

Digitizing learning modules without internet quota to accelerate education equity in Pabean Udik Village Indramayu

Achmad Zuchriadi¹, Fajar Rahayu², Muhammad Alif Razi³, Silvia Anggraeni⁴, Jati Kinsela Brajamusti⁵, Mutiara Putri Rafhsanjani Darmawan⁶, Yusak Hamonangan⁷
^{1,2,3,4,5,6,7}Department of Electrical Engineering, UPN Veteran Jakarta, Indonesia

ARTICLE INFO

Article history:

Received Sept 19, 2023

Revised Oct 10, 2023

Accepted Oct 12, 2023

Keywords:

Digitizing;
Education Equity;
Internet Quota;
Learning Modules.

ABSTRACT

Education equality for the Indonesian people still needs to be improved; for example, in Indramayu, the average length of schooling for the community has only reached 6.52 years (2021) and 6.83 years (2022), still below the 12-year compulsory education program. One way of equitable distribution of education through digitisation of the Education module still needs to be solved, especially related to uneven internet access facilities and the high price of internet quota. Therefore, it is necessary to carry out this activity so that a system that contains digital learning modules can be produced without using internet quota. This activity aims to digitise learning modules that can be accessed without internet quota to accelerate education equity for Pabean Udik Village Indramayu school students. Activities are carried out by designing a system consisting of hardware, web-based applications and learning module content, both K-13 modules and Virtual laboratories. The result obtained is the availability of a system that contains learning module content and virtual laboratories that can be accessed without internet quota using smartphones, tablets and computers. This system is expected to be a solution for equitable development, especially for students in Indramayu, to increase students' knowledge even though the average school time is still below national standards. This system can also be implemented in other regions to accelerate education equity in Indonesia.

This is an open access article under the [CC BY-NC](#) license.



Corresponding Author:

Fajar Rahayu,
Department of Electrical and Computer Engineering,
UPN Veteran Jakarta,
Jl. RS. Fatmawati, Pondok Labu, Jakarta 12450 Indonesia.
Email: fajarrahayu@upnvj.ac.id

1. INTRODUCTION

Education is a means for a country to progress (Tchamyu, 2020), and the quality of a country's education determines the country's progress (Avelar et al., 2019; Banerjee et al., 2021; Leal Filho et al., 2018). Given the importance of education, the Government of Indonesia is very concerned about the quality of education for its citizens. The Indonesian government has launched several programs to improve the quality of education in Indonesia (Rozak, 2021), including equal distribution of education for Indonesian people everywhere. Education equality for the community is very important (Agil, 2020; Broderick, 2018; Duan et al., 2021). One way to accelerate education equity is to conduct online learning (Cidral et al., 2018; Lee et al., 2019; Nie et al., 2020). This online learning method can proliferate because it is supported by faster internet access (Tick, 2019).

However, some regions still have a level of education, such as Indramayu City, where the average length of schooling for the community is only 6,52 years (2021) and 6,83 years (2022) still below the national target of 12 years. On the other hand, internet access in Indonesia is still uneven (Safitri et al., 2022). There are still many areas in Indonesia that need proper internet access. Even if internet access is available, buying quotas is still expensive. In other words, it can be called even though the internet already exists. Still, the available quota is limited and depends on the ability to buy the internet quota (Amir et al., 2020; Yunus et al., 2023)

For this reason, it is necessary to digitize learning modules where digital learning modules allow students not to be limited in time and space like traditional learning so that students can adjust the time and location to carry out learning activities (Blau & Shamir-Inbal, 2017; Hylén & Schuller, 2007; Lin et al., 2017; Yates et al., 2021). Furthermore, creating a system containing digital learning modules that can be accessed without internet quota is necessary. Therefore, it is essential to carry out this activity so that a plan that includes digital learning modules can be produced without using the internet quota. This research aims to digitized learning modules that can be accessed without internet quota to increase student's knowledge with a case study for students in Pabean Udik Village Indramayu.

2. RESEARCH METHOD

The activities carried out can be divided into three parts: 1. Prepare suitable hardware, which can be a mini PC, PC or Notebook, in this activity using Dell OptiPlex 8940 PC, which is used as a local web server (Serik et al., 2019) and can be accessed via Wi-Fi network directly from other devices without internet quota. 2. Prepare content in the form of material in the form of K13 learning modules for junior high school students and virtual Laboratories modules from Phet edu. This Virtual Lab module helps students to be able to understand better the theory that has been taught before (Glassey & Magalhães, 2020; Grodotzki et al., 2018). Create a web-based application that can display pre-prepared content (Arnaiz-González et al., 2018; El Hani et al., n.d.). Web-based learning is quite effective for school students because it can be accessed using various devices, such as smartphones, tablets and computers .

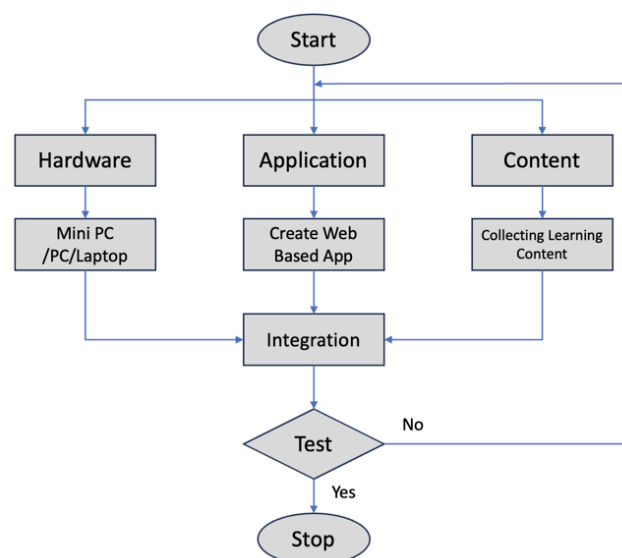


Figure 1. Research Method

3. RESULTS AND DISCUSSIONS

a. Web Application Designed

The website's homepage design is shown in Figure 2. Users can see at a glance what features are available on the website, and if they want to access more deeply, they can click the button on the homepage or click the button in the navigation. Column. On this home page, recommendations for each feature offered on the site are also displayed, and let's remember the study duration and rating.

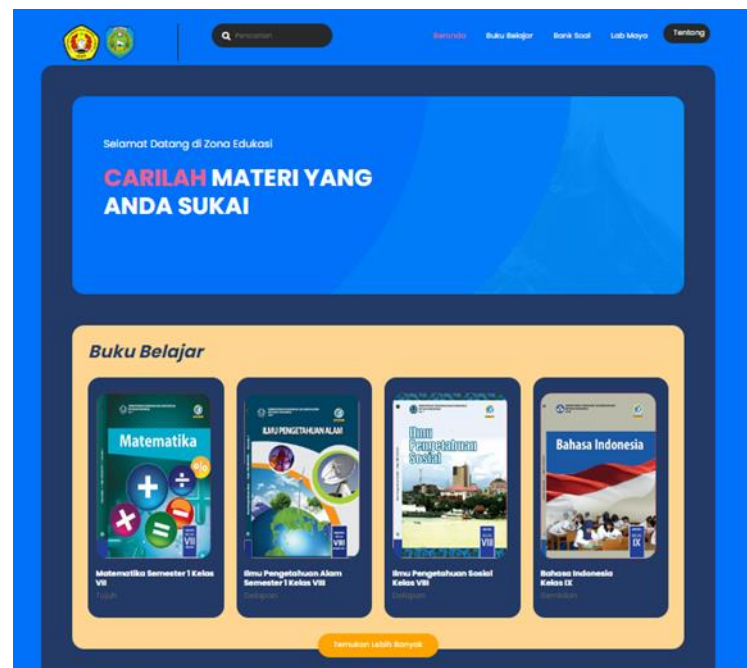


Figure 2. Home Page

Then, this study book page contains books that can be used as study references and applied in many places or for independent study. You can see this page in Figure 3. This study book is also equipped with a search function, so if users want to search for the book they are looking for directly, it will be very effective to use this function. However, on the other hand, the page also shows previews of some of the most frequently searched books.

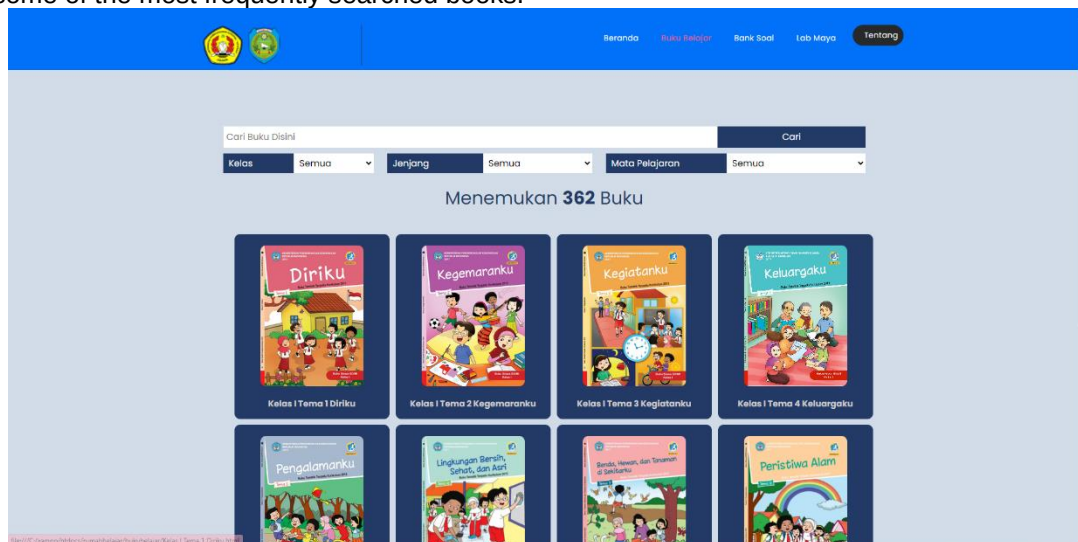


Figure 3. Study Book Page

Then there is the question bank. This question bank page contains a collection of questions that can help users improve their understanding or knowledge of the subject they are studying or have studied. This question bank also has a search function to help users select courses or study material questions, and this question bank is also equipped with answers so users can later see if the answer is available. right or not. This page can be seen in Figure 4.

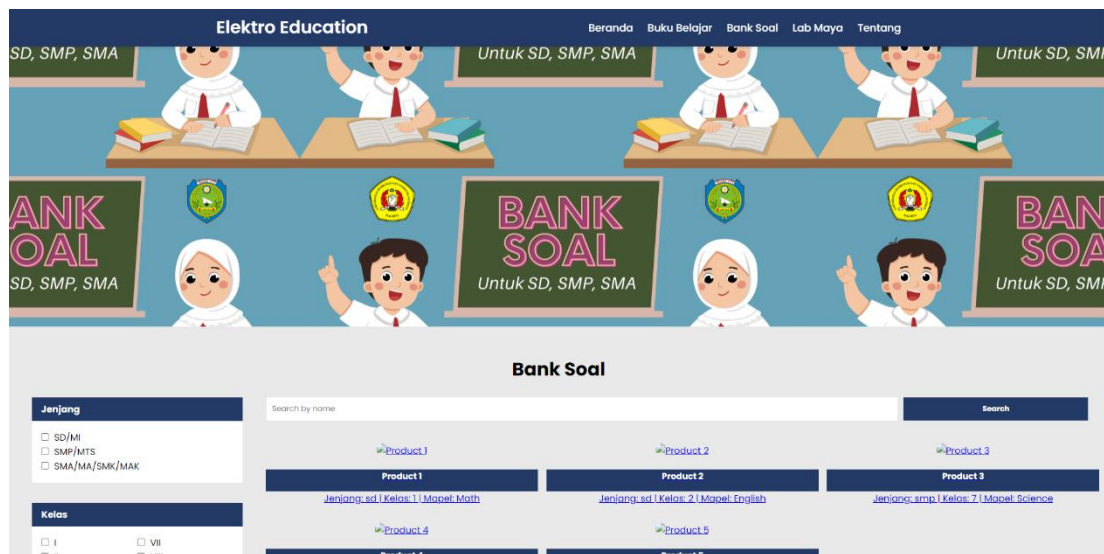


Figure 4. Question Bank Page

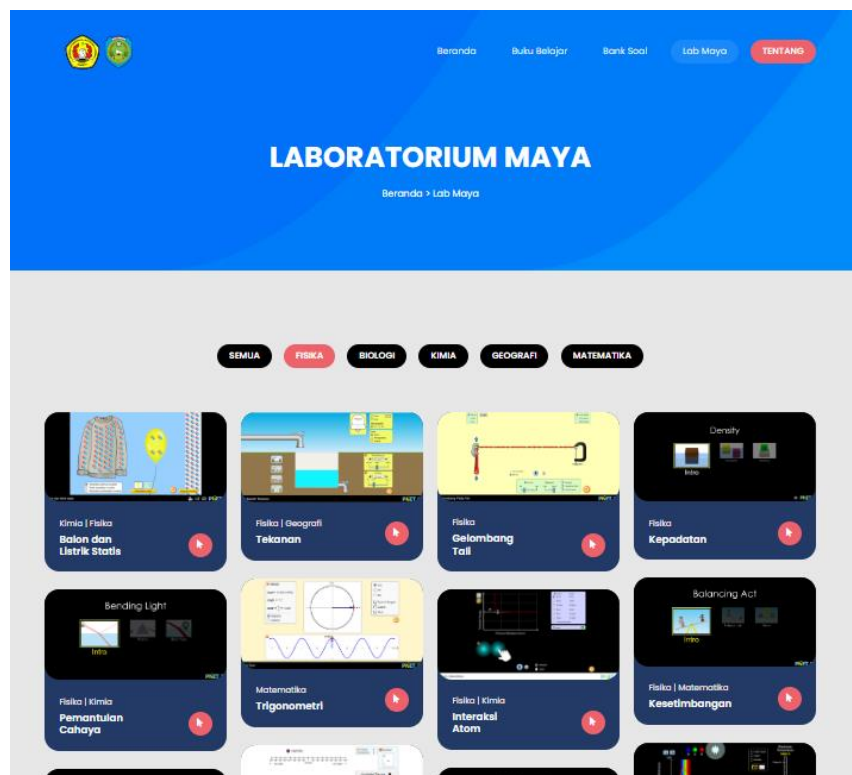


Figure 5. Virtual Lab Page

The latter is part of our higher category, namely virtual labs. This page can be seen in Figure 5. This virtual lab is equipped with a filtering system, users need to tap on the desired filter and all the filtering results the user requires will appear immediately. This virtual lab has been made truly satisfying as it addresses the original goal of creating this virtual lab: to bring simulated conditions into the lab so that they can be performed at home, anywhere and reduce labor accidents in the laboratory. The contents page of this virtual laboratory can be seen in Figure 6.

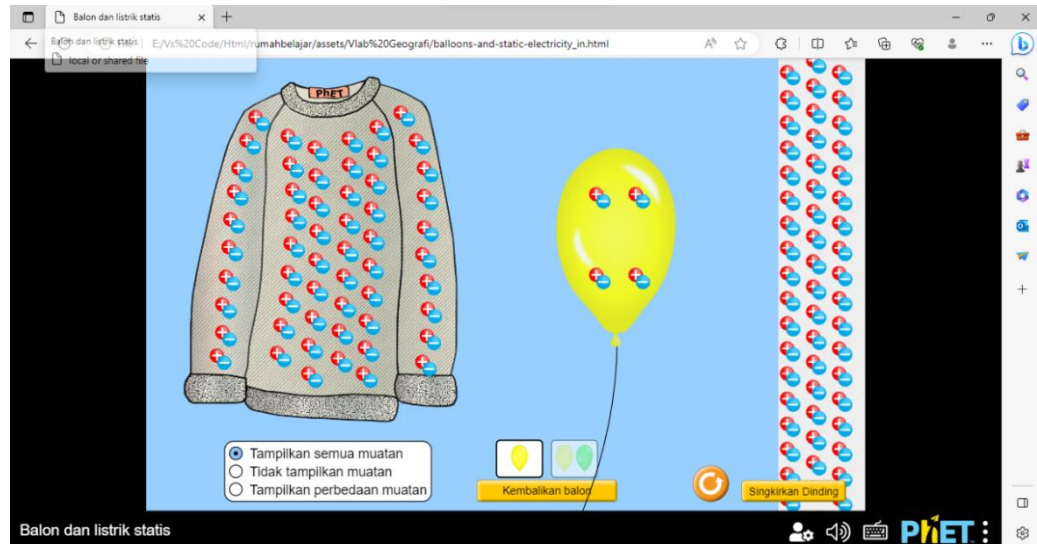


Figure 6. Sample Content of Virtual Lab

b. Flow diagram for web application

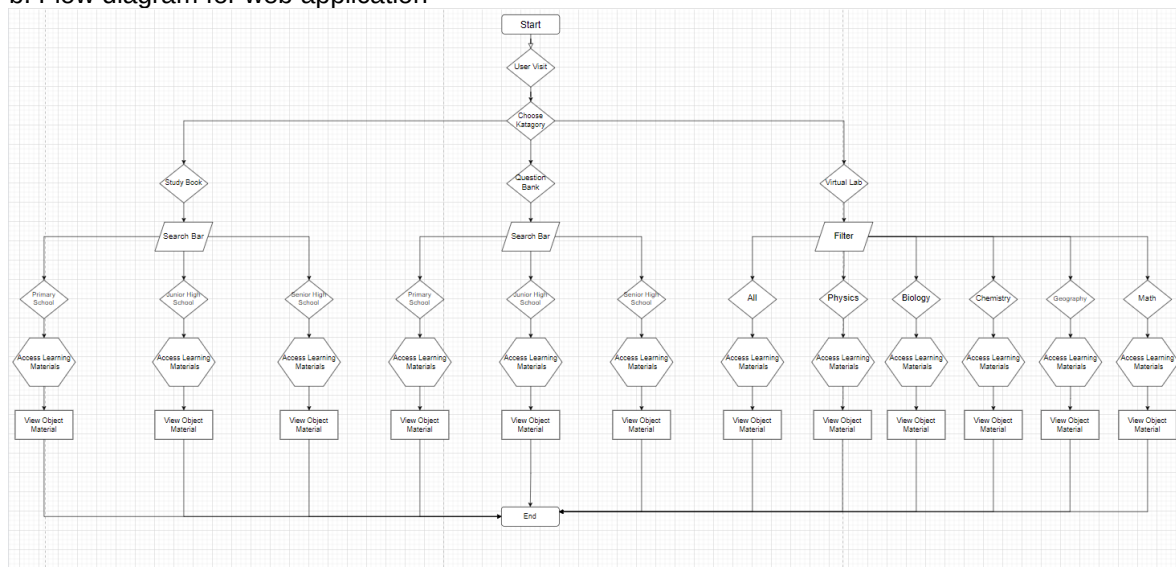


Figure 7 Flow Diagram for web Application

You can see the flow designed on this electrical education website in some of the previous page design images, where this website is designed to be responsive, very efficient and simple for all users. Some features available on the Site are designed to facilitate long or repeated visits by users. This website does not have a login page, so users can access it directly, as shown in the diagram in Figure 7, some features are provided there. The length of school time for Indramayu students who were previously only 5.9 years old can be increased by implementing this system which can be installed both in schools, village halls and other public facilities visited by many students and the community. Limited internal access and expensive internet quota to access online learning are expected not to be an obstacle anymore with this system because it can be accessed by cellphones, laptops and tablets without the need for internet quota anymore.

4. CONCLUSION

The activities that have been carried out have resulted in the availability of a system containing learning module content and virtual laboratories that can be accessed without internet quota using smartphones, tablets and computers. This activity aims to digitize learning modules that can be accessed easily in order to accelerate educational equality for Pabean Udik Indramayu Village school students. Activities are carried out by designing a system consisting of hardware, web-based applications and learning module content, both K-13 modules and Virtual laboratories. This system could be a solution for equitable educational development, especially for students in Indramayu to increase student knowledge even though the average school time is still below national standards. This system can also be applied in other regions to accelerate educational equality in Indonesia.

REFERENCES

- Agil, N. (2020). ANALISIS WACANA PEMBAHARUAN KEBIJAKAN ZONASI MENTERI PENDIDIKAN DAN KEBUDAYAAN NADIEM MAKARIM SEBAGAI SOLUSI PEMERATAAN PENDIDIKAN DI INDONESIA. *JUrnal Pendidikan Kewarganegaraan Undiksha*, 8(2), 157–167. <https://www.google.com/url?sa=t&source=web&rct=j&url=https://ejournal.undiksha.ac.id/index.php/JJPP/article/view/25434&ved=2ahUKEwic5fep2PHsAhUSeYKHU8fBGQQFjAAegQICRAC&usg=AOvVaw3Tezzh5erg5X3r51XrDwtW>
- Amir, L. R., Tanti, I., Maharani, D. A., Wimardhani, Y. S., Julia, V., Sulijaya, B., & Puspitawati, R. (2020). Student perspective of classroom and distance learning during COVID-19 pandemic in the undergraduate dental study program Universitas Indonesia. *BMC Medical Education*, 20(1). <https://doi.org/10.1186/s12909-020-02312-0>
- Arnaiz-González, Á., Díez-Pastor, J. F., Ramos-Pérez, I., & García-Osorio, C. (2018). Seshat — a web-based educational resource for teaching the most common algorithms of lexical analysis. *Computer Applications in Engineering Education*, 26(6), 2255–2265. <https://doi.org/10.1002/cae.22036>
- Avelar, A. B. A., Silva-Oliveira, K. D. da, & Pereira, R. da S. (2019). Education for advancing the implementation of the Sustainable Development Goals: A systematic approach. *International Journal of Management Education*, 17(3), 100322. <https://doi.org/10.1016/j.ijme.2019.100322>
- Banerjee, R., Mishra, V., & Maruta, A. A. (2021). Energy poverty, health and education outcomes: Evidence from the developing world. *Energy Economics*, 101(June), 105447. <https://doi.org/10.1016/j.eneco.2021.105447>
- Blau, I., & Shamir-Inbal, T. (2017). Re-designed flipped learning model in an academic course: The role of co-creation and co-regulation. In *Computers and Education* (Vol. 115). Elsevier Ltd. <https://doi.org/10.1016/j.compedu.2017.07.014>
- Broderick, A. (2018). Equality of what? The capability approach and the right to education for persons with disabilities. *Social Inclusion*, 6(1), 29–39. <https://doi.org/10.17645/si.v6i1.1193>
- Cidral, W. A., Oliveira, T., Di Felice, M., & Aparicio, M. (2018). E-learning success determinants: Brazilian empirical study. *Computers and Education*, 122(February 2017), 273–290. <https://doi.org/10.1016/j.compedu.2017.12.001>
- Duan, H., Yan, H., He, Y., & Li, X. (2021). Spatiotemporal analysis of the achievement of equitable quality basic education in Gansu Province, Northwest China. *Sustainability (Switzerland)*, 13(11). <https://doi.org/10.3390/su13115862>
- El Hani, S., Essaïdi, M., Institute of Electrical and Electronics Engineers. Morocco Section., & Institute of Electrical and Electronics Engineers. (n.d.). *Proceedings of 2017 International Conference on Electrical and Information Technologies (ICEIT 2017)*.
- Glassey, J., & Magalhães, F. D. (2020). Virtual labs – love them or hate them, they are likely to be used more in the future. In *Education for Chemical Engineers* (Vol. 33, pp. 76–77). Elsevier B.V. <https://doi.org/10.1016/j.ece.2020.07.005>
- Grodotski, J., Ortelt, T. R., & Tekkaya, A. E. (2018). Remote and Virtual Labs for Engineering Education 4.0: Achievements of the ELLI project at the TU Dortmund University. *46th SME North American Manufacturing Research Conference, NAMRC 46, Texas, USA*, 26, 1349–1360. <https://doi.org/10.1016/j.promfg.2018.07.126>

- Hylén, J., & Schuller, T. (2007). Giving knowledge for free. In *OECD Observer* (Issue 263). <https://doi.org/10.1787/9789264066021-ja>
- Leal Filho, W., Raath, S., Lazzarini, B., Vargas, V. R., de Souza, L., Anholon, R., Quelhas, O. L. G., Haddad, R., Klavins, M., & Orlovic, V. L. (2018). The role of transformation in learning and education for sustainability. *Journal of Cleaner Production*, 199, 286–295. <https://doi.org/10.1016/j.jclepro.2018.07.017>
- Lee, J., Song, H. D., & Hong, A. J. (2019). Exploring factors, and indicators for measuring students' sustainable engagement in e-learning. *Sustainability (Switzerland)*, 11(4). <https://doi.org/10.3390/su11040985>
- Lin, M. H., Chen, H. C., & Liu, K. S. (2017). A study of the effects of digital learning on learning motivation and learning outcome. *Eurasia Journal of Mathematics, Science and Technology Education*, 13(7), 3553–3564. <https://doi.org/10.12973/eurasia.2017.00744a>
- Nie, D., Panfilova, E., Samusenkov, V., & Mikhaylov, A. (2020). E-learning financing models in Russia for sustainable development. *Sustainability (Switzerland)*, 12(11), 3–6. <https://doi.org/10.3390/su12114412>
- Rozak, A. (2021). KEBIJAKAN PENDIDIKAN DI INDONESIA. *Journal of Islamic Education*, 3(2), 197–208.
- Safitri, A. O., Yunianti, V. D., & Rostika, D. (2022). Upaya Peningkatan Pendidikan Berkualitas di Indonesia: Analisis Pencapaian Sustainable Development Goals (SDGs). *Jurnal Basicedu*, 6(4), 7096–7106. <https://doi.org/10.31004/basicedu.v6i4.3296>
- Serik, M., Mukhambetova, M., & Yeskermessuly, A. (2019). Improving the content of a client-server technology training course: Set up and collaborative implementation of local and cloud-based remote servers. *International Journal of Emerging Technologies in Learning*, 14(21), 191–204. <https://doi.org/10.3991/ijet.v14i21.10643>
- Tchamy, V. S. (2020). Education, lifelong learning, inequality and financial access: evidence from African countries. *Contemporary Social Science*, 15(1), 7–25. <https://doi.org/10.1080/21582041.2018.1433314>
- Tick, A. (2019). An Extended TAM Model, for Evaluating eLearning Acceptance, Digital Learning and Smart Tool Usage. *Acta Polytechnica Hungarica*, 16(9), 213–233.
- Yates, A., Starkey, L., Egerton, B., & Flueggen, F. (2021). High school students' experience of online learning during Covid-19: the influence of technology and pedagogy. *Technology, Pedagogy and Education*, 30(1), 59–73. <https://doi.org/10.1080/1475939X.2020.1854337>
- Yunus, S., Mariyudi, M., & Abubakar, M. Bin. (2023). Strategies for optimizing learning activities during the pandemic and new normal. *Cogent Social Sciences*, 9(1). <https://doi.org/10.1080/23311886.2023.2175491>