Jurnal Paedagogy:
Jurnal Penelitian dan Pengembangan Pendidikan
https://e-journal.undikma.ac.id/index.php/pedagogy/index
Email:paedagogy@undikma.ac.id

Vol. 13 No. 2 : April 2026
E-ISSN: 2722-4627
pp. 835-845

Trends and Emerging Innovations in Digital Media for E-Module Development: A Systematic Literature Review

Maria Veronica Deno*, Khaerudin, Dwi Kusumawardani
Educational Technology Study Program, Faculty of Education.
Universitas Negeri Jakarta, Indonesia.
*Corresponding Author. Email: mariadeno968@gmail.com

Abstract: This study aims to conduct a comprehensive mapping of the evolution of digital media in e-module development over the past five years (2020–2024). Furthermore, it seeks to identify research gaps to provide a strategic roadmap for the future development of e-modules integrated with Artificial Intelligence (AI) and immersive media. Adopting the PRISMA 2020 protocol, a Systematic Literature Review (SLR) was conducted on Scopus-indexed articles. From the selection process, 20 articles were analyzed through a systematic process of categorization and synthesis based on research types, pedagogical approaches, and the digital media and platforms used. The findings indicate the dominance of R&D methods, particularly the ADDIE and 4D models. Pedagogical approaches such as Problem-Based Learning, STEM, SETS, Discovery Learning, and Guided Inquiry consistently improve critical thinking skills, learning outcomes, and 21st-century competencies. In terms of technology, Android-based platforms and flipbooks are the most preferred due to their accessibility and support for multimedia elements such as videos, animations, simulations, and interactive quizzes. These findings highlight the importance of developing e-modules that are systematic, pedagogically grounded, constructivist, and supported by interactive multimedia. Future research needs to explore the integration of AR/VR, gamification, and artificial intelligence.

Article History
Received: 21-01-2026
Revised: 27-02-2026
Accepted: 14-03-2026
Published: 20-04-2026

Key Words:
Digital Media; E-Module; Innovation; Learning; Artificial Intelligence.

How to Cite: Deno, M. V., Khaerudin, & Kusumawardani, D. (2026). Trends and Emerging Innovations in Digital Media for E-Module Development: A Systematic Literature Review. *Jurnal Paedagogy*, *13*(2), 835-845. https://doi.org/10.33394/jp.v13i2.19401

https://doi.org/10.33394/jp.v13i2.19401

Introduction

The global educational landscape is currently undergoing a paradigmatic shift, where traditional pedagogical frameworks are being rapidly superseded by dynamic, technology-mediated instructional environments. The rapid development of digital technology has brought significant changes to educational practices, particularly in the way learning materials are delivered and how learners interact (Miarso, 2004; Smaldino et al., 2019). Digital learning environments now emphasize flexibility, interactivity, and learner-centered approaches, enabling students to actively engage in the learning process (Heinich et al., 2002). In this context, e-modules have emerged as one of the most widely developed forms of digital learning media due to their ability to integrate various multimedia elements such as text, images, audio, video, and interactive features (Amini & Usmeldi, 2022; Asfiya et al., 2024).

Over the past five years (2020-2024), research on e-module development has increased significantly, driven by the growing demand for flexible and technology-based learning solutions. Numerous studies have examined the effectiveness of e-modules, the integration of pedagogical approaches such as Problem-Based Learning, STEM, SETS,

Vol. 13 No. 2 : April 2026
E-ISSN: 2722-4627
pp. 835-845

Discovery Learning, and Guided Inquiry, as well as their impact on critical thinking skills, learning outcomes, and 21st-century competencies (Hardeli et al., 2023; Sulistyana et al., 2023; Pitorini et al., 2024; Asrizal et al., 2024; Pertiwi et al., 2024; Yuliatun et al., 2024)

However, despite the abundance of studies, existing research remains fragmented and lacks a structured synthesis that systematically maps research trends, methodological patterns, and technological developments (Snyder, 2019). In particular, there is still limited comprehensive analysis that highlights future innovation directions, especially in the integration of advanced technologies such as artificial intelligence (AI) and immersive media, including augmented reality (AR) and virtual reality (VR). This gap indicates the need for a systematic review that not only synthesizes existing findings but also provides clear directions for future research and development.

From a theoretical perspective, the development of e-modules is grounded in several key frameworks, including constructivism theory, multimedia learning theory, and instructional media theory. Constructivism emphasizes that learners actively construct knowledge through interaction and exploration (Piaget, 1973; Vygotskij & Cole, 1978), while multimedia learning theory highlights the importance of integrating visual and verbal elements to enhance understanding (Mayer, 2009). Instructional media theory further explains how digital technologies can be effectively designed to support meaningful learning experiences (Heinich et al., 2002; Smaldino et al., 2019). These perspectives provide a foundation for understanding how e-modules can be developed as effective and interactive learning media.

Therefore, this study aims to provide a systematic and comprehensive analysis of e-module development from 2020 to 2024 using the PRISMA 2020 protocol (Page et al., 2021) Specifically, this study identifies trends in research and development models, examines the pedagogical approaches applied in e-module design, and analyzes the digital media and platforms used to support interactive learning. Furthermore, this review contributes to the existing literature by offering a structured synthesis of current research and highlighting future innovation directions, particularly in the integration of artificial intelligence and immersive media.

Research Method

This study employs a Systematic Literature Review (SLR) approach based on the PRISMA 2020 guidelines (Page et al., 2021) to ensure that the processes of identifying, selecting, evaluating, and synthesizing the literature are conducted systematically and transparently (Snyder, 2019). The search was carried out through the Scopus database using keywords that reflect the focus of the research, namely interactive digital learning media in the context of Problem-Based Learning. The search was refined using filters for the years 2020–2024, journal article document types, and strengthened with queries such as: TITLE-ABS-KEY “e-modul” OR “electronic modul” AND PUBYEAR > 2019. The retrieved articles were then verified by examining their titles, abstracts, and full texts to ensure relevance to e-modules.

The articles obtained from the initial search were screened using predefined inclusion and exclusion criteria to ensure their relevance to the focus of this review on e-modules as digital learning media. At this stage, studies were selected based on their alignment with the research objectives, particularly those examining the role, function, effectiveness, or implementation of e-modules in learning contexts. Detailed inclusion and exclusion criteria are presented in Table 1.

Jurnal Paedagogy:
Jurnal Penelitian dan Pengembangan Pendidikan
https://e-journal.undikma.ac.id/index.php/pedagogy/index
Email:paedagogy@undikma.ac.id

Vol. 13 No. 2 : April 2026
E-ISSN: 2722-4627
pp. 835-845

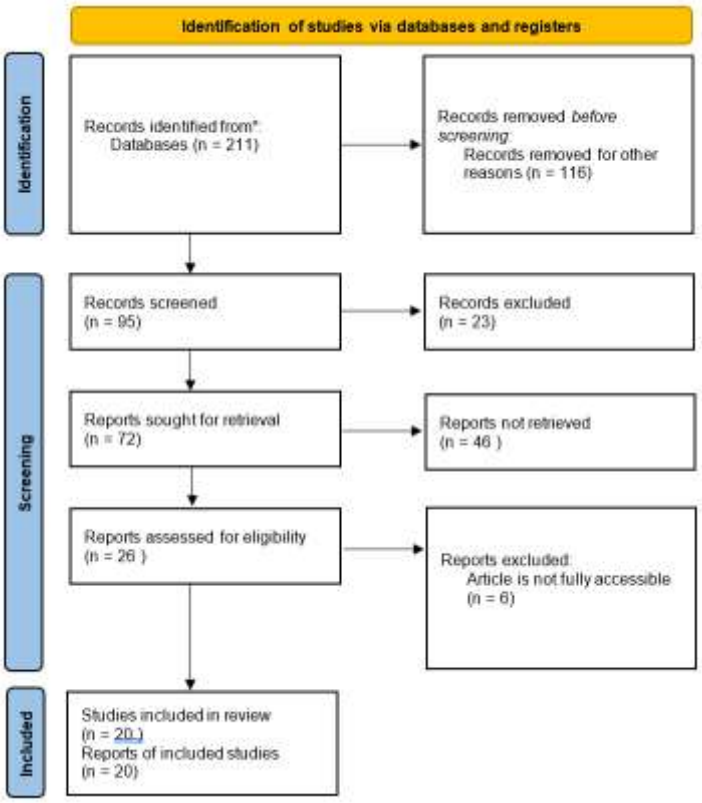

Figure 1. PRISMA

Figure 1. The article selection process was conducted through four stages following the PRISMA Flow: (1) Identification, 211 articles were retrieved from Scopus using the keyword "e-module" for the years 2020-2024; (2) Screening, No duplicate records were found or removed at this stage; (3) Eligibility, After filtering based on titles that directly discussed e-modules, 26 articles remained; and (4) Included, After examining the full content, 20 articles met the inclusion criteria and were included in this.

Table 1. Inclusion and Exclusion Criteria

Category	Inclusion Criteria	Exclusion Criteria
Core Topic	Studies that explicitly discuss e-modules as digital learning media	Studies discussing other digital technologies without focusing on e-modules (e.g., e-books, videos, LMS, general applications).
Implementation	Articles examining the function, role, effectiveness, or implementation of e-modules in the learning process	Articles that only describe e-module theory without analyzing its role, effectiveness, or implementation
Research Type	Experimental, R&D, quasi-experimental, descriptive, mixed methods, qualitative, systematic review, or development design studies	Opinion papers, editorials, blogs, non peer-reviewed proceedings, or non-scientific reports
Language and Access	Articles written in English and accessible for data analysis	Articles written in languages other than English that limit comparison and data synthesis
Publication Range	Publications within the specified range of 2020 to 2024	Publications outside the specified range of 2020 to 2024
Article Accessibility	Articles available in full-text and downloadable or fully accessible	Articles available only as abstracts or not accessible in full-text

Jurnal Paedagogy:
Jurnal Penelitian dan Pengembangan Pendidikan
https://e-journal.undikma.ac.id/index.php/pedagogy/index
Email:paedagogy@undikma.ac.id

Vol. 13 No. 2 : April 2026
E-ISSN: 2722-4627
pp. 835-845

Following the selection process, data extraction was conducted systematically from the selected articles. The extracted variables included authors, publication year, research type, development model, pedagogical approach, learning outcomes, and the digital media and technologies used.

The extracted data were then analyzed using a qualitative content analysis approach to identify patterns, trends, and relationships across the studies. The findings were further organized through thematic synthesis, enabling the classification of results into key themes such as research models, pedagogical strategies, and technological innovations in e-module development.

Results and Discussion

The findings of this study are structured around three research questions that guided the synthesis of 20 selected articles regarding trends in e-module development within the learning context. Based on the evidence gathered, the first section of the findings presents a descriptive overview of the research and development (R&D) trends that dominated e-module literature during the 2020-2024 period.

The second section summarizes the patterns of digital media and platform utilization that support e-module interactivity and accessibility. The final section identifies the impact of e-module implementation on higher-order thinking skills, student learning outcomes, and 21st-century competencies. Overall, these findings address the research questions concerning the evolution of e-module instructional design practices and the resulting pedagogical impacts across various educational levels.

Table 2. Type of Research

Type of Research	Frequency	Authors
R&D: ADDIE	6	Rasyid et al. (2024); Yoda et al. (2024); Astuti et al. (2022); Setyani et al. (2022); Asmianto (2022); Febriyana et al. (2022)
R&D: 4D	6	Azkia et al. (2024); Pertiwi et al. (2024); Yuliatun et al. (2024); Sulistyana et al. (2023); Dewi et al. (2023); Amini et al. (2022)
R&D: Plomp	2	Asfiya et al. (2024); Damrah et al. (2024)
Quasi-experimental	4	Pitorini et al. (2024); Asrizal et al. (2024); Desnita et al. (2022); Dewi et al. (2022)
Pre-experimental	2	Alyusfitri et al. (2024); Hardeli et al. (2023)

Table 2 the most dominant research types are Research and Development (R&D) models, particularly ADDIE and 4D. The dominance of these models indicates a continued reliance on structured instructional design frameworks in e-module development. While these models remain relevant due to their systematic and procedural nature, their widespread use also suggests limited methodological innovation.

Compared to global trends, where adaptive, iterative, and data-driven design approaches are increasingly adopted, the findings indicate that e-module development remains largely procedural rather than dynamic. This suggests that future research should explore more flexible development frameworks that can accommodate rapid technological changes and user-centered design principles. Table 3 will explain the pedagogical approaches and their outcomes. Table 3 will explain the pedagogical approaches and their outcomes.

Jurnal Paedagogy:
Jurnal Penelitian dan Pengembangan Pendidikan
https://e-journal.undikma.ac.id/index.php/pedagogy/index
Email:paedagogy@undikma.ac.id

Vol. 13 No. 2 : April 2026
E-ISSN: 2722-4627
pp. 835-845

Table 3. Pedagogical Approaches and Their Results

Approach	Purpose	Findings	Authors
Problem-Based Learning	To examine the effectiveness of a Problem-Based Learning (PBL) based e-module combined with Socratic Dialogue on environmental change material in improving high school students' critical thinking skills.	Students who used the e-module showed greater improvement in critical thinking skills after the learning process compared to those who did not use the e-module. Thus, the PBL-based e-module combined with Socratic Dialogue is proven effective in enhancing students' critical thinking skills.	Pitorini et al. (2024)
STEM Problem-Based Contextual Learning	E-module to improve students' thinking skills in thermochemistry learning material.	Critical thinking skills assessed using the e-module were higher compared to conventional media, showing that the e-module is effective in improving students' critical thinking skills.	Pertiwi et al. (2024)
STEM	To investigate the effect of using a STEM-Smart Physics E-Module on students' understanding of physics concepts and analyze its impact on 4C skills.	The STEM e-module increased learning activity, motivation, interactivity, and 21st-century skills. Critical thinking showed the most dominant improvement. The module is suitable as an interactive, smartphone-based physics learning solution.	Asrizal et al. (2024)
SETS	To develop an Android-based science e-module using the Science, Environment, Technology, and Society (SETS) approach for teaching Earth structure and dynamics.	The Android-based science e-module developed with the SETS approach for Earth structure and dynamics material is feasible for use in learning.	Yuliatun et al. (2024)
Discovery Learning	To analyze the effectiveness of a discovery-based e-module integrated with probing–prompting questions on basic chemical laws and voltaic cell material for high school learning.	Student learning outcomes improved after the implementation of the e-module. Therefore, the discovery-based e-module integrated with probing questions is effective in improving learning outcomes in chemistry.	Hardeli et al. (2023)
Guided Inquiry	To determine the feasibility and effectiveness of the Guided Inquiry based e-module (Mosiry) in improving integrated science process skills (SPS) of grade XI students in the Immune System topic.	The findings show that the Mosiry e-module is feasible for use as a learning medium for the Immune System topic and can moderately improve students' integrated SPS.	Sulistyana et al. (2023)

Table 3 shows that e-modules are widely integrated with active learning approaches such as Problem-Based Learning, STEM, SETS, Discovery Learning, and Guided Inquiry. These approaches consistently demonstrate positive impacts on higher-order thinking skills, learning outcomes, and 21st-century competencies.

Jurnal Paedagogy:
Jurnal Penelitian dan Pengembangan Pendidikan
https://e-journal.undikma.ac.id/index.php/pedagogy/index
Email:paedagogy@undikma.ac.id

Vol. 13 No. 2 : April 2026
E-ISSN: 2722-4627
pp. 835-845

This trend confirms the continued relevance of constructivist principles, where learners actively construct knowledge through interaction and problem-solving activities. However, in the context of mobile-based e-modules, new challenges emerge. Learners often engage with digital content in multitasking environments, which may reduce sustained cognitive engagement and limit deep learning.

In contrast, global developments in digital learning have begun to emphasize adaptive and personalized learning systems that respond to individual learner needs. Therefore, while current e-modules successfully integrate active pedagogies, future development should move toward more intelligent, responsive, and personalized learning experiences. Table 4 will describe the media and interactive multimedia components. Table 4 will describe the media and interactive multimedia components.

Table 4. Interactive Multimedia Media and Components

Category	Media/ Software	Interactive Multimedia Components	Access	Authors
Mobile Platform	Android	Text, images, animations, audio, video, interactive navigation, Augmented Reality (AR) displaying 3D objects such as a pedicab.	Online & offline via smartphone or laptop	Astuti et al. (2022); Febriyana et al. (2022); Dewi et al. (2022); Asmianto et al. (2022); Dewi & Kuswanto (2023); Asrizal et al. (2024); Yuliatun et al. (2024)
	Mobile Learning	Text, animations, video, audio, hyperlinks	Main content accessible offline; videos require internet connection; via smartphone or laptop	Asrizal et al. (2024)
Flipbook Creators	Flipbook	Text, images, video, audio, and interactive links	Online & offline via smartphone or laptop	Pitorini et al. (2024)
	Flipcreator	Text, images, animations, and video	Online via smartphone or laptop	Rasyid et al. (2024)
	Anyflip	Text, animations, video	Online via smartphone or laptop	Sulistyana et al. (2023)
	Kvisoft Flipbook	Text, images, animations, music, and video	Online via smartphone or laptop; offline via .exe or .swf file	Setiyani et al. (2022)
	Flip PDF Professional/PDF	Text, images, navigation, hyperlinks, images, animations, and video	Main content accessible offline; videos and external links require internet; via smartphone or laptop	Asfiya et al. (2024); Damrah et al. (2024)

Jurnal Paedagogy:
Jurnal Penelitian dan Pengembangan Pendidikan
https://e-journal.undikma.ac.id/index.php/pedagogy/index
Email:paedagogy@undikma.ac.id

Vol. 13 No. 2 : April 2026
E-ISSN: 2722-4627
pp. 835-845

	Canva	Video, audio, images, and interactive quizzes	Online via smartphone or laptop	Yoda et al. (2024); Barvirman et al. (2023); Hardeli et al. (2023)
Multimedia Tools	Interactive multimedia	Text, images, animations, audio, and video	After download, the e-module can be accessed offline via smartphone or laptop	Alyusfitri et al. (2024)
Authoring Tools	Lectora Inspire 17	Text, images, graphics, sound, video, and animations	Online and offline; can be stored on flash drives or portable devices	Desnita et al. (2022)
	Adobe Flash CS6	Text, images, video	After download, accessible offline via smartphone or laptop	Amini et al. (2022)
Web-based Tools	Web, Google Sites, integrated with PhET Colorado (virtual experiment)	Text, video, images, and animations	Online via smartphone or laptop	Pertiwi et al. (2024)

Table 4 mobile platforms (especially Android) and flipbook-based tools are the most widely used technologies in e-module development. Their popularity is largely driven by accessibility, flexibility, and their ability to integrate various multimedia elements such as text, images, audio, video, and interactive features. Despite these advantages, the increasing integration of multimedia components also introduces potential challenges. From a multimedia learning perspective, excessive or unstructured use of multiple media formats may lead to cognitive overload, particularly when learners access content through mobile devices with limited attention spans.

Furthermore, when compared to global trends, the integration of advanced technologies such as artificial intelligence, learning analytics, and immersive media (e.g., AR/VR) remains limited. This indicates that current e-modules, while technologically rich, have not yet fully leveraged emerging innovations that can enhance personalization, interactivity, and immersive learning experiences..

Discussion

The findings of this systematic literature review reveal that e-module development between 2020 and 2024 is heavily dominated by Research and Development (R&D) methodologies, specifically the ADDIE and 4D models. These models provide a structured framework that ensures the production of high-quality instructional materials. This trend reinforces instructional design theories which emphasize that effective learning media must undergo rigorous needs analysis, systematic design, and iterative evaluation (Heinich et al., 2002; Smaldino et al., 2019). Furthermore, the prevalence of R&D approaches aligns with previous studies by Amini & Usmeldi (2022), suggesting that systematic development is crucial for ensuring the validity and practicality of digital learning tools.

Beyond development-focused studies, the presence of quasi-experimental and pre-experimental designs indicates a shift from merely creating products toward evaluating the effectiveness of e-module implementation. The studies analyzed demonstrate that e-modules significantly enhance learning outcomes, critical thinking skills, and 21st-century

Vol. 13 No. 2 : April 2026
E-ISSN: 2722-4627
pp. 835-845

competencies. These outcomes reinforce the findings of Pitorini et al. (2024) and Hardeli et al. (2023), which show that e-modules designed with appropriate pedagogical frameworks can produce substantial improvements in learning quality. Theoretically, this is in line with Mayer's (2009) view that digital learning designed with multimedia principles strengthens comprehension and information retention.

From a pedagogical perspective, the integration of Problem-Based Learning (PBL), STEM, SETS, and Discovery Learning within e-modules represents a deliberate effort to foster active learning environments. These approaches are deeply rooted in constructivist paradigms, asserting that knowledge is not merely transmitted but actively constructed by learners through social interaction and problem-solving (Piaget, 1973; Vygotsky & Cole, 1978).

In the context of pedagogy, the e-module acts as a scaffolding tool that guides students through complex cognitive tasks. Studies by Asrizal et al. (2024) and Pertiwi et al. (2024) demonstrate that when STEM is embedded into e-modules, it does not only deliver content but also trains the 4C skills (Critical Thinking, Collaboration, Creativity, and Communication), which are the core pillars of modern pedagogical goals.

From a technological and instructional perspective, the dominance of the Android platform and flipbook media (Kvisoft, AnyFlip, Flip PDF) highlights a trend toward ubiquitous learning. This pedagogical shift allows students to engage with material outside the traditional classroom, supporting self-regulated learning (SRL). According to Ally (2009), the portability of Android-based modules empowers learners to take control of their learning pace. Furthermore, the use of interactive simulations and videos supports the Cognitive Theory of Multimedia Learning, which reduces extraneous cognitive load and enhances the germane load necessary for deep learning (Mayer, 2009).

Compared to previous reviews, this study reveals that effective digital learning media are no longer viewed as isolated technological tools. As stated by Snyder (2019), the success of digital intervention lies in the seamless integration of pedagogy and instructional design. This review demonstrates that current trends are moving toward a "Pedagogy-First" approach, where digital features are selected based on their ability to facilitate specific learning models like Inquiry or PBL, rather than just for technological novelty.

Nevertheless, this review identifies several limitations. Most studies were conducted on a small scale, which limits the generalizability of the pedagogical impact. Furthermore, the potential of immersive technologies like Augmented Reality (AR) and Artificial Intelligence (AI) to provide personalized learning pathways remains under-explored in the current e-module landscape (Page et al., 2021).

Based on the synthesis of these 20 articles, several questions remain unanswered. Specifically, there is limited evidence on how e-modules can fully leverage adaptive and personalized learning pathways through Artificial Intelligence (AI), immersive technologies such as Augmented Reality (AR) and Virtual Reality (VR), and gamification to enhance engagement and learning outcomes. Additionally, the long-term impact of e-modules on learner motivation, self-regulated learning, and knowledge retention remains under-explored. Future research should also investigate scalable implementation strategies and the effectiveness of e-modules across diverse educational contexts and learner populations.

Vol. 13 No. 2 : April 2026
E-ISSN: 2722-4627
pp. 835-845

Conclusion

The development of e-modules in recent years has been dominated by R&D approaches, particularly the ADDIE and 4D models, which are considered the most suitable for producing systematic and well-tested digital learning products. From a pedagogical perspective, e-modules developed through Problem-Based Learning, STEM, SETS, Discovery Learning, and Guided Inquiry have been proven effective in improving critical thinking skills, learning outcomes, and 21st-century competencies.

From a technological standpoint, Android and various flipbook platforms are the most frequently used media due to their flexible access and extensive support for interactive multimedia. Several e-modules have already reached a level of technological integration capable of transforming learning through problem-solving activities and interactive exploration. Overall, the findings of this SLR affirm that e-modules hold a strategic role in supporting the transformation of digital learning. Future development should focus on the integration of more advanced technologies, collaborative features, and long-term evaluation to ensure that e-modules can provide maximum contributions to educational innovation and quality in the digital era.

Recommendation

Based on the results of this study, it is recommended that educators, curriculum developers, and education policymakers encourage the systematic development and implementation of pedagogically grounded e-modules in learning practices. Teachers should be supported through professional development programs that strengthen their ability to design and utilize e-modules aligned with constructivist learning principles and multimedia learning theory. In classroom practice, e-modules should be used to facilitate active learning, critical thinking, collaboration, and independent learning through problem-based, inquiry-based, and STEM-oriented approaches. Furthermore, future research is encouraged to integrate advanced technologies such as augmented reality, gamification, and artificial intelligence to enhance interactivity and personalization, while also addressing challenges related to digital access, infrastructure, and teachers' technological competencies.

References

Ally, M. (2009). Mobile learning: Transforming the delivery of education and training. Athabasca University Press.

Alyusfitri, R., Gistituati, N., Yerizon, Y., Fauzan, A., & Yarman, Y. (2024). The effectiveness and relationship of student responses toward learning outcomes using interactive multimedia-based e-modules in elementary schools. International Electronic *Journal of Elementary Education*. 6 (5), 573-584. https://doi.org/10.26822/iejee.2024.354

Amini, R., & Usmeldi, U. (2022). Developing the interactive e-module based on integrated learning for primary school students. *International Journal of Information and Education Technology*. 12 (4), 272-279. https://doi.org/10.18178/ijiet.2022.12.4.1615

Asfiya, N., Razi, P., Hidayati, H., & Sari, S. Y. (2024). Development of e-module for independent learning of physics material based on independent curriculum. *International Journal of Information and Education Technology*. 14,(5) 761-769. https://doi.org/10.18178/ijiet.2024.14.5.2100

Vol. 13 No. 2 : April 2026
E-ISSN: 2722-4627
pp. 835-845

Asmianto, A., Hafiizh, M., Rahmadani, D., Pusawidjayanti, K., & Wahyuningsih, S. (2022). Developing Android-based interactive e-modules on trigonometry to enhance the learning motivation of students. *International Journal of Interactive Mobile Technologies*. 16 (02), hlm. 159–170. https://doi.org/10.3991/ijim.v16i02.27503

Asrizal, A., Nazifah, N., Effendi, H., & Helma. (2024). STEM-smart physics e-module to promote conceptual understanding and 4C skills of students. *International Journal of Information and Education Technology*. 14 (2), 279-286. https://doi.org/10.18178/ijiet.2024.14.2.2049

Astuti, C. C., Wiguna, A., Latifa, F. N., & Olvyya, A. (2022). Development of Android-based "Mbaregi" statistics e-module as an innovation for statistics learning media with hybrid learning. *Barekeng*. 16 (2), 515-524. https://doi.org/10.30598/barekengvol16iss2pp515-524

Azkiya, H., Ws, H., & Hayati, Y. (2024). E-module based on multicultural values: Development strategy for Islamic primary education. Munaddhomah : : *Jurnal Manajemen Pendidikan Islam*. 5 (4), 421–434. https://doi.org/10.31538/munaddhomah.v5i4.1511

Damrah, Rasyid, W., Pitnawati, Komaini, A., Mario, D. T., & Zulbahri. (2024). Digital-based e-module in tennis learning for undergraduate students in sports education. *Sport Mont*, 22(1), 43–51. https://doi.org/10.26773/smj.240207

Desnita, D., Festiyed, F., Novitra, F., Ardiva, A., & Navis, M. Y. (2022). The effectiveness of CTL-based physics e-module on the improvement of the creative and critical thinking skills of senior high school students. *TEM Journal*. 11 (2) 802-810. https://doi.org/10.18421/TEM112-38

Dewi, C. A., Awaliyah, N., Fitriana, N., Darmayani, S., Nasrullah, N., Setiawan, J., & Irwanto, I. (2022). Using Android-based e-module to improve students' digital literacy on chemical bonding. *International Journal of Interactive Mobile Technologies*. 16 (22), 191–208. https://doi.org/10.3991/ijim.v16i22.34151

Dewi, P. S., & Kuswanto, H. (2023). The effectiveness of the use of augmented reality-assisted physics e-module based on PEDICAB to improve mathematical communication and critical thinking abilities. *Journal of Technology and Science Education*. 13 (1) , 53-64. https://doi.org/10.3926/jotse.1714

Febriyana, M., Azizah, A., Rahman, A., Auliya, A. R., & Sitepu, M. S. (2022). Pengembangan E-Modul Dilan berbasis Android (Didroid) pada materi panas bagi siswa sekolah dasar. Munaddhomah: *Jurnal Manajemen Pendidikan Islam*. 3 (4), 378–387. https://doi.org/10.31538/munaddhomah.v3i4.305

Hardeli, L., Hafifah, H., Yusmaita, E., & Yerimadesi, N. (2023). The effectiveness of e-modules based on discovery learning model integrated by probing-prompting questions in high school chemistry learning. *Kasetsart Journal of Social Sciences*. 44 (4), 1109-1114. https://doi.org/10.34044/j.kjss.2023.44.4.15

Heinich, R., Molenda, M., Russell, J. D., & Smaldino, S. E. (2002). Instructional Media and Technologies for Learning (7th ed.). Englewood Cliffs, NJ: Prentice-Hall.

Mayer, R. E. (2009). Multimedia Learning (2nd ed.). Cambridge University Press.

Miarso, Yusufhadi. (2004). Menyemai Benih Teknologi Pendidikan. Jakarta: Kencana.

Page, M. J., McKenzie, J. E., Bossuyt, P. M., Boutron, I., Hoffmann, T. C., Mulrow, C. D., & Moher, D. (2021). The PRISMA 2020 statement: An updated guideline for reporting systematic reviews. BMJ, 372, n71. https://doi.org/10.1136/bmj.n71

Pertiwi, N. P., Saputro, S., Yamtinah, S., & Kamari, A. B. (2024). Enhancing critical thinking skills through STEM problem-based contextual learning: An integrated e-module education website with virtual experiments. *Journal of Baltic Science Education*. 23, 739-766. https://doi.org/10.33225/jbse/24.23.739

Piaget, J. (1973). To understand is to invent: The future of education. Grossman.

Pitorini, D. E., Suciati, & Harlita. (2024). Students' critical thinking skills using an e-module based on problem-based learning combined with Socratic dialogue. *Journal of Learning for Development*. 11 (1), 52–65. https://doi.org/10.56059/jl4d.v11i1.1014

Rasyid, R., Agustang, A., Aryuni, V. T., Maru, R., Mufiana, I., & Soamole, H. (2024). Validity of environmental education e-module based on education for sustainable development using Flipcreator platform to develop environmental awareness in geography education students at Khairun University. *Journal of Applied Science, Engineering, Technology, and Education*. 6 (2), 105-117. https://doi.org/10.35877/454RI.asci3093

Setiyani, S., Waluya, S. B., Sukestiyarno, Y. L., & Cahyono, A. N. (2022). E-module design using Kvisoft Flipbook application based on mathematics creative thinking ability for junior high schools. *International Journal of Interactive Mobile Technologies*. 16 (04), hlm. 116–136. https://doi.org/10.3991/ijim.v16i04.25329

Smaldino, S. E., Lowther, D. L., & Russell, J. D. (2019). Instructional Technology and Media for Learning (12th ed.). Boston: Pearson Education.

Snyder, H. (2019). Literature review as a research methodology: An overview and guidelines. *Journal of Business Research*, 104, 333–339. https://doi.org/10.1016/j.jbusres.2019.07.039

Sulistyana, Y., Indrowati, M., & Ariyanto, J. (2023). Effectiveness of guided inquiry-based MOSIRY e-module on the immune system in improving students' integrated science process skills (SPS). *Journal of Learning for Development*. 10 (2), 267–279. https://doi.org/10.56059/jl4d.v10i2.800

Vygotsky, L. S & Cole, M. (1978). Mind in society: The development of higher psychological processes. Harvard University Pres.

Yoda, I. K., Kasih, I., & Ilra, T. (2024). Developing an e-module to improve the seventh-grade student's bump pass skills in volleyball. *Journal of Education and e-Learning Research*. 11 (1), 17–25. https://doi.org/10.20448/jeelr.v11i1.5286

Yuliatun, T., Putranta, H. P., & Uskenat, K. (2024). Development of natural sciences e-modules based on Android with a science, environment, technology, and society approach in the earth structure chapter. *Revista Mexicana de Física E*. 21 (1),1-9. https://doi.org/10.31349/RevMexFisE.21.010213