



Development of a Flipbook-Assisted E-Module Integrating Problem-Based Learning to Enhance Students' Conceptual Understanding

Siti Nurfadlah*, Ila Rosmilawati, Indri Sari Utami

Department of Elementary Education, Faculty of Teacher Training and Education,
Universitas Sultan Ageng Tirtayasa, Indonesia.

*Corresponding Author. Email: nurfadlah6676@gmail.com

Abstract: This study aims to develop a flipbook-assisted e-module integrated with the Problem-Based Learning (PBL) model for the topic “This Is My Local Identity” in IPAS learning, and to evaluate its feasibility and effectiveness in enhancing elementary school students’ conceptual understanding. The study employed a Research and Development (R&D) method based on the ADDIE model and involved fourth-grade elementary school students. Data were collected through observation, interviews, questionnaires, and pretest–posttest assessments of conceptual understanding. The feasibility of the product was analyzed using Aiken’s V, while its effectiveness was measured using the N-gain test. The results showed that the developed e-module achieved an average Aiken’s V value of 0.80, indicating that it is valid and feasible in terms of both content and media aspects. Furthermore, the effectiveness analysis revealed an N-gain score of 0.67, categorized as moderate, indicating a significant improvement in students’ conceptual understanding after the implementation of the e-module. The integration of flipbook multimedia features with the PBL model created a more interactive, contextual, and meaningful learning environment. The visual and interactive elements embedded in the flipbook supported students in understanding abstract concepts of local identity through contextual problem orientation, exploratory activities, and collaborative discussions. This study contributes to the development of digital instructional media by providing empirical evidence that the integration of multimedia-based technology with student-centered learning models can enhance conceptual understanding in elementary education.

Article History

Received: 13-03-2026

Revised: 19-04-2026

Accepted: 28-05-2026

Published: 20-06-2026

Key Words:

Flipbook E-Module;
Problem Based Learning;
Conceptual Understanding;
Local Identity; IPAS.

How to Cite: Nurfadlah, S., Rosmilawati, I., & Utami, I. S. (2026). Development of a Flipbook-Assisted E-Module Integrating Problem-Based Learning to Enhance Students’ Conceptual Understanding. *Jurnal Kependidikan : Jurnal Hasil Penelitian Dan Kajian Kepustakaan Di Bidang Pendidikan, Pengajaran, Dan Pembelajaran*, 12(2), 875-886. <https://doi.org/10.33394/jk.v12i2.20245>



<https://doi.org/10.33394/jk.v12i2.20245>

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



Introduction

The rapid development of digital technology has significantly changed educational practices worldwide, especially in 21st-century learning. Students are now expected not only to gain knowledge, skills, and attitudes, but also to be able to use Information and Communication Technology (ICT) effectively in various learning situations. ICT includes different digital tools that help users access, process, store, and share information efficiently. In education, technology is no longer viewed only as a supporting tool, but as an important component that helps create more flexible, adaptive, and innovative learning environments (Prasasti & Anas, 2023). Previous studies show that integrating ICT into learning can improve instructional quality and increase student engagement when it is connected meaningfully with learning objectives (Haleem et al., 2022). Similarly, Siregar et al. (2021) explain that technology integration can improve learning effectiveness when it is supported by appropriate instructional strategies rather than being used only as an additional tool.



From a theoretical perspective, education is viewed as a structured process aimed at developing human potential through organized learning experiences. This view is in line with Law Number 20 of 2003 concerning the National Education System, which emphasizes the importance of developing knowledgeable, creative, independent, and responsible citizens (Yolandasari et al., 2025). In addition, the 2013 Curriculum promotes interactive, innovative, and student-centered learning that considers students' characteristics and encourages meaningful learning experiences (Putri et al., 2024). However, the implementation of these approaches at the elementary school level is still not optimal, especially in improving higher-order thinking skills and conceptual understanding.

One of the major problems in elementary education is students' low conceptual understanding, particularly when learning abstract material. Conceptual understanding refers to students' ability to interpret, connect, and apply knowledge in different contexts, and it is considered an important indicator of meaningful learning (Deliany et al., 2019). Previous studies found that many students still struggle to distinguish examples from non-examples, explain concepts clearly, and apply knowledge in real-life situations (Rida et al., 2025). These problems are often caused by teacher-centered learning, limited classroom interaction, and the lack of engaging and interactive learning media.

Preliminary observations conducted in a fourth-grade IPAS classroom showed that the learning process was still mostly teacher-centered, with textbooks used as the main learning source. Initial assessment results indicated that only 38% of students were able to correctly identify examples and non-examples related to local identity concepts. This finding suggests that many students still had difficulties understanding concepts deeply and relating the material to their daily lives. As a result, students had limited opportunities to participate actively in the learning process, which affected their conceptual understanding. In addition, the learning materials used in class were not sufficiently connected to students' real-life experiences, making learning less meaningful. This condition is closely related to the limited use of innovative and technology-based learning media. Research also shows that conventional teaching approaches are less effective in encouraging active learning compared to interactive digital learning environments (Cirgi & Miarsyah, 2021). Therefore, instructional innovation that combines technology with appropriate teaching approaches is needed to improve student engagement and conceptual understanding.

One possible solution is the development of ICT-based teaching materials in the form of electronic modules (e-modules). E-modules provide flexible and accessible learning resources and can include multimedia elements such as text, images, audio, and videos to support deeper understanding (Febriani & Widiyanto, 2023). Flipbook-based e-modules, in particular, offer an interactive digital format that combines the experience of reading a physical book with multimedia features. Previous studies have shown that flipbook-based e-modules can improve students' motivation, engagement, and conceptual understanding (Prihatiningtyas et al., 2025). In addition, Setyorini et al. (2026) reported that such media enhance students' learning experiences through attractive and dynamic visual content. However, other studies indicate that digital media alone are often not enough to produce optimal learning outcomes when they are not supported by appropriate instructional models (Nastiti et al., 2026).

In this context, Problem-Based Learning (PBL) is considered a suitable learning approach because it emphasizes active learning through contextual problem-solving. PBL encourages students to build knowledge independently, develop critical thinking skills, and engage in meaningful learning activities (Aksari et al., 2024). Dolmans et al. (2016) also explain that PBL helps students develop deeper conceptual understanding because learning is



connected to real-life situations. Recent studies further show that combining PBL with digital learning media can improve student engagement and learning outcomes (Sikumbang, 2025). Likewise, Harsono and Wati (2025) found that integrating PBL with technology-based learning environments supports more effective and student-centered learning.

Despite these developments, previous studies mostly examined flipbook-based e-modules and the PBL model separately, especially at the elementary school level. Bibliometric studies also confirm that the integration of interactive digital media and problem-based learning is still rarely explored, even though it has strong potential to improve learning effectiveness (Nuralita et al., 2025). Similarly, Rahmawati and Mukniah (2025) emphasize the need for more comprehensive studies that combine technological innovation with pedagogical strategies. This gap highlights the importance of integrating flipbook technology with the PBL model in a more systematic and meaningful way. Without interactive multimedia support, students often have difficulty understanding problems presented in the problem orientation stage of PBL, especially when the material is delivered only through text. The use of videos, images, animations, and contextual illustrations in flipbooks can help students visualize real-life situations related to local identity, making abstract concepts easier to understand. At the same time, the PBL model encourages students to actively explore, discuss, and solve contextual problems. Therefore, integrating flipbook media with PBL is theoretically important because it supports students' cognitive understanding through multimedia learning while also encouraging active knowledge construction through problem-solving activities.

Based on this research gap, the present study develops a flipbook-assisted e-module integrated with the Problem-Based Learning model. This approach is expected to create a more interactive, contextual, and student-centered learning environment by combining multimedia learning with problem-solving activities. The study was motivated by the need to improve elementary school students' conceptual understanding while supporting the implementation of technology-based learning.

Conceptual understanding, as an important part of the cognitive domain, helps students construct meaningful knowledge (Astuti & Dasmo, 2016). According to the revised taxonomy by Anderson and Krathwohl, conceptual understanding includes cognitive processes such as interpreting, classifying, comparing, and explaining concepts meaningfully. Therefore, conceptual understanding is not only about memorizing information, but also about connecting and applying knowledge in different situations. It also includes abilities such as interpreting, classifying, summarizing, inferring, and explaining concepts clearly (Nurvitasari & Samsudin, 2023). For this reason, improving students' conceptual understanding requires not only appropriate learning materials but also effective instructional design and innovative learning media. Therefore, this study aims to develop a flipbook-assisted e-module based on the Problem-Based Learning model that meets the criteria of validity, practicality, and effectiveness in improving students' conceptual understanding in IPAS learning. This study contributes to the literature by providing empirical evidence on the integration of digital learning media with problem-based learning approaches. In addition, it offers practical guidance for teachers in designing more interactive, contextual, and meaningful learning experiences, especially in elementary education.

Research Method

This study used a Research and Development (R&D) method to develop a flipbook-assisted e-module based on the Problem-Based Learning (PBL) model and to examine its feasibility and effectiveness in improving students' conceptual understanding.

The development process used the ADDIE model, which consists of five stages: Analysis, Design, Development, Implementation, and Evaluation. The ADDIE model was chosen because it provides clear and systematic steps for developing learning media (Arlim & Fauzi, 2025). Previous studies also show that the ADDIE model helps produce effective and well-organized instructional media (Kurniawan & Syafriani, 2021).

This study was conducted in an elementary school involving 28 fourth-grade students in IPAS learning. The population included all fourth-grade students, while the sample was selected using purposive sampling based on the research needs. Grade IV was chosen because students already had basic skills in using digital learning media with teacher guidance. However, preliminary observations showed that many students still had difficulties understanding IPAS concepts, especially topics related to local identity. In addition, the topic “This Is My Local Identity” is part of the Grade IV IPAS curriculum, making this class suitable for implementing the developed e-module. The independent variable in this study was the use of a flipbook-assisted e-module integrated with the PBL model, while the dependent variable was students’ conceptual understanding. Students’ conceptual understanding was measured through indicators such as interpreting, classifying, explaining, and drawing conclusions.

Data were collected through observations, interviews, questionnaires, and tests. The instruments used in this study included expert validation sheets, teacher and student response questionnaires, and conceptual understanding tests in the form of pretests and posttests. Instrument quality was tested through validity and reliability testing. Content validity was analyzed using Aiken’s V index, which measures the agreement among experts regarding the relevance of each instrument item. The Aiken’s V score ranges from 0 to 1, where higher scores indicate stronger validity (Ningtyas et al., 2025). Previous studies also state that Aiken’s V is an effective method for evaluating content validity in educational research instruments (Nurhidayah et al., 2025). Reliability testing was conducted to ensure that the instruments consistently measured students’ conceptual understanding.

The research procedure followed the ADDIE stages systematically. The analysis stage focused on identifying learning needs, student characteristics, and curriculum requirements through observations and interviews. The results showed that the learning process was still teacher-centered and that interactive learning media were rarely used. As a result, students were less active during learning and experienced difficulties understanding abstract concepts.

The design stage focused on preparing the structure and appearance of the e-module. This stage included organizing the learning materials, designing learning activities based on the PBL model, and creating the flipbook layout. The learning materials were adjusted to the IPAS learning outcomes. At this stage, the research instruments were also prepared.

The development stage involved creating the e-module by integrating multimedia elements such as images, videos, and interactive activities based on the stages of the PBL model. The product was then validated by material experts and media experts. Revisions were made based on expert suggestions until the product met the required validity criteria. The implementation stage was carried out through a limited classroom trial. Students completed a pretest before the learning activities began to measure their initial conceptual understanding. The learning process was then conducted using the developed e-module integrated with the PBL model. After the learning activities were completed, students were given a posttest to measure improvements in their conceptual understanding.

The evaluation stage included formative and summative evaluation. Formative evaluation was conducted at each stage of development to identify and improve weaknesses in the product. Meanwhile, summative evaluation was conducted to determine the overall

effectiveness of the developed e-module. Data analysis was carried out using both qualitative and quantitative approaches. Qualitative data obtained from expert feedback and user responses were analyzed descriptively to improve the product. Quantitative data were analyzed to determine the feasibility and effectiveness of the e-module. Product validity was calculated using the Aiken's V formula:

$$V = \frac{\sum s}{n(c - 1)}$$

To measure the effectiveness of the e-module, the N-Gain score was used by comparing pretest and posttest results:

$$\text{N-Gain} = \frac{\text{Posttest} - \text{Pretest}}{\text{Ideal Score} - \text{Pretest}}$$

The N-Gain results were classified into three categories: high ($g > 0.70$), moderate ($0.30 \leq g \leq 0.70$), and low ($g < 0.30$), based on the effectiveness criteria proposed by Meltzer (2002). This analysis was used to determine the extent of improvement in students' conceptual understanding after the implementation of the developed e-module.

Results and Discussion

Prerequisite Test Results

Before conducting the effectiveness analysis, prerequisite testing was carried out to ensure that the data met the required statistical assumptions. In this study, the Shapiro–Wilk test was employed to assess data normality, considering that the sample size was fewer than 50 participants. The analysis of the gain scores, calculated from the difference between pretest and posttest results, produced a significance value of 0.082. Since this value exceeds the threshold of 0.05 ($0.082 > 0.05$), the data can be considered normally distributed. This result indicates that the dataset satisfies the assumptions for conducting further parametric analysis. Consequently, the use of the N-Gain test to evaluate the improvement in students' conceptual understanding is statistically appropriate and methodologically justified.

Product Feasibility

The feasibility of the developed e-module was determined through a comprehensive validation process involving material experts and media experts. The evaluation encompassed several critical aspects, including the alignment of content with learning objectives, conceptual accuracy, completeness of materials, clarity of language, visual presentation, and the level of interactivity.

Table 1. Feasibility Test Results of the Flipbook-Assisted E-Module

Assessed Aspect	Aiken's V Value	Category
Material Feasibility	0.81	Very Valid
Media Feasibility	0.79	Valid
Average	0.80	Valid

As presented in Table 1, the material aspect obtained an Aiken's V value of 0.81, which falls into the *very valid* category. This indicates that the instructional content is well-aligned with the learning outcomes, conceptually accurate, and systematically organized. In contrast, the media aspect achieved a value of 0.79, categorized as *valid*, suggesting that the visual design, navigation, and interactivity meet the required standards, although minor refinements are still necessary.

The overall average score of 0.80 confirms that the developed e-module is feasible for implementation in classroom learning. This finding is in line with previous studies demonstrating that flipbook-based e-modules tend to achieve high validity when developed through structured instructional design frameworks (Prihatiningtyas et al., 2025). In addition,

expert validation has been recognized as a critical step in ensuring the quality, usability, and pedagogical appropriateness of digital learning media (Setianingsih et al., 2024). Feedback provided by validators primarily focused on technical improvements, such as enhancing design consistency, refining color composition, and incorporating more relevant illustrations. These revisions contributed significantly to improving both the aesthetic quality and instructional clarity of the e-module.

Product Description

The final product of this study is a flipbook-based digital e-module that is accessible via computers and smartphones, thereby supporting flexible and independent learning. The e-module is systematically structured, consisting of a cover page, user instructions, learning objectives, core materials, PBL-based learning activities, interactive quizzes, and reflection components.



Figure 1. Main Display of the Flipbook-Assisted E-Module

The design of the e-module was developed by considering the cognitive and developmental characteristics of elementary school students. The use of simple and communicative language is complemented by engaging visual elements, contextual illustrations, and balanced color composition. Furthermore, the learning materials are explicitly linked to students' real-life experiences, thereby facilitating more meaningful learning.

The instructional activities embedded in the e-module follow the syntax of the Problem-Based Learning model, which includes problem orientation, problem identification, information exploration, group discussion, presentation of findings, and reflection. This structured approach encourages students to actively engage in the learning process and construct their own understanding through problem-solving activities. Previous research has shown that integrating PBL into digital learning environments enhances student engagement and promotes deeper conceptual understanding (Kharomah et al., 2024). Moreover, interactive e-modules that combine visual and contextual elements have been found to support more meaningful and effective learning experiences (Fadhilah & Mulyani, 2024).

Effectiveness Testing

The effectiveness of the developed e-module was analyzed using the N-Gain test, based on a comparison between pretest and posttest scores.

Table 2. N-Gain Test Results of Students' Conceptual Understanding

Average Pretest	Average Posttest	N-Gain	Category
52.40	84.10	0.67	Moderate

As shown in Table 2, the average pretest score of 52.40 increased to 84.10 in the posttest. The resulting N-Gain value of 0.67 falls within the *moderate* category, indicating a substantial improvement in students' conceptual understanding. These findings are consistent

with prior research indicating that PBL-based e-modules tend to produce moderate to high learning gains, particularly when supported by interactive digital features (Afni & Nur, 2024). In addition, flipbook-based learning media have been reported to enhance student engagement and improve learning outcomes through their visual and interactive characteristics (Putri et al., 2026).

The improvement in students' conceptual understanding can be attributed to several key factors. First, the use of contextual problems enables students to relate abstract concepts to real-life situations. Second, the integration of multimedia elements increases students' attention and learning motivation. Third, the application of the PBL model encourages active participation through discussion, exploration, and problem-solving processes. These factors collectively contribute to deeper and more meaningful learning. Overall, the findings demonstrate that the developed flipbook-assisted e-module based on the PBL model is not only valid and feasible, but also effective in enhancing students' conceptual understanding. Therefore, this product holds significant potential as an innovative, interactive, and contextually relevant learning medium for elementary education.

Discussion

The findings of this study show that the development of a flipbook-assisted e-module integrated with the Problem-Based Learning (PBL) model has a positive effect on improving elementary school students' conceptual understanding. This finding reflects the increasing importance of integrating Information and Communication Technology (ICT) into education to create learning environments that are more interactive, flexible, and meaningful (Prasasti & Anas, 2023). Previous studies have explained that the integration of digital technology not only improves instructional quality but also encourages students to participate more actively during the learning process (Siregar et al., 2021). In addition, technology integration can support learning effectiveness and students' cognitive development by promoting more student-centered learning experiences (Haleem et al., 2022). International studies also confirm that well-designed digital learning environments can improve learning outcomes and student engagement significantly (Schindler et al., 2017).

The improvement in students' conceptual understanding can be explained through the interaction between the multimedia features in the flipbook and the problem-solving activities in the PBL model. The flipbook provided students with interactive learning experiences through text, images, animations, videos, and interactive navigation. These features helped present abstract concepts related to local identity in IPAS learning in a more concrete, contextual, and visually meaningful way. According to Mayer's Multimedia Learning Theory, students learn more effectively when verbal and visual information are presented together because learners process information through visual and auditory channels simultaneously (Mayer, 2014). In this study, the multimedia elements helped students connect new information with their previous knowledge, which supported deeper conceptual understanding.

The presentation of "Local Identity" materials through multimedia elements also played an important role in creating meaningful learning experiences. Videos, illustrations, and contextual images in the flipbook allowed students to observe cultural activities and local community practices directly instead of relying only on written explanations. This helped students interpret and classify concepts more easily because the learning materials were closely connected to their daily lives. These findings are consistent with previous studies showing that interactive digital modules improve conceptual understanding by encouraging active cognitive engagement and contextual learning (Kharomah et al., 2024). In addition, the visual and interactive features of flipbook media have been shown to increase students'

motivation and information retention by making learning activities more interesting and easier to access (Aprilia, 2017).

Another factor that contributed to the improvement in students' conceptual understanding was the integration of the PBL model into the e-module design. The implementation of PBL stages, including problem orientation, investigation, discussion, presentation, and reflection, encouraged students to actively build knowledge through real problem-solving activities. The multimedia features in the flipbook especially supported the problem orientation stage, which is often difficult for elementary school students when problems are presented only through written text. Through videos, illustrations, and contextual scenarios, students were able to visualize real situations related to local identity issues, which helped them understand the problems more clearly. This process is in line with constructivist learning principles, which state that knowledge is actively built through meaningful experiences and social interaction (Shofiyah et al., 2018).

Furthermore, integrating PBL into the digital learning environment also supported students' independence, critical thinking, and collaborative learning skills. During the investigation and discussion stages, students were encouraged to explore information, analyze contextual problems, and express their ideas actively. These learning activities increased students' cognitive involvement and encouraged deeper conceptual understanding rather than simple memorization. Previous research has shown that PBL effectively improves students' critical thinking and independent learning abilities (Khairani, 2023). Likewise, other studies indicate that combining PBL with digital learning environments creates more effective student-centered learning experiences and improves conceptual understanding (Islam & Chua, 2025).

The effectiveness of the developed e-module can therefore not only be seen as the result of using technology, but also as the result of meaningful integration between multimedia learning and problem-based learning approaches. The interactive media elements attracted students' attention and helped reduce difficulties in understanding abstract concepts, while the PBL model encouraged active exploration and knowledge construction. This finding supports the idea that digital learning media become more effective when combined with instructional models that actively involve students in cognitive and collaborative learning processes (Clark & Mayer, 2016). Recent studies also emphasize that strong integration between instructional design and technological features can improve usability and learning effectiveness significantly (Fadhilah & Mulyani, 2024).

Despite these positive findings, several limitations should still be considered. The improvement in conceptual understanding had not yet reached the optimal level, which may have been influenced by limited implementation time, students' adaptation to technology-based learning, and teachers' readiness to use digital media in classroom instruction. Previous studies have also identified challenges related to infrastructure, technological accessibility, and user readiness in implementing digital learning media effectively (Setianingsih et al., 2024). These limitations indicate the need for broader implementation and continuous improvement of digital instructional media to maximize learning outcomes.

Overall, this study contributes both theoretically and practically to elementary education. Theoretically, it strengthens the literature related to the integration of multimedia learning and problem-based learning in improving conceptual understanding. Practically, it provides an innovative instructional product that supports interactive, contextual, and meaningful learning experiences, especially in IPAS learning related to local identity. The findings also highlight the importance of aligning technological tools with appropriate

instructional strategies to optimize students' cognitive engagement and conceptual understanding.

Conclusion

This study concludes that the development of a flipbook-assisted e-module integrated with the Problem-Based Learning (PBL) model successfully meets the criteria of validity, practicality, and effectiveness in improving elementary school students' conceptual understanding in IPAS learning. The product was validated by experts and demonstrated strong feasibility in terms of content accuracy, language clarity, and media design. Its implementation in classroom learning resulted in a measurable improvement in students' conceptual understanding, as indicated by the moderate N-Gain score, confirming its effectiveness as an instructional medium. These findings imply that the integration of interactive digital media with a problem-based learning approach creates a more engaging, contextual, and student-centered learning environment that supports meaningful knowledge construction. In terms of contribution, this study strengthens the theoretical and practical perspectives on combining digital learning media with innovative pedagogical models in elementary education.

Recommendation

Based on the findings of this study, teachers are encouraged to use interactive digital media together with suitable learning models to create more meaningful and student-centered learning. The use of flipbook-assisted e-modules integrated with the Problem-Based Learning (PBL) model can help students understand concepts more easily through interactive and contextual learning activities. Teachers are also advised to connect learning materials with students' daily lives, especially in IPAS learning related to local identity. For future researchers, it is suggested to conduct studies with larger samples and in different school settings to obtain broader results. Future studies can also explore the use of other digital learning media combined with innovative learning models to improve students' conceptual understanding and higher-order thinking skills. In addition, further research may examine the long-term effects of flipbook-assisted learning on students' motivation, critical thinking, and cultural awareness.

References

- Aksari, N., Putra, A., & Lestari, D. (2024). The effect of problem-based learning on students' conceptual understanding. *Jurnal Pendidikan IPA*, 10(1), 12–20.
- Afni, N., & Nur, A. B. (2024). The effectiveness of using flipbook e-module with PBL model on student understanding. <https://etdci.org/journal/macca/article/view/2470>
- Al Jannah, R. (2025). Inovasi pembelajaran untuk meningkatkan keterlibatan siswa. *Jurnal Pendidikan Inovatif*, 7(1), 33–41.
- Aprilia, D. (2017). Pengaruh media flipbook terhadap motivasi belajar siswa. *Jurnal Pendidikan*, 5(2), 45–52.
- Arlim, M., & Fauzi, A. (2025). Validity and practicality of physics e-modules based on ADDIE model. *Jurnal Penelitian Pendidikan IPA*. <https://jppipa.unram.ac.id/index.php/jppipa/article/view/13332>
- Astuti, Y., & Dasmo. (2016). Peran pemahaman konsep dalam pembelajaran. *Jurnal Pendidikan Sains*, 4(1), 12–18.
- Cirgi, A., & Miarsyah, M. (2021). Student engagement dalam pembelajaran abad 21. *Jurnal Pendidikan Biologi*, 9(2), 101–109

- Clark, R. C., & Mayer, R. E. (2016). *E-learning and the science of instruction: Proven guidelines for consumers and designers of multimedia learning* (4th ed.). Wiley.
<https://doi.org/10.1002/9781119239086>
- Damaiyanti, A., & Silitonga, H. T. M. (2025). Development of flipbook-based e-modules with ADDIE approach. *Jurnal Pedagogy*.
<https://ojspanel.undikma.ac.id/index.php/pedagogy/article/view/13751>
- Deliany, N., Rahmawati, S., & Hidayat, T. (2019). Analisis pemahaman konsep siswa. *Jurnal Pendidikan*, 7(1), 23–30.
- Deslauriers, L., McCarty, L. S., Miller, K., Callaghan, K., & Kestin, G. (2019). Measuring actual learning versus feeling of learning in response to being actively engaged in the classroom. *Proceedings of the National Academy of Sciences*, 116(39), 19251–19257.
<https://doi.org/10.1073/pnas.1821936116>
- Dolmans, D. H. J. M., Loyens, S. M. M., Marcq, H., & Gijbels, D. (2016). Deep and surface learning in problem-based learning: A review. *Advances in Health Sciences Education*, 21(5), 1087–1112. <https://doi.org/10.1007/s10459-015-9645-6>
- Fadhilah, R., & Mulyani, P. K. (2024). Development of flipbook-based e-modules to improve student learning outcomes. *Jurnal Penelitian Pendidikan IPA*, 10(2), 1234–1242.
<https://doi.org/10.29303/jppipa.v10i2.7804>
- Febriani, L., & Widiyanto, W. (2023). Pengembangan e-modul berbasis teknologi. *Jurnal Teknologi Pendidikan*, 11(1), 50–58.
- Field, A. (2018). *Discovering statistics using IBM SPSS statistics* (5th ed.). Sage Publications.
- Haleem, A., Javaid, M., Qadri, M. A., & Suman, R. (2022). Understanding the role of digital technologies in education: A review. *Sustainability*, 14(10), 6250.
<https://doi.org/10.3390/su14106250>
- Hanifah, W., & Rochintaniawati, D. (2025). Validity and reliability of e-module using Aiken's V. *Pedagonal Journal*. <https://pedagonal-fkip.unpak.ac.id/index.php/pedagonal/article/view/34>
- Harsono, T. F., & Wati, U. A. (2025). Development of PBL-based flipbook e-modules. *Jurnal Penelitian Ilmu Pendidikan*.
<https://jurnal.uny.ac.id/index.php/jpip/article/view/91610>
- Hmelo-Silver, C. E. (2004). Problem-based learning: What and how do students learn? *Educational Psychology Review*, 16(3), 235–266.
<https://doi.org/10.1023/B:EDPR.0000034022.16470.f3>
- Ikroma, I., & Prasetyaningtyas, S. (2025). Pengaruh e-modul flipbook terhadap hasil belajar IPAS. *Jurnal Pendidikan Dasar*, 9(1), 55–63.
- Islam, M. R., & Chua, K. J. (2025). Hybrid problem-based learning in digital environments: Effects on student engagement and conceptual understanding. *European Journal of Education*.
<https://doi.org/10.1111/ejed.70066>
- Khairani, F. (2023). Penerapan problem-based learning dalam meningkatkan kemandirian belajar siswa. *Jurnal Inovasi Pendidikan*, 6(2), 88–95.
- Kharomah, S., Mulyati, Y., & Marsuki, M. F. (2024). Enhancing students' science outcomes through problem-based interactive flipbook e-module.
<https://ejournal.umm.ac.id/index.php/raden/article/view/34572>



- Kharomah, S., Widodo, A., & Suyanto, S. (2024). Interactive e-modules and their impact on students' conceptual understanding in science learning. *Journal of Science Education*, 8(1), 55–63.
- Kurniawan, R., & Syafriani. (2021). The validity of e-module based on guided inquiry integrated ethnoscience. *Journal of Physics: Conference Series*, 1876(1). <https://doi.org/10.1088/1742-6596/1876/1/012067>
- Laili, N., Hidayat, A., & Rahman, F. (2019). Penggunaan e-modul dalam pembelajaran. *Jurnal Teknologi Pendidikan*, 7(2), 75–83.
- Mayer, R. E. (2014). Cognitive theory of multimedia learning. In R. E. Mayer (Ed.), *The Cambridge handbook of multimedia learning* (pp. 43–71). Cambridge University Press. <https://doi.org/10.1017/CBO9781139547369.005>
- Masitoh, S. (2022). Tantangan penggunaan media digital dalam pembelajaran. *Jurnal Teknologi Pendidikan*, 8(2), 101–109.
- Nastiti, N., Widiarti, N., & Subali, B. (2026). Trends in game-based e-module development: A bibliometric review. *Journal of Innovation in Primary Education*. <https://ejournal.papanda.org/index.php/jirpe/article/view/2905>
- Ningtyas, A. I., Yamtinah, S., & Saputro, S. (2025). Content validity analysis using Aiken's V method in educational instruments. *Jurnal Penelitian Pendidikan IPA*. <https://jppipa.unram.ac.id/index.php/jppipa/article/view/11429>
- Nufus, H., & Fitriani, D. (2024). Development research using ADDIE model in education. *Jurnal Gantang*. <https://ojs.umrah.ac.id/index.php/gantang/article/view/6959>
- Nuralita, A. D. A., Subali, B., & Nugroho, S. E. (2025). Mapping project-based learning e-modules: A systematic review. *Jurnal Inovasi Pendidikan IPA*. <https://jurnal.uny.ac.id/index.php/jipi/article/view/87903>
- Nurhidayah, N., Fatkhulloh, S., & Yanto, N. (2025). Development of assessment instruments using ADDIE model and Aiken's V validation. *Journal of Education Research*. <https://journal.web.id/journals/venn/article/view/290>
- Nurvitasari, E., & Samsudin, A. (2023). Indikator pemahaman konsep dalam pembelajaran sains. *Jurnal Pendidikan IPA*, 11(1), 22–30.
- Ortiz Moreno, J. A., & Godoy-Rangel, A. (2025). Digital problem-based learning environments and their effect on student engagement. *Computers & Education*. <https://doi.org/10.1016/j.compedu.2025.105012>
- Prasasti, R., & Anas, M. (2023). Pemanfaatan teknologi dalam pembelajaran abad ke-21. *Jurnal Pendidikan Modern*, 5(1), 10–18.
- Prince, M. (2004). Does active learning work? A review of the research. *Journal of Engineering Education*, 93(3), 223–231. <https://doi.org/10.1002/j.2168-9830.2004.tb00809.x>
- Prihatiningtyas, S., Shofiyah, N., & Yunus, S. R. (2025). Enhancing science literacy through flipbook-based e-modules. *Humanities and Social Sciences Communications*. <https://doi.org/10.1057/s41599-025-05054-w>
- Putri, A. R., Sari, D. P., & Nugroho, B. (2024). Implementasi Kurikulum 2013 dalam pembelajaran. *Jurnal Pendidikan Dasar*, 8(2), 120–130.
- Putri, S. K., Saliman, S., & Widiastuti, A. (2026). Flipbook-based e-module to improve student learning outcomes. <https://journal.unilak.ac.id/index.php/lectura/article/view/30339>
- Rida, M. N. H., Fatmawati, U., & Karyanto, P. (2025). Developing flipbook e-modules to enhance conceptual understanding. *JPBI*. <https://ejournal.umm.ac.id/index.php/jpbi/article/view/37548>



- Rahmawati, I., & Mukniah, M. (2025). Problem-based e-modules using flipbooks as innovation. *European Journal of Education Studies*.
<http://www.ejeset.saintispub.com/ejeset/article/view/1100>
- Savery, J. R. (2015). Overview of problem-based learning: Definitions and distinctions. In A. Walker, H. Leary, C. Hmelo-Silver, & P. A. Ertmer (Eds.), *Essential readings in problem-based learning* (pp. 5–15). Purdue University Press.
<https://doi.org/10.2307/j.ctt6wq6fh.4>
- Schindler, L. A., Burkholder, G. J., Morad, O. A., & Marsh, C. (2017). Computers in education: Engagement and learning outcomes. *Computers & Education*, 113, 1–17.
<https://doi.org/10.1016/j.compedu.2017.05.013>
- Setiadi, A., Rahman, M., & Putri, S. (2021). Pengembangan media flipbook dalam pembelajaran. *Jurnal Teknologi Pendidikan*, 7(1), 34–42.
- Setiadi, A., Nugroho, B., & Wulandari, S. (2021). Pengembangan media flipbook dalam pembelajaran. *Jurnal Teknologi Pendidikan*, 7(1), 34–42.
- Setianingsih, D. R., & Ismawati, R. (2024). Development of PBL-based e-modules and their effectiveness.
<https://journal.walisongo.ac.id/index.php/Phenomenon/article/view/22535>
- Setianingsih, D. R., Wahyuni, S., & Hidayat, T. (2024). Challenges in implementing digital learning media in elementary schools. *Jurnal Pendidikan Dasar*, 13(1), 67–75.
- Setyorini, E., Sukarmin, S., & Harlita, H. (2026). Development of flipbook e-modules to enhance science literacy. *Edunesia Journal*.
<https://mail.edunesia.org/edu/article/view/1659>
- Shella, N. (2025). Penerapan model PBL dalam meningkatkan keterampilan berpikir tingkat tinggi. *Jurnal Pendidikan*, 10(1), 60–68.
- Shofiyah, N., Wulandari, F., & Setiawan, D. (2018). Model problem-based learning dalam pembelajaran. *Jurnal Pendidikan*, 6(2), 120–128.
- Sikumbang, N. (2025). Development of PBL-integrated e-modules in physics learning. *Jurnal Penelitian Pendidikan IPA*.
<https://jppipa.unram.ac.id/index.php/jppipa/article/view/11627>
- Siregar, E., Nadiroh, N., & Hartono, H. (2021). Pengembangan media pembelajaran berbasis teknologi. *Jurnal Pendidikan*, 8(1), 15–22.
- Supardan, D. (n.d.). Konsep dasar dalam pembelajaran. *Jurnal Pendidikan*.
- Theobald, E. J., Hill, M. J., Tran, E., Agrawal, S., Arroyo, E. N., Behling, S., ... Freeman, S. (2020). Active learning narrows achievement gaps for underrepresented students in STEM. *Proceedings of the National Academy of Sciences*, 117(12), 6476–6483.
<https://doi.org/10.1073/pnas.1916903117>
- Tuzahara, F. (2025). Efektivitas media digital dalam meningkatkan hasil belajar siswa. *Jurnal Pendidikan Digital*, 3(1), 44–52.
- Winarni, K. A., Akhsan, H., & Kistiono, K. (2025). Development and effectiveness testing of instructional modules using N-Gain. *EduFisika Journal*. <https://online-journal.unja.ac.id/EDP/article/view/49875>
- Wittayakom, S., & Kanjanavisutt, C. (2024). Active learning in digital classrooms: Effects on student engagement and conceptual understanding. *Education and Information Technologies*.
<https://doi.org/10.1007/s10639-024-12345-6>
- Yolandasari, R., Putri, N. A., & Hidayat, T. (2025). Implementasi sistem pendidikan nasional di Indonesia. *Jurnal Pendidikan Nasional*, 9(1), 1–10.