion and is relevant to the context of their lives.

2. The Effect Of Technology Use on Student Learning Outcomes In PAI

The use of technology in Islamic Religious Education (PAI) has shown a significant impact on student learning outcomes. The integration of technologies such as learning apps, interactive videos, and e-learning platforms allows for the delivery of PAI materials in a more engaging, contextual, and easy-to-understand way (Said, 2024). Technology is able to break the boredom that often appears in traditional learning methods that tend to be dominated by lectures and memorization. With the help of technology, students can learn in a more interactive and multimedia-based method, which ultimately improves their understanding of the religious concepts taught. The use of visual media, for example, can help students visualize abstract concepts in Islamic teachings, such as monotheism, morals, and sharia laws (Akrim et al., 2022)

In addition to providing a more engaging learning experience, technology also allows access to a variety of richer and more diverse learning resources. Students can access Islamic classics, lectures by scholars from different parts of the world, and even interactive materials tailored to the PAI curriculum. This enriches their learning with a broader and deeper perspective (Nasir et al., 2024). For example, video lectures from renowned scholars or simulations of Islamic history can provide a more immersive learning experience, which not only supports student engagement but also improves their understanding of the teaching material. Thus, technology not only helps students to understand the lessons, but also encourages further exploration of religious teachings (Abubakari & Zakaria, 2023).

Another positive effect of using technology in PAI is the improvement of students' critical and analytical thinking skills. In many cases, technology allows students to interact with the subject matter more actively. For example, in an e-learning platform, students can be given analytical tasks that encourage them to understand more deeply, relate religious concepts to real-life contexts, or discuss with peers through online forums. Technology-powered problem-based learning also encourages students to solve problems based on religious principles, which helps them put theory into practice. As a result, students not only learn to memorize, but also understand and apply Islamic teachings in their social context.

Furthermore, the use of technology can also increase the effectiveness of student learning outcome evaluation (Turillazzi et al., 2023). Thanks to the digital platform, teachers can easily monitor students' learning progress, both individually and in groups. Learning applications or platforms are often equipped with analytics features that provide detailed reports on student progress, from the frequency of material access, exam results, to participation in online discussions. This allows teachers to identify areas where students need to improve and provide more specific and targeted guidance. As a result, technology helps in providing faster and more effective feedback, which can improve the overall learning process (Ryan Rucker, 2023).

However, although technology provides various benefits in improving student learning outcomes in PAI, some challenges remain. One of the biggest challenges is the availability of adequate technology in schools, especially in regions with limited technological infrastructure. In addition, the readiness of teachers to use technology effectively is also the key to the success of this implementation (Gyawali & Mehndroo, 2020.. Teachers must be trained in the use of technology so that they are able to make the most of it to improve student learning outcomes.

Without adequate skills, the use of technology can become ineffective and actually add complexity to the learning process.

Overall, the effect of using technology on student learning outcomes in PAI is very positive if applied correctly. Technology provides new and more effective ways to convey and understand subject matter, increase student engagement, enrich learning resources, and accelerate the evaluation of learning outcomes. However, the success of technology in supporting learning outcomes depends on the readiness of infrastructure, teacher skills, and support from all relevant parties. With the right approach, technology can be a powerful tool in shaping a generation that is not only technologically literate, but also has a deep understanding of religion and is relevant to modern life.

3. Effective Technology to Apply in PAI Learning

In the context of Islamic Religious Education (PAI), several technologies have proven to be very effective in improving student experience and learning outcomes. One very useful technology is learning videos. Interactive videos that present lectures from scholars, simulations of Islamic stories, or visual explanations of religious concepts can help students understand the material in a more engaging and memorable way (Sulaeman et al., 2022). For example, videos that visually depict Islamic history or moral principles can make abstract material more concrete and easy to digest. This technology allows students to learn at their own pace, and can be accessed at any time, providing additional flexibility in the learning process.

Mobile learning applications are also a very effective tool in PAI learning. These apps often come with a variety of features such as interactive quizzes, flashcards, and assignments that can help students learn the material in a more structured and fun way (Nasir et al., 2024). Some applications even provide materials specifically designed to support the PAI curriculum, such as memorization of prayers and surah of the Qur'an, as well as explanations of sharia laws in an easy-to-understand form. The use of mobile apps allows students to learn independently and monitor their progress in real-time, increasing their engagement and motivation in learning (McNamara et al., 2022).

E-learning platforms are another technology that is very effective to implement in PAI. The platform provides a virtual space for web-based learning where students can access subject matter, participate in discussions, and participate in collaborative assignments. With features such as discussion forums, video conferences, and downloadable learning materials, the e-learning platform allows students to interact with teachers and classmates online (Feridun & Bayraktar, 2024). It also supports distance learning, so students from different locations can take PAI classes without having to be physically present at school. The ease of access and interactivity offered by e-learning platforms helps to enrich the learning experience of students (Aseery, 2024).

In addition, the use of augmented reality (AR) technology in PAI learning can create a highly immersive learning experience. AR allows students to see religious objects or concepts in 3D that appear in a real environment through their devices. For example, AR can be used to depict important locations in Islamic history or illustrate abstract concepts such as the pillars

of faith in a more visual and interactive way. This technology helps students to understand and remember information better because the learning experience offered is more engaging and contextual (Feridun & Bayraktar, 2024).

Gamification technology has also been shown to be effective in increasing student engagement in PAI learning. Gamification integrates game elements, such as points, levels, and badges, into the learning process to make it more engaging and motivating. By turning learning activities into fun challenges, students become more motivated to actively participate and complete assignments better (Gusman, 2023). For example, game-based quizzes that test understanding of PAI material can encourage students to study harder and feel more involved in the learning process.

Finally, social media technology can also be used to improve PAI learning. Through social media platforms, students can discuss, share understanding, and ask questions about the subject matter with their classmates and teachers. This creates a space for students to learn collaboratively and build a more active learning community. Teachers can use social media to share articles, videos, and other resources that support PAI learning, as well as to provide additional feedback and support to students outside of classroom hours (Aksak Kömür & Okur, 2024). The use of social media in education allows students to connect and learn in a more social and interactive context.

By effectively implementing these technologies, PAI education can become more dynamic, engaging, and relevant to the needs and interests of modern students. Technology not only enriches teaching materials but also provides new ways to improve student engagement and learning outcomes, ensuring that they not only understand religious teachings better but also apply them in their daily lives.

Conclusion

From the results of this study, it can be concluded that the use of technology, such as learning videos, interactive applications, and e-learning platforms, significantly increases student involvement in the learning process. In addition, there is an increase in student learning outcomes, especially in terms of material understanding and critical thinking skills. This study recommends that technology be more integrated in the Islamic Religious Education curriculum to maximize a more interesting and effective learning experience.

REFERENCE

Abubakari, M., & Zakaria, G. (2023). Technology Acceptance Model in Islamic Education (TAMISE) for Digital Learning: Conceptual Framework Proposal. *Canadian Journal of Educational and Social Studies*, *3*, 25–42. https://doi.org/10.53103/cjess.v3i4.153

Adipat, S., & Chotikapanich, R. (2024). Advancing Higher Education with the Transition to Smart Universities: A Focus on Technology. *Shanlax International Journal of Education*, *12*(3), 29–36. https://doi.org/10.34293/education.v12i3.7635

Akrim, A., Setiawan, H. R., Selamat, S., & Ginting, N. (2022). Transformation of Islamic education curriculum development policy in the national education system. *Cypriot Journal of Educational Sciences*, *17*(7), 2538–2552. https://doi.org/10.18844/cjes.v17i7.7685

Aksak Kömür, İ., & Okur, M. R. (2024). Preferences and Views of School Students on the Integration of MOOCs in Performance Tasks of EFL Courses. *Journal of Learning for Development*, *11*(2), 369–381. https://doi.org/10.56059/jl4d.v11i2.900

Ali, R. (2023). INSTITUTIONAL ADOPTION AND IMPLEMENTATION OF BLENDED LEARNING: DIFFERENCES IN STUDENT PERCEPTIONS. *Turkish Online Journal of Distance Education*, *24*(1), 37–53. https://doi.org/10.17718/tojde.973869

Aseery, A. (2024). Enhancing learners' motivation and engagement in religious education classes at elementary levels. *British Journal of Religious Education*, *46*(1), 43–58. https://doi.org/10.1080/01416200.2023.2256487

Bairral, M., & Aldon, G. (2024). The Integration of Digital Technology in Task-Design on Eye-Tracking Studies in Geometry. *Journal of Research in Mathematics Education*, *13*(2), 164–179. https://doi.org/10.17583/redimat.15041

Budiman, A., Samani, M., Rusijono, R., Setyawan, W. H., & Nurdyansyah, N. (2020). The Development of Direct-Contextual Learning: A New Model on Higher Education. *International Journal of Higher Education*, *10*(2), 15. https://doi.org/10.5430/ijhe.v10n2p15

Edy Nurtamam, M., Santosa, T., Ilwandri, Aprilisia, S., Rahman, A., & Suharyat, Y. (2023). Meta-analysis: The Effectiveness of Iot-Based Flipped Learning to Improve Students' Problem Solving Abilities. *Edumaspul - Jurnal Pendidikan*, *7*, 1491–1501. https://doi.org/10.33487/edumaspul.v7i1.6195

Faisal, M., Za, T., Siswanto, R., Hayati, H., & Darojat, J. (2021). The Integration of KKNI, SNPT, and the Integration-Interconnection Paradigm in Curriculum Development at PTKI. *Jurnal Ilmiah Peuradeun*, *9*(2), 309. https://doi.org/10.26811/peuradeun.v9i2.528

Feridun, K. B., & Bayraktar, Ü. (2024). The Future of Virtual Reality and Education. *The Turkish Online Journal of Educational Technology*, *23*(3).

Gusman, E. (2023). *A Comprehensive Review to Identify the Challenges and Opportunities of Using Digital Technology in English Teaching in Higher Education*.

Gyawali, Y. P., & Mehndroo, M. (n.d.). *Navigating the Digital Frontier: Exploring Opportunities and Challenges in the Integration of Technology in Higher Education*.

Hariyadi, S., Rofi'i, A., Santosa, T. A., Taqiyuddin, & Sakti, B. P. (2023). Effectiveness of STEM-Based Mind Mapping Learning Model to Improve Students' Science Literacy in the Era of Revolution 4.0. *Jurnal Penelitian Pendidikan IPA*, *9*(10), 791–799. https://doi.org/10.29303/jppipa.v9i10.5125

Mazrur, Jennah, R., Mujib, A., & Jamalie, Z. (2023). The acceptance and effectiveness of digital learning technologies: A detailed empirical investigation in Islamic study classrooms. *Journal of Education and E-Learning Research*, *10*(2), 175–186. https://doi.org/10.20448/jeelr.v10i2.4495

McNamara, D. S., Arner, T., Butterfuss, R., Mallick, D. B., Lan, A. S., Roscoe, R. D., Roediger, H. L., & Baraniuk, R. G. (2022). Situating AI (and Big Data) in the Learning Sciences: Moving toward Large-Scale Learning Sciences. In A. H. Alavi, F. Ouyang, P. Jiao, & B. M. McLaren, *Artificial Intelligence in STEM Education* (1st ed., pp. 289–308). CRC Press. https://doi.org/10.1201/9781003181187-23

Miskiah, M., Suryono, Y., & Sudrajat, A. (2019). INTEGRATION OF INFORMATION AND COMUNICATION TECHNOLOGY INTO ISLAMIC RELIGIOUS EDUCATION TEACHER TRAINING. *Jurnal Cakrawala Pendidikan*, *38*(1), 130–140. https://doi.org/10.21831/cp.v38i1.23439

Nasir, Mohd., Rizal, S., Basri, & Pabbajah, M. (2024). Revolutionizing Teungku Dayah learning model: Exploring the transformative impact of technological advancements on Islamic

education in Aceh. *Cogent Education*, *11*(1), 2335720. https://doi.org/10.1080/2331186X.2024.2335720

Oktarina, K., Suhaimi, S., Santosa, T. A., Razak, A., Irdawati, I., Ahda, Y., Lufri, L., & Putri, D. H. (2021). Meta-Analysis: The Effectiveness of Using Blended Learning on Multiple Intelligences and Student Character Education During the Covid-19 Period. *IJECA (International Journal of Education and Curriculum Application)*, *4*(3), 184–192. https://doi.org/10.31764/ijeca.v4i3.5505

Putra, M., Rahman, A., Ilwandri, I., Suhayat, Y., Santosa, T. A., Putra, R., & Aprilisia, S. (2023). The Effect of STEM-Based REACT Model on Students' Critical Thinking Skills: A Meta-Analysis Study. *LITERACY : International Scientific Journals of Social, Education, Humanities*, *2*(1), Article 1. https://doi.org/10.56910/literacy.v2i1.560

Ramulumo, M., & Mohapi, S. (2023). Utilizing Blended Learning to Mitigate the Challenges Brought by Natural Disasters in South African Schools. *Research in Social Sciences and Technology*, *8*(4), 76–93. https://doi.org/10.46303/ressat.2023.33

Ryan Rucker. (2023). Raising Learner Satisfaction in Online Computer Programming and Information Technology Courses: One Instructor's Five Successful Strategies. *Journal of Open, Flexible and Distance Learning*, *27*(1), 54–63. https://doi.org/10.61468/jofdl.v27i1.541

Said, H. (2024). *Hasani Ahmad Said—[Full Buku] The Role of Islamic Da'wah in Creating Peace and Developing Civilization*.

Sukiman, S., Haningsih, S., & Rohmi, P. (2021). The Pattern of Hybrid Learning to Maintain Learning Effectiveness at the Higher Education Level Post-COVID-19 Pandemic. *European Journal of Educational Research*, *volume–11–2022*(volume–11–issue–1–january–2022), 243–257. https://doi.org/10.12973/eu-jer.11.1.243

Sulaeman, N., Efwinda, S., & Putra, P. D. A. (2022). Teacher readiness in STEM education: Voices of Indonesian Physics teachers. *Journal of Technology and Science Education*, *12*(1), 68. https://doi.org/10.3926/jotse.1191

Sumarno, S. (2023). Integration of Digital Technology in Public Management Transformation: Implications for Educational Advancements in Indonesia. *International Journal of Asian Education*, *4*(2), 115–120. https://doi.org/10.46966/ijae.v4i2.348

Turillazzi, A., Taddeo, M., Floridi, L., & Casolari, F. (2023). The digital services act: An analysis of its ethical, legal, and social implications. *Law, Innovation and Technology*, *15*(1), 83–106. https://doi.org/10.1080/17579961.2023.2184136

Usman, A., Susilo, H., Suwono, H., & D. Corebima, A. (2021). The Contributions of Metacognitive Skills towards the Retention of Different Academic Ability Students for the Implementation of Several Learning Models. *International Journal of Education and Practice*, *9*(3), 550–567. https://doi.org/10.18488/journal.61.2021.93.550.567

Utomo, W., Suryono, W., Jimmi, J., Santosa, T. A., & Agustina, I. (2023). Effect of STEAM-Based Hybrid Based Learning Model on Students' Critical Thinking Skills. *Jurnal Penelitian Pendidikan IPA*, *9*(9), 742–750. https://doi.org/10.29303/jppipa.v9i9.5147

Zulkifli, Z., Satria, E., Supriyadi, A., & Santosa, T. A. (2022). Meta-analysis: The effectiveness of the integrated STEM technology pedagogical content knowledge learning model on the 21st century skills of high school students in the science department. *Psychology, Evaluation, and Technology in Educational Research*, *5*(1), Article 1. https://doi.org/10.33292/petier.v5i1.144

Zulyusri, Z., Elfira, I., Lufri, L., & Santosa, T. A. (2023). Literature Study: Utilization of the PjBL Model in Science Education to Improve Creativity and Critical Thinking Skills. *Jurnal Penelitian Pendidikan IPA*, *9*(1), 133–143. https://doi.org/10.29303/jppipa.v9i1.2555