



Analysis of the Effectiveness of Using Flipbook-Based E-Modules in Science Learning in Elementary Schools

Ida Puspita Sari^{1*}, Rohmani¹, Khoirun Nisa²

¹Muhamamdiyah University Kotabumi, North Lampung, Indonesia

²National Dong Hwa University, Hualien, Taiwan



DOI: <https://doi.org/10.46245/ijorer.v5i6.615>

Sections Info

Article history:

Submitted: May 27, 2024

Final Revised: June 18, 2024

Accepted: June 12, 2024

Published: December 07, 2024

Keywords:

Elementary School;

E-Module;

Flipbook-Based;

Science.



ABSTRACT

Objective: Science learning in elementary school is essential in building scientific understanding and positive attitudes towards science in students. This study aims to analyze the effectiveness of using flipbook-based e-modules in learning science in elementary school. **Method:** The method used in this research is a systematic literature review that includes various relevant empirical studies from 2019 to 2023. Data sources were collected from academic databases such as Google Scholar using the keywords e-module, flipbook, science, and elementary school. **Results:** The results of the analysis show that using flipbook-based e-modules in learning science in elementary schools has several advantages, including increased student learning motivation, better interaction between students and materials, and improved mastery of science concepts. **Novelty:** This research contributes to developing engaging and effective learning methods in primary education and encourages further research to explore the long-term impact of using flipbook-based e-modules in various teaching contexts.

INTRODUCTION

Learning natural science in elementary school is essential for building students' scientific understanding. Conventional teaching methods often need help to meet students' increasingly dynamic learning needs (Jafnihirida et al., 2023). Therefore, innovation in delivering material is significant in attracting students' interest. Traditional classroom teaching methods often need to be more effective in keeping students' attention and interest (Mustofa, 2023). This can result in low concept understanding and student motivation to learn (Brenda et al., 2023). Limited time and resources in delivering material are also an obstacle for teachers (Dohaney et al., 2020; Elisa et al., 2021; Gao & Zhang, 2020; Lukas & Yunus, 2021; Mailizar et al., 2020). Therefore, innovative solutions are needed to overcome this problem and develop the quality of science teaching in elementary schools (Ira & Desyandri, 2023). One of these solutions is the use of flipbook-based e-modules.

Therefore, flipbook-based e-modules are a solution to overcome problems in science learning. This digital flipbook presents subject matter with engaging and interactive visualizations (Bunari et al., 2024; Hartomo & Sukmawati, 2024; Herianto et al., 2022; Salzabila & Fathurrahman, 2024; Utami & Ducha, 2020). Features such as animations, videos, and quizzes help students master diverse concepts for better understanding (Eka & Mayarni, 2022). Not only that, this e-module can be accessed anytime and anywhere, providing convenience to the learning process. Implementing flipbook-based e-modules in science learning in elementary schools provides various benefits (Muhammad & Amanullah, 2020). Teachers can adopt more creative and engaging teaching approaches, making the teaching and learning process more lively (Adipat et

al., 2021; Asad et al., 2020; Blaschke, 2021; Huang et al., 2020; Ng et al., 2022; Zhang et al., 2020). Students can learn independently by following the instructions in the e-module helps develop lifelong learning skills (Atik & Shofan, 2023). Not only that, the use of this technology can foster student motivation and learning outcomes.

Various studies have shown the effectiveness of using e-modules in learning. For example, research by Ritonga et al. (2024) shows that the flipbook-based e-module media that is applied has benefits in adding to the learning experience of students, can be applied anytime and anywhere, and is made an attractive assessment tool. Other research revealed by Arifin et al. (2023) that the use of e-modules of heat science material designed using the Flipbook Maker application includes excellent aspects, can be applied to teaching, and is entrusted with being able to arouse student motivation in learning, training students to think at a high level and master technology. Other research by Purbasari (2022) suggests that teaching and learning activities using e-module media *kayanya negriku* based on flipbook is proven to improve the learning outcomes of fourth-grade students.

Based on this research, this study introduces innovation by analyzing the use of flipbook-based e-modules in science learning in primary schools. This research focuses on the effectiveness of using flipbook-based e-modules in science learning. Utilizing the latest technology, this study is expected to contribute significantly to developing innovative learning methods in elementary schools. The research question in this study is: How does using flipbook-based e-modules affect students' understanding of concepts in learning science in elementary schools? This study aims to evaluate the use of flipbook-based e-modules on concept understanding, learning motivation, and student learning outcomes. In addition, this study also aims to identify obstacles and challenges in implementing the e-module and provide recommendations for further development. With the rapid development of educational technology, this research will focus on the latest innovations in flipbook-based e-modules, including interactive and multimedia features that can enhance students' learning experience. This research is expected to contribute to developing effective digital teaching materials for education in the digital era.

RESEARCH METHOD

This research uses the Systematic Literature Review (SLR) method; SLR is a literature review method that is carried out systematically and structured to identify, assess, and synthesize all scientific evidence relevant to a particular research topic (Kanchan, 2023). The primary purpose of a systematic literature review is to provide a comprehensive and unbiased summary of existing insights on a particular topic, identify gaps in the literature, and provide direction for future research (Al-Ansi et al., 2023; Hartshorn & McMurry, 2020; Pangastuti & Fadhillah, 2020; Prahani et al., 2023; Saphira, 2022). This method involves a systematic data collection, analysis, and synthesis approach, enabling researchers to make evidence-based decisions, inform policy development, and guide practice guidelines in health, education, and management science. According to Kanchan (2023), the chart at this literature review stage is as follows.



Figure 1. Literature review steps.

The search source for articles related to the research theme reviewed in this study came from the Google Scholar database. The beginning of the literature search in this study focused on the title of the article, namely The Use of Flipbook-Based E-Modules in Science Learning in Elementary Schools totaling 2,280 published articles, after which the literature search was limited by the range of years starting from 2019-2023 by obtaining the results of 1,260 articles, then the literature search added the first keyword "Flipbook-Based E-Modules" obtained the results of 861 articles, and the second keyword "Science Learning in Elementary Schools" obtained the results of 237 articles. Of the 237 articles, researchers selected data. They limited the data according to criteria related to the research theme so that articles that would be carried out in the literature review were obtained.

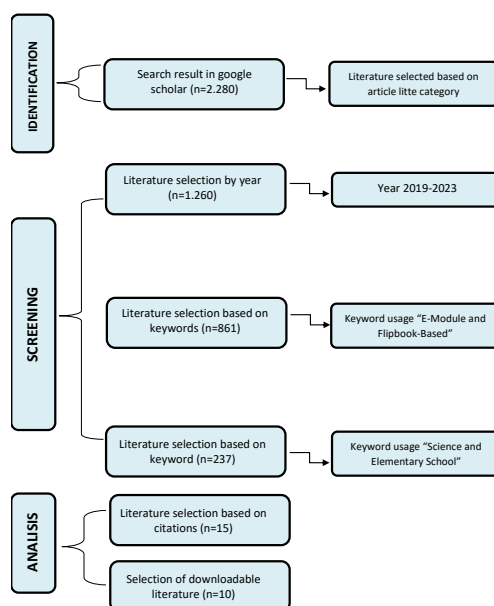


Figure 2. Inclusion criteria steps for finding the effectiveness of flipbook-based e-modules in science learning at elementary school.

RESULTS AND DISCUSSION

Results

The data in the study are documents in the form of articles. The article literature is analyzed on the scholar.google.com website. The 2,280 literature items in the scholar database consist of two types: books and articles. This research focuses on articles by searching using four keywords: e-modules, flipbooks, science, and elementary schools. The research developments from 2019-2023 are shown in Figure 3.

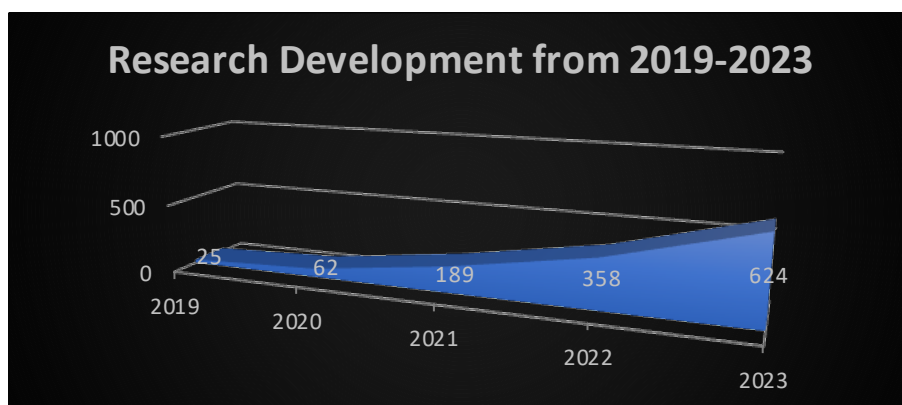


Figure 3. Article development from 2019-2023.

Figure 3 shows that the development of article publications regarding using digital flipbook-based e-modules in learning science in elementary schools on Google Scholar has increased from 2019-2023. This is shown in 2019 and 2020; 14 and 37 articles were published on Google Scholar. In 2021, 154 articles were published, and this number continued to increase in 2022 and 2023, where 387 articles and 632 articles were found published on the Google Scholar database regarding the use of digital-based flipbooks in learning science in elementary school. In 2023, the highest number of published articles was found on Google Scholar; the following is the calculation of the mean or average article published on the Google Scholar database:

$$\tilde{x} = \frac{\text{Number of articles}}{\text{Number of years}}$$

$$\tilde{x} = \frac{1260 \text{ articles}}{5 \text{ years}} = 252 \text{ articles}$$

So, the average number of articles published in the Google Scholar database per year is 252. Based on literature searches on using flipbook-based e-modules in learning science in elementary schools, 2,280 articles were found, limited to 2019-2023, with articles totaling 1,940. Furthermore, by adding the keywords "E-Module" and "Flipbook," 861 were found, then limited by further keywords "Science" and "Elementary School," 237 articles were obtained. Moreover, the last one is limited to 15 citations to get six articles. So from the results of citation restrictions, 6 articles were obtained that discussed the effectiveness of flipbook-based e-modules in learning science in elementary schools, 6 of these articles will be reviewed. The results of the review of 10 articles related to the use of flipbook-based e-modules in learning science in elementary schools are presented in Table 1.

Table 1. Results of article review.

Number	Articles	Research Result	Recommendation
1	Needs Analysis of Flipbook-Based Digital Teaching Materials to Empower Learners' 21st Century Skills in Elementary School Science Learning (Sari & Atmojo, 2021)	The results of this study show that: 1. teachers generally use existing printed teaching materials in learning. 2. Teachers have a positive perception of the opportunity to develop and utilize flipbooks to facilitate the use of digital teaching materials	The results of this study are hoped to be a basis for teacher consideration in developing and implementing flipbook-based digital teaching materials to facilitate students' learning process. the learning process of students
2	Development of Problem-Based Learning Based Science Flipbook E-Modules on Environmental Pollution Material (Rasmawan et al., 2022)	The results showed that the problem-based learning-based science flipbook E-module in environmental pollution material has a level of validity in the aspects of content, language, and graphics that is very valid ($k = 1.00$)	This indicates that the E-module developed can be used as a learning media that can improve students' critical thinking skills through the questions developed, motivate student learning with topics presented in the form of text, videos, and images, and help teachers apply technology in teaching and learning activities.
3	Development of E-Modules Based on Flipbook Applications in Elementary Schools (Ramadhina & Pranata, 2022)	The results of research on the development of electronic modules (e-modules) based on digital flipbooks for learning science class IV Elementary School material on the Life Cycle of Living Things indicate that the electronic module (e-module) based on digital flipbooks is very feasible.	The completed electronic module (e-module) will be published in SWF HTML or PDF form and can be sent to students through online applications to support learning, such as WhatsApp, e-mail, and others.
4	Analysis of E-Module Flipbook Based on Problem-Based Learning for Empowering Critical Thinking Skills in Elementary School Science Learning	The results showed that the PBL-based E-module Flipbook can empower critical thinking skills in elementary science learning to become a 21st-century digital media renewal	E-module flipbook based on PBL as an effective solution for 21st-century science learning according to the character of the material and the learning style of 21st-century students as digital natives.

Number	Articles	Research Result	Recommendation
5	(Endaryati et al., 2021) Development of Heyzine Flipbook Interactive E-Modules Based on Scientific Water Cycle Materials for Class V Elementary School Students (Manzil & Thohir, 2022)	Through trials, the e-module products developed are very valid and feasible to use and get a positive response from students as one of the science teaching materials for water cycle materials.	In this research and development, educators need suggestions to help prepare more innovative and creative teaching materials that can be applied optimally.
6	Development of Flipbook-Based E-Modules on the Theme of Saving Living Things (Hasriani et al., 2024)	The media developed is included in the valid category, which means that the results obtained are a source of information that is appropriate and according to the research objectives	This flipbook-based e-module media can be an innovation in digital learning media.
7	Development of E-Modules Based on Flipbook Application for the Subtheme of Human Growth and Development (Sakdiah, 2024)	E-Modules based on the flipbook application can be categorized as feasible, effective, and practical for students to use in learning.	The development of flipbook application-based e-modules on the subtheme of human growth and development is expected to provide innovative solutions in learning that are more interactive and effective.
8	Literature Review: The Effect of E-Module Use on Elementary School Student Learning Outcomes (Fujiarti, 2024)	Examine the results of the validity, practicality, and effectiveness of e-modules to determine their effect on student learning outcomes. The study's validity, practicality, and effectiveness showed that e-modules are indeed feasible learning media for improving the learning outcomes of elementary school students. Because teaching is influenced by technology, the stages	As for the suggestions that can be conveyed to teachers and students, it is very recommended to further apply e-modules in learning to foster motivation and interest. foster motivation and interest in learning, which can improve student learning outcomes.

Number	Articles	Research Result	Recommendation
		of learning activities become unusual and interesting, which can increase students' desire to learn, which affects learning outcomes.	
9	Needs Analysis of Web-Based Interactive Digital Flipbook Media to Improve Critical Thinking Skills of Elementary School Students (Velinda et al., 2024)	The results of this study show that 84.3% of students agree to use interactive flipbook digital media when learning in class	For this reason, using interactive flipbooks assisted by audio and visuals is considered feasible and attracts students to learn while playing.
10	Analysis of Heyzine Flipbook-Based Digital Teaching Materials on Critical Thinking Skills of IPAS Learning in Elementary Schools (Fitriyani & Suciptaningsih, 2024)	Digital teaching materials based on hygiene flipbooks can be used as a teacher reference in learning IPAS in elementary schools	This research emphasizes the importance of technology integration in developing teaching materials to improve the quality of learning in the digital era.

Discussion

The analysis results obtained six suitable articles regarding flipbook-based e-module media in learning science in elementary school. The results of Sari and Atmojo (2021) show that flipbook-based e-modules must be improved and implemented to empower students' 21st-century abilities in learning science in elementary school. Research by Rasmawan et al. (2022) shows that the e-module developed using PBL-based PDF Flipbook Builder software on environmental pollution material has a very high level of validity and receives a very good response. This shows that the e-module is effective as a learning media that can improve students' critical thinking skills through the questions developed (Hamidah et al., 2022; Mahmudah et al., 2022; Meryastiti et al., 2023; Purwoko et al., 2023; Zahra & Purwantoyo, 2024), motivate students through material presented in the form of text, videos, and images, and assist teachers in applying technology in the classroom.

Research by Ramadhina and Pranata (2022) shows that digital flipbook-based electronic e-modules in learning science for grade IV elementary schools with material on the Life Cycle of Living Things show that this media is feasible. The quality of this e-module is considered very good because it has been tested by two experts, namely media experts and material experts. The evaluation results showed a percentage of the feasibility of 81.60% and 84.80%, respectively, which were included in the very feasible

category. Research by Endaryati et al. (2021) shows that flipbook e-modules can be used as a reference for teachers in learning science in elementary schools. This is because flipbook e-modules allow hyperlinks, images, videos, sounds, and other supporting materials to be added. With these features, the abstract characteristics of science materials can be supported by various media in the e-module flipbook. As a result, 21st-century skills can be applied in the classroom, while its education aims to produce human resources who are skilled in communication, collaboration, critical thinking, and creative problem-solving.

Research conducted by Manzil & Anas Thohir (2022) shows that the e-module product developed is considered very valid and feasible to use and receives positive responses from students as one of the science teaching materials for water cycle material. Research by Hasriani et al. (2024) shows that the validity of flipbook-based e-modules on the theme of saving living things has been validated by three experts in their fields, namely linguists, obtaining a percentage of 87.5% very valid category and showing excellent results. Research conducted by Sakdiah (2024) shows that the e-module product developed is considered very valid and feasible to use and receives positive responses from students as one of the science teaching materials for water cycle material. Research by Fujiarti (2024) shows that the validity of flipbook-based e-modules on the theme of saving living things has been validated by three experts in their fields, namely linguists, obtaining a percentage of 87.5% in a very valid category and showing excellent results. Other research by Velinda et al. (2024) shows that the use of animation, audio, and diverse visual displays is the reason students like learning using digital flipbook media compared to the use of printed media books to be the primary teaching material and also helps teachers in improving the quality of teaching in elementary schools. Another study by Fitriyani and Suciptaningsih (2024) showed that flipbook-based digital teaching materials could be an effective alternative to improve the teaching of IPAS at the elementary level.

The Effectiveness of Using Digital-based Flipbooks in Science Learning in Elementary Schools

The use of technology in education has brought many significant changes in how subject matter is delivered. E-module offers interactive visualizations that attract students' interest in learning, especially in science learning in elementary schools (Barokah et al., 2023). With various exciting features such as animations, videos, and quizzes, flipbook-based e-modules are expected to increase learning effectiveness (Sakinah et al., 2023; Sari & Khaidir, 2023; Tania & Astutik, 2024; Yuyun et al., 2022). According to Endaryati et al. (2023), e-modules based on flipbooks provide content that is more interesting than conventional textbooks. Dynamic and interactive visualization can make the subject matter more alive (Abdinejad et al., 2021; Al-Ansi et al., 2023; Husni, 2020; Jeffery & Bauer, 2020). Students can be more interested and motivated to learn. This increased interest and motivation are essential in supporting practical learning activities.

Science learning often involves diverse and abstract concepts. By applying flipbook-based e-modules, these concepts can be presented in a more understandable form through animations and illustrations (Erniwati et al., 2022). This helps students to master the material better and to visualize abstract concepts, making learning more effective. Flipbook-based e-modules can be applied anytime and anywhere with electronic devices such as tablets or computers (Maharani et al., 2024; Setiyaningsih et

al., 2024; Usman et al., 2024; Yuniarta et al., 2023; Yusmar et al., 2024). This flexibility allows students to learn according to their chosen time and place. Thus, students can organize their learning schedule, which can increase learning independence and discipline (Asrizal et al., 2023; Firdausih & Aslan, 2024; Mufidah et al., 2023; Pitorini et al., 2024; Sutianah et al., 2023). Flipbook-based e-modules also allow for a more personalized approach to learning (Firdaus & Pahlevi, 2022; Fitriyah & Sahda, 2023; Hasibuan et al., 2023; Lubis et al., 2024; Rahmiati et al., 2023). Students can learn at their own pace and repeat material that has yet to be understood. This is different from conventional teaching methods, which often cannot adapt to students' individual needs. This more personalized approach can help students improve their learning outcomes.

Flipbook-based e-modules are often equipped with features that encourage interaction and collaboration. Students can participate in online discussions, work on assignments, and share ideas through digital platforms. These interactions and collaborations are essential in improving social skills and cooperation, which are necessary in the real world (Khofifah & Barokah, 2024). By using flipbook-based e-modules, students do not just learn subject matter but develop technological skills (Marpaung et al., 2024; Rohmatin et al., 2022; Suharsono et al., 2023; Ula et al., 2023). Digital literacy is becoming increasingly important in this modern era. Technology in learning helps students become more familiar with digital tools and platforms, which will be helpful in their future lives and careers.

Despite the many benefits, implementing flipbook-based e-modules also faces several challenges, such as limited access to technology in some areas and the need for teacher training (Fitriana et al., 2024). However, these challenges can be overcome with the proper support from the school and government and adequate infrastructure. Continuous evaluation is also essential to ensure these e-modules remain relevant and effective in supporting science learning in primary schools.

CONCLUSION

Fundamental Finding: The use of flipbook-based e-modules in science learning in elementary schools has proven to be effective in improving the quality of learning. This e-module can attract students' interest and motivation to learn through dynamic and interactive visualization. **Implication:** In addition, flipbook-based e-modules make it easier to understand complex science concepts, provide flexibility in learning, and support a more personalized learning approach. The interactive features in these e-modules also help create an inclusive learning environment, improve students' technology skills, and facilitate interaction and collaboration. For teachers, this e-module makes it easier to prepare and evaluate learning. **Limitation:** Although there are challenges, such as limited access to technology and the need for teacher training, the benefits offered by flipbook-based e-modules are far more significant. **Future Research:** Several suggestions can be given to maximize the effectiveness of using flipbook-based e-modules in science learning in elementary schools. First, there needs to be increased access to technology and infrastructure in schools, especially in remote areas. Second, adequate teacher training is essential to use these e-modules optimally. Third, ongoing evaluation must be carried out to ensure that this e-module remains relevant and effective in learning. With these steps, flipbook-based e-modules can be used as a very effective tool in improving the quality of science learning in elementary schools.

ACKNOWLEDGEMENTS

Thank you to Mr. Rohmani, S.Pd, M.Pd, who has helped prepare this article and provided direction and suggestions for writing it. Thank you to friends and especially family who have provided support in writing this article

REFERENCES

- Abdinejad, M., Talaie, B., Qorbani, H. S., & Dalili, S. (2021). Percepciones de los estudiantes utilizando tecnologías de realidad aumentada y visualización 3D en la educación química. *Journal of Science Education and Technology*, 30(1), 87–96. <http://dx.doi.org/10.1007/s10956-020->
- Adipat, S., Laksana, K., Busayanon, K., Ausawasowan, A., & Adipat, B. (2021). Engaging students in the learning process with game-based learning: The fundamental concepts. *International Journal of Technology in Education*, 4(3), 542–552. <https://doi.org/10.46328/ijte.169>
- Al-Ansi, A. M., Jaboob, M., Garad, A., & Al-Ansi, A. (2023). Analyzing augmented reality (AR) and virtual reality (VR) recent development in education. *Social Sciences & Humanities Open*, 8(1), 1–10. <https://doi.org/10.1016/j.ssaho.2023.100532>
- Arifin, I. N., Mardian Arif, R., Arifin, V. M., Juniarti, Y., & Sutisna, I. (2023). Development design of e-modules on caloric material based on flipbook maker in increasing learning motivation of grade v students in elementary schools. *PEDAGOGIKA*, 4(1), 99–111.
- Asad, M. M., Hussain, N., Wadho, M., Khand, Z. H., & Churi, P. P. (2020). Integration of e-learning technologies for interactive teaching and learning process: an empirical study on higher education institutes of Pakistan. *Journal of Applied Research in Higher Education*, 13(3), 649–663. <https://doi.org/10.1108/JARHE-04-2020-0103>
- Asrizal, A., Annisa, N., Festiyed, F., Ashel, H., & Amnah, R. (2023). STEM-integrated physics digital teaching material to develop conceptual understanding and new literacy of students. *Eurasia Journal of Mathematics, Science and Technology Education*, 19(7), 1–11. <https://doi.org/10.29333/ejmste/13275>
- Atik, W., & Shofan, F. (2023). The development of a flibook-based interactive e-module to facilitate sequences and series learning process for 10th-grade. *MATHEdunesa*, 12(1), 194–206. <https://doi.org/10.26740/mathedunesa.v12n1.p194-206>
- Barokah, A., Kurnia, I. R., Maulana, D., & Umah, R. N. (2023). Pelatihan dan pendampingan penggunaan e-modul sains di SDN pondok bambu 06. *Jurnal Lentera Pengabdian*, 1(3), 117–129. <https://doi.org/10.59422/lp.v1i03.117>
- Blaschke, L. M. (2021). The dynamic mix of heutagogy and technology: Preparing learners for lifelong learning. *British Journal of Educational Technology*, 52(4), 1629–1645. <https://doi.org/10.1111/bjet.13105>
- Brenda, R., Silalahi, B., & Hendra, H. (2023). Development of web-based flipbook teaching materials on science content in elementary schools. *Journal of Education Research*, 4(3), 1341–1349.
- Bunari, B., Setiawan, J., Ma'arif, M. A., Purnamasari, R., Hadisaputra, H., & Sudirman, S. (2024). The influence of flipbook learning media, learning interest, and learning motivation on learning outcomes. *Journal of Education and Learning*, 18(2), 313–321. <https://doi.org/10.11591/edulearn.v18i2.21059>
- Dohaney, J., de Róiste, M., Salmon, R. A., & Sutherland, K. (2020). Benefits, barriers, and incentives for improved resilience to disruption in university teaching.

- International Journal of Disaster Risk Reduction*, 50, 1-11. <https://doi.org/10.1016/j.ijdrr.2020.101691>
- Eka, F., & Mayarni, M. (2022). The effect of crossword puzzle type active learning strategy assisted by flip book media on science learning activity of grade IV elementary school students. *Indonesian Science Education Journal*, 10(4), 1-11. <https://doi.org/10.24815/jpsi.v10i4.26281>
- Elisa, P., Ningsih, A., & Sari, M. N. (2021). Are learning media effective in english online learning?: The students ' and teachers ' perceptions. *Tarbawi: Jurnal Ilmu Pendidikan*, 17(2), 173-183. <http://dx.doi.org/10.32939/tarbawi.v17i2.1012>
- Endaryati, A., Ragil, I., Atmojo, W., Slamet, S. Y., & Suryandari, K. C. (2021). Analysis of e-module flipbook based on problem based learning to empower critical thinking skills in elementary school science learning. *DWIJA CENDEKIA: Journal of Pedagogical Research*, 5(2), 301-312. <http://dx.doi.org/10.53402/ajet.v1i3.38>
- Endaryati, S. A., Slamet, S. Y., & Suryandari, K. C. (2023). Analysis of PBL-based flipbook e-module in enhancing elementary school students' critical thinking skills: A literature review. *Innovation and Social Science*, 157-165.
- Erniwati, E., Sudding, S., & Muhammad, A. (2022). Development of flipbook-based e-modules in the discovery learning model to increase students' motivation and learning outcomes (Study on the subject matter of reaction rate). *Chemistry Education Review*, 6(1), 1-11. <https://doi.org/10.26858/cer.v6i1.39490>
- Firdaus, R., & Pahlevi, T. (2022). The development of problem-based learning e-modules on correspondence materials. *JINOTEP (Jurnal Inovasi Dan Teknologi Pembelajaran): Kajian Dan Riset Dalam Teknologi Pembelajaran*, 9(2), 145-165. <https://doi.org/10.17977/um031v9i22022p145>
- Firdausih, F., & Aslan, A. (2024). Literature review: The effect of project-based learning on student motivation and achievement in science. *Indonesian Journal of Education (INJOE)*, 4(3), 1011-1022.
- Fitriana, E., Djono, D., & Sumaryati, S. (2024). Possibilities for using e-modules in vocational high schools to facilitate critical thinking skills. *International Journal of Recent Educational Research*, 5(3), 656-665. <https://doi.org/10.46245/ijorer.v5i3.595>
- Fitriyah, I. J., & Sahda, S. N. S. (2023). Development of e-module flipbook based on discovery learning to increase learning motivation. *JIPVA (Jurnal Pendidikan IPA Veteran)*, 7(2), 1-14. <https://doi.org/10.31331/jipva.v7i2.2738>
- Fitriyani, D., & Suciptaningsih, O. A. (2024). Analysis of heyzine flipbook-based digital teaching materials on critical thinking skills of IPAS learning in elementary schools. *Pendas: Scientific Journal of Basic Education*, 9(2), 2331-2342. <https://doi.org/10.23969/jp.v9i2.13623>
- Fujiarti, A. (2024). Literature review: The effect of e-module use on elementary school students' learning outcomes. *Journal of Education Insight*, 4(1), 145-156. <https://doi.org/10.61978/eduscape.v2i2.145>
- Gao, L. X., & Zhang, L. J. (2020). Teacher learning in difficult times: Examining foreign language teachers' cognitions about online teaching to tide over COVID-19. *Frontiers in Psychology*, 11, 1-14. <https://doi.org/10.3389/fpsyg.2020.549653>
- Hamidah, A., Hawalya, H., & Sanjaya, M. E. (2022). Effectiveness of integrated interactive problem-based learning e-modules in improving critical thinking abilities. *Jurnal Paedagogy*, 9(1), 788-799. <http://dx.doi.org/10.33394/jp.v11i4.12939>
- Hartomo, R. M., & Sukmawati, W. (2024). The effect of digital flipbook media on improving science literacy on human digestive system materials among

- elementary school students. *Jurnal Penelitian Pendidikan IPA*, 10(9), 6260–6270. <https://doi.org/10.29303/jppipa.v10i9.7994>
- Hartshorn, K. J., & McMurry, B. L. (2020). The effects of the COVID-19 pandemic on ESL learners and TESOL practitioners in the United States. *International Journal of TESOL Studies*, 2, 140–156. <https://doi.org/10.46451/ijts.2020.09.11>
- Hasibuan, S. H., Zulfarina, Z., & Putra, R. A. (2023). Development of interactive systems based on patterns. *Journal of Educational Science*, 7(3), 15–28. <http://dx.doi.org/10.6007/IJARBS/v7-i6/3033>
- Hasriani, H., Baderiah, B., Bungawati, B., & Wiratman, A. (2024). Development of flipbook-based e-modules on the theme of saving living things. *Indo-MathEdu Intellectuals Journal*, 5(2), 1432–1440. <https://doi.org/10.54373/imeij.v5i2.897>
- Herianto, H., Wilujeng, I., & Lestari, D. P. (2022). Effect of interactive multimedia e-books on lower-secondary school students' curiosity in a science course. *Education and Information Technologies*, 27(7), 9619–9639. <https://doi.org/10.1007/s10639-022-11005-8>
- Huang, R., Tlili, A., Chang, T. W., Zhang, X., Nascimbeni, F., & Burgos, D. (2020). Disrupted classes, undisrupted learning during COVID-19 outbreak in China: Application of open educational practices and resources. *Smart Learning Environments*, 7(1), 1–11. <https://doi.org/10.1186/s40561-020-00125-8>
- Husni, H. (2020). The effect of inquiry-based learning on religious subjects learning activities: An experimental study in high schools. *Jurnal Penelitian Pendidikan Islam*, 8(1), 43–51. <https://doi.org/10.36667/jppi.v8i1.434>
- Ira, O., & Desyandri, D. (2023). E-module IPAS based on flip PDF corporate application to support the implementation of the “Independent Curriculum.” *Jurnal Ilmu Pendidikan Sekolah Dasar*, 11(1), 1–10. <https://doi.org/10.24036/e-jipsd.v11i1.14400>
- Jafnihirida, L., Rizal, F., & Eka, K. (2023). Effectiveness of e-module interactive learning media design. *INNOVATIVE: Journal of Social Science Research*, 3(1), 227–239. <http://dx.doi.org/10.2991/assehr.k.200323.096>
- Jeffery, K. A., & Bauer, C. F. (2020). Students' responses to emergency remote online teaching reveal critical factors for all teaching. *Journal of Chemical Education*, 97(9), 2472–2485. <https://doi.org/10.1021/acs.jchemed.0c00736>
- Kanchan, S. (2023). Literature review. *Cambridge Elements: Research Methods*. <https://doi.org/10.1017/9781009010054.005>
- Khofifah, E. U., & Barokah, A. (2024). Development of flip book-based science module to increase learning motivation of elementary students. *Journal of Elementary School Education*, 1–17. <http://dx.doi.org/10.24114/sejpsd.v12i3.40164>
- Lubis, R., Bundu, P., & Gani, H. A. (2024). Development of a learning model for Islamic religious education based on a flipbook e-module for junior high school student achievement. *Journal of Multidisciplinary Academic and Practice Studies*, 2(2), 131–145. <https://doi.org/10.35912/jomaps.v2i2.2138>
- Lukas, B. A., & Yunus, M. M. (2021). ESL teachers' challenges in implementing e-learning during COVID-19. *International Journal of Learning, Teaching and Educational Research*, 20(2), 330–348. <https://doi.org/10.26803/IJLTER.20.2.18>
- Maharani, S. D., Laihat, L., Budiansyah, B., Susanti, R., Dewie, S. S. E., Ramadhani, S., & Sundari, A. (2024). Analyzing the needs of pre-service teacher education students for flipbook learning resources: Enhancing understanding and engagement with educational materials. *AL-ISHLAH: Jurnal Pendidikan*, 16(2), 2300–2309. <https://doi.org/10.35445/alishlah.v16i2.4741>

- Mahmudah, S., Kirana, T., & Rahayu, Y. S. (2022). Profile of students' critical thinking ability: Implementation of e-modul based on problem-based learning. *IJORER: International Journal of Recent Educational Research*, 3(4), 478–488. <https://doi.org/10.46245/ijorer.v3i4.231>
- Mailizar, Almanthari, A., Maulina, S., & Bruce, S. (2020). Secondary school mathematics teachers' views on e-learning implementation barriers during the COVID-19 pandemic: The case of Indonesia. *Eurasia Journal of Mathematics, Science and Technology Education*, 16(7), 1-10. <https://doi.org/10.29333/EJMSTE/8240>
- Manzil, E. F., & Anas Thohir, S. M. (2022). Development of a scientific-based Heyzine flipbook interactive e-module on water cycle materials for grade V elementary school students. *Elementary School: Review of Educational Theory and Practice*, 31(2), 112–126. <https://doi.org/10.2991/assehr.k.211223.218>
- Marpaung, D. R., Ilham, Z., & Marlina, M. E. (2024). Development of flipbook-based e-module to improve students' learning outcomes in basketball course. *Al-Ishlah: Jurnal Pendidikan*, 16(3), 3380–3388. <https://doi.org/10.35445/alishlah.v16i3>
- Meryastiti, V., Ridlo, Z. R., Supeno, S., & Rahayuningsih, R. (2023). Improving critical thinking skills of junior high school students in science learning using the development of interactive e-module based Macromedia Flash. *Journal of Innovative Science Education*, 12(2), 163–172. <https://doi.org/10.15294/jise.v12i2.55080>
- Mufidah, A., Indana, S., & Arifin, I. S. Z. (2023). E-module based on blended learning type flipped classroom on climate change materials to train students' digital literacy ability. *International Journal of Current Educational Research*, 2(1), 1–16. <https://doi.org/10.53621/ijocer.v2i1.204>
- Muhammad, A., & Amanullah. (2020). Development of digital flipbook learning media to support the learning process in the era of the Industrial Revolution 4.0. *Jurnal Dimensi Pendidikan dan Pembelajaran*, 8(1), 1–12. <https://doi.org/10.24269/DPP.V0I0.2300>
- Mustofa, M. (2023). Development of engineering design process (EDP)-based flipbook modules to improve junior high school students' science literacy in science learning. *Tarbiyah Wa Ta'lim*, 10(2), 1-10. <https://doi.org/10.21093/twt.v10i2.5841>
- Ng, D. T. K., Ng, E. H. L., & Chu, S. K. W. (2022). Engaging students in creative music making with musical instrument application in an online flipped classroom. *Education and Information Technologies*, 27(1), 45–64. <https://doi.org/10.1007/s10639-021-10568-2>
- Pangastuti, R., & Fadhillah, N. (2020). Integrated Twin Tower (ITT) based learning to think (LTT) model to enhance scientific creativity and spirituality of students in the Early Childhood Islamic Education Department. *Studies in Learning and Teaching*, 1(1), 18–26. <https://doi.org/10.46627/silet.v1i1.21>
- Pitorini, D. E., Suciati, S., & Harlita, H. (2024). Feasibility of an e-module based on problem-based learning combined with Socratic dialogue to enhance students' critical thinking skills. *Biosfer: Jurnal Tadris Biologi*, 15(1), 87-95. <https://doi.org/10.24042/biosfer.v15i1.22213>
- Prahani, B. K., Dawana, I. R., Jatmiko, B., & Amelia, T. (2023). Research trend of big data in education during the last 10 years. *International Journal of Emerging Technologies in Learning*, 18(10), 39–64. <https://doi.org/10.3991/ijet.v18i10.38453>

- Purbasari, A. H. (2022). Implementation of flipbook-based "Kayanya Negriku" e-module on learning outcomes of grade IV elementary school students. *Proceedings of the Basic Scientific Conference*, 3, 484–488.
- Purwoko, R. Y., Kusumaningrum, B., Laila, A. N., & Astuti, E. P. (2023). Development of open-ended-based mathematics e-modules to enhance students' critical thinking ability. *Mathline: Jurnal Matematika dan Pendidikan Matematika*, 8(1), 194–206. <https://doi.org/10.31943/mathline.v8i1.337>
- Rahmiati, R., Putri, M., Engkizar, E., & Mokhtar, M. M. (2023). The effectiveness of flipbook-based e-modules in increasing student creativity in nail art subject in higher education. *Jurnal Pendidikan Vokasi*, 13(2), 167–177. <https://doi.org/10.21831/jpv.v13i2.54330>
- Ramadhina, S. R., & Pranata, K. (2022). Development of e-modules based on flipbook application in elementary school. *Basicedu Journal*, 6(4), 7265–7274. <https://doi.org/10.31004/basicedu.v6i4.3470>
- Rasmawan, R., Muharini, R., & Lestari, I. (2022). Development of problem-based learning science e-module flipbook on environmental pollution material. *Basicedu Journal*, 6(5), 9156–9169. <https://doi.org/10.31004/basicedu.v6i5.3558>
- Ritonga, A. A., Syafitri, F., Widia, F., Sazkia, N., & Siregar, N. E. (2024). Development of flipbook-based e-module learning media regarding the human respiratory system in MI/SD class V. *Multidisciplinary Scientific Journal*, 1(12), 462–467. <https://doi.org/10.5281/zenodo.104462325>
- Rohmatin, I. A., Racmayani, A., & Jumadi, J. (2022). Development of e-module based on flipbook learning model problem-based learning (PBL) to improve critical thinking ability. *Berkala Ilmiah Pendidikan Fisika*, 10(3), 342–360. <https://doi.org/10.20527/bipf.v10i3.13655>
- Sakdiah, H. (2024). Pengembangan e-modul berbasis aplikasi flipbook subtema pertumbuhan dan perkembangan manusia. *Didaktik: Jurnal Ilmiah PGSD STKIP Subang*, 10(1), 2301–2314. <https://doi.org/10.36989/didaktik.v10i1.2772>
- Sakinah, G. S., Indrawadi, J., Suryanef, S., & Ernawati, E. (2023). The development of e-modules of Pancasila education learning with the flipbook application. *Scaffolding: Jurnal Pendidikan Islam dan Multikulturalisme*, 5(3), 601–631. <https://doi.org/10.37680/scaffolding.v5i3.3815>
- Salzabila, P. A., & Fathurrahman, M. (2024). Development of flipbook-assisted interactive teaching materials to improve learning outcomes. *Jurnal Penelitian Pendidikan IPA*, 10(9), 6955–6961. <https://doi.org/10.29303/jppipa.v10i9.8404>
- Saphira, H. V. (2022). Integrating local wisdom-based learning to preparing the Pancasila students' profile, yes or no? *International Journal of Current Educational Research*, 1(1), 18–35. <https://doi.org/10.53621/ijocer.v1i1.136>
- Sari, F. F. K., & Atmojo, I. R. W. (2021). Analisis kebutuhan bahan ajar digital berbasis flipbook untuk memberdayakan keterampilan abad 21 peserta didik pada pembelajaran IPA sekolah dasar. *Jurnal Basicedu*, 5(6), 6079–6085. <https://doi.org/10.31004/basicedu.v5i6.1715>
- Sari, N., & Khaidir, C. (2023). Needs analysis and design of flipbook-based e-module development with RME model to improve students' concept understanding ability. *JDIME: Journal of Development and Innovation in Mathematics Education*, 1(2), 12–24. <https://doi.org/10.32939/jdime.v1i2.2979>
- Setiyaningsih, I., Adiwijaya, P. A., & Numertayasa, I. W. (2024). Development of e-flashcard vocabulary on "I like fruits" as a learning media assisted by Heyzine

- Flipbook. *Edunesia: Jurnal Ilmiah Pendidikan*, 5(2), 941–956. <https://doi.org/10.51276/edu.v5i2.912>
- Suharsono, N., Sufi, L., & Hidayat, R. (2023). Development of e-modules assisted by flipbook applications in marketing subjects in vocational schools. *International Education Trend Issues*, 1(2), 196–209. <https://doi.org/10.56442/ieti.v1i3.224>
- Sutianah, C., Nurhutami, M. A., & Yamin, A. A. (2023). Implementation of BMC-based teaching and learning factory model in increasing student competencies in leather creative skills concentration and imitation in vocational school. *Jurnal Pendidikan Vokasi*, 13(2), 178–191. <https://doi.org/10.21831/jpv.v13i2.56001>
- Tania, N., & Astutik, Y. P. (2024). Development of flipbook-based e-modules on vocabulary subjects of class VIII at MTsN Berau. *Peel: Paser English Education and Linguistic*, 4(2), 20–31. <https://doi.org/10.56489/peel.v4i2.144>
- Ula, E. M., Paidi, P., & Jumadi, J. (2023). Electronic module development science-based learning flipbook theory system breathing in humans for student class VIII SMP/MTs. *Jurnal Penelitian Pendidikan IPA*, 9(4), 1593–1599. <https://doi.org/10.29303/jppipa.v9i4.1755>
- Usman, H., Lestari, I., Siregar, Y. E. Y., Rafiq, S., & SENTRYO, I. (2024). Flipbook and e-learning for teaching English to elementary school teacher education students. *Studies in English Language and Education*, 11(2), 919–935. <https://doi.org/10.24815/siele.v11i2.35476>
- Utami, P. T., & Ducha, N. (2020). The validity and legibility of digital literacy-based reproductive system flipbook to improve the critical thinking skills of grade 11th high school students. *Berkala Ilmiah Pendidikan Biologi (BioEdu)*, 9(3), 451–457. <https://doi.org/10.26740/bioedu.v9n3.p451-457>
- Yunianta, T. N. H., Herman, T., Wizhar, B. A., & Kurniawan, M. A. F. (2023). Development of mathematics e-module using Kodular and Flipbook for junior high school students: Differences. *Jurnal Didaktik Matematika*, 10(1), 1–16. <https://doi.org/10.24815/jdm.v10i1.29730>
- Yusmar, F., Putra, P., Ahmad, N., & Astuti, S. (2024). Development of flipbook-based e-module integrated with external features to facilitate student self-learning. *Journal of Educational Technology Research and Development*, 10(3), 988–1000. <http://dx.doi.org/10.33394/jk.v10i3.12520>
- Yuyun, S., Harjono, A., & Gunada, I. W. (2022). Developing flipbook-based physics e-module to increase students' learning outcome and motivation. *Jurnal Pendidikan Fisika dan Teknologi*, 8(2), 163–175. <https://doi.org/10.29303/jpft.v8i2.4292>
- Zahra, K. A., & Purwantoyo, E. (2024). Development of interactive e-modules for differentiated learning to improve critical thinking skills and student learning outcomes on body defense system. *Journal of Biology Education*, 13(3), 300–308.
- Zhang, A., Olelewe, C. J., Orji, C. T., Ibezim, N. E., Sunday, N. H., Obichukwu, P. U., & Okanazu, O. O. (2020). Effects of innovative and traditional teaching methods on technical college students' achievement in computer craft practices. *Sage Open*, 10(4), 11–23. <https://doi.org/10.1177/2158244020982986>

***Ida Puspita Sari (Corresponding Author)**

Bachelor of Education Program, Muhammadiyah University Kotabumi,
Jl. Hasan Kepala Ratu 1052, Sindang Sari, Kotabumi, Lampung
E-mail: idapuspitasari560@gmail.com

Rohmani

Lecturer in the Elementary School Teacher Education Study Program,
Muhammadiyah University Kotabumi,
Jl. Hasan Kepala Ratu 1052, Sindang Sari, Kotabumi, Lampung
E-mail: rohman.orgos@gmail.com

Khoirun Nisa'

Department of Education and Human Potentials Development, Hua-Shih College
of Education, National Dong Hwa University
No. 1, Sec. 2, Da Hsueh Rd., Shoufeng, Hualien 974301, Taiwan, R.O.C.
Email: 611388112@gms.ndhu.edu.tw
