

DEVELOPMENT OF INTERACTIVE TEACHING MODULES BASED ON DIFFERENTIATED LEARNING TO SUPPORT THE IMPLEMENTATION OF THE MERDEKA CURRICULUM IN THE ERA OF DIGITAL KNOWLEDGE REVOLUTION

Siti Halimatus Sa'adah¹, Eva Dewi²

Pascasarjana Universitas Islam Negeri Suska Riau, Indonesia^{1,2}

e-mail: halimatussaadahsiti@gmail.com

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ABSTRAK

Ketersediaan sumber belajar digital yang mampu mengakomodasi perbedaan kesiapan, minat, dan profil belajar peserta didik masih menjadi tantangan dalam penerapan pembelajaran berdiferensiasi pada Kurikulum Merdeka. Kondisi tersebut menunjukkan perlunya bahan ajar yang tidak hanya memanfaatkan teknologi, tetapi juga menyediakan pengalaman belajar yang fleksibel sesuai karakteristik peserta didik. Penelitian ini bertujuan mengembangkan modul ajar interaktif berbasis pembelajaran berdiferensiasi serta menguji kelayakan, kepraktisan, dan efektivitas penggunaannya dalam pembelajaran. Penelitian menggunakan metode *Research and Development* (R&D) dengan model ADDIE yang meliputi *Analysis*, *Design*, *Development*, *Implementation*, dan *Evaluation*. Penelitian dilaksanakan di SMAN 1 Lubuk Batu Jaya pada tahun ajaran 2025/2026 dengan melibatkan 63 peserta didik kelas XI. Data diperoleh melalui wawancara, observasi, dokumentasi, angket validasi dan respons pengguna, serta tes hasil belajar. Hasil validasi menunjukkan tingkat kelayakan sebesar 89,52% dari ahli materi dan 93,30% dari ahli media. Penilaian guru dan peserta didik masing-masing mencapai 93,89% dan 93,78%. Efektivitas ditunjukkan oleh peningkatan rata-rata nilai dari 59,04 pada *pretest* menjadi 87,96 pada *posttest*, dengan nilai *N-Gain* sebesar 0,711 (71,1%) dalam kategori tinggi. Dengan demikian, modul yang dikembangkan layak, praktis, dan efektif digunakan sebagai sumber belajar untuk mendukung pembelajaran berdiferensiasi serta implementasi Kurikulum Merdeka.

Kata Kunci: *ADDIE, Modul Ajar Interaktif, Pembelajaran Berdiferensiasi, Pembelajaran Digital, Kurikulum Merdeka*

ABSTRACT

The availability of digital learning resources capable of accommodating differences in students' readiness, interests, and learning profiles remains a challenge in implementing differentiated learning within the Merdeka Curriculum. This condition highlights the need for learning materials that not only utilize technology but also provide flexible learning experiences according to students' characteristics. This study aimed to develop an interactive teaching module based on differentiated learning and to examine its feasibility, practicality, and effectiveness in the learning process. The study employed a *Research and Development* (R&D) method using the ADDIE model, consisting of *Analysis*, *Design*, *Development*, *Implementation*, and *Evaluation*. The research was conducted at SMAN 1 Lubuk Batu Jaya during the 2025/2026 academic year and involved 63 eleventh-grade students. Data were collected through interviews, observations, documentation, validation and user-response questionnaires, and learning achievement tests. The validation results indicated feasibility scores of 89.52% from the material experts and 93.30% from the media experts. Teacher and student assessments

reached 93.89% and 93.78%, respectively. Effectiveness was demonstrated by an increase in the average score from 59.04 on the *pretest* to 87.96 on the *posttest*, with an *N-Gain* score of 0.711 (71.1%), categorized as high. Therefore, the developed module is feasible, practical, and effective as a learning resource to support differentiated learning and the implementation of the Merdeka Curriculum.

Keywords: *ADDIE, Interactive Teaching Module, Differentiated Learning, Digital Learning, Independent Curriculum*

INTRODUCTION

Education in the contemporary digital era is increasingly required to respond to differences in students' characteristics, learning readiness, interests, and educational needs. The transformation of learning environments has shifted attention from uniform instruction toward learning practices that provide students with opportunities to engage with content and activities according to their individual conditions. This direction is particularly relevant to the implementation of the Merdeka Curriculum, which encourages learning that is more flexible, student-centered, and responsive to learner diversity. Cholilah et al. (2023) explain that the implementation of the Merdeka Curriculum in twenty-first-century learning requires educational practices that are adaptive to changes in students' needs and developments in the learning environment.

One approach that directly responds to student diversity is differentiated learning. Differentiated learning provides opportunities for teachers to modify learning content, processes, and learning products according to differences in students' readiness, interests, and learning characteristics. Trisnani et al. (2024) describe differentiated learning as an important component in the implementation of the Merdeka Curriculum because it enables learning experiences to be adjusted to student diversity. This approach is also relevant to the challenges of classroom implementation because Sitorus (2025) identifies various opportunities as well as practical challenges in implementing differentiated learning, particularly in adapting instructional practices to the diverse conditions of students. Qorib (2024) further emphasizes the relevance of differentiated instruction as an approach for responding to student diversity in inclusive and moderate educational contexts.

The implementation of differentiated learning, however, requires learning resources that can translate its principles into concrete classroom activities. Teachers cannot rely solely on uniform instructional materials when students have different levels of readiness, interests, and learning characteristics. Avivi et al. (2023) demonstrate that differentiated learning can be integrated into classroom instruction through learning models and activities designed to respond to students' characteristics, while Ermawan and Ps (2024) highlight the relevance of interactive digital teaching modules in supporting the implementation of the Merdeka Curriculum. These findings indicate that the success of differentiated learning is not only determined by the instructional approach but also by the availability of learning resources that are sufficiently flexible to support its implementation.

Digital learning resources provide an opportunity to address this requirement because they can combine textual material with multimedia, interactive activities, assessment, and flexible access. Usmeldi et al. (2023) demonstrate the relevance of interactive *e-modules* based on information technology for developing digital learning competencies, while Ermawan and Ps (2024) report the potential of interactive digital teaching modules in the context of the Merdeka Curriculum. Nuraini and Kusaeri (2025), through a systematic literature review, further highlight the relationship between digital learning media, differentiated learning, and

student motivation. These studies strengthen the argument that digital resources can become an important component of differentiated learning, although their educational value depends on how effectively the technology is designed around pedagogical needs rather than being used merely as a digital replacement for conventional materials.

Recent developments also show the potential for combining interactive digital modules with differentiated instruction. Ramdhani et al. (2025) developed interactive *e-modules* based on differentiated instruction and the theory of didactical situations, demonstrating the possibility of embedding differentiated principles within a structured digital learning resource. Heng (2025) likewise discusses the use of technology-enhanced differentiated instruction to support learning, indicating that digital technology can strengthen opportunities for flexible learning when appropriately integrated with instructional strategies. Mirari (2022) adds that adaptive learning systems have potential in personalized education because learning experiences can be adjusted to individual learner conditions. Collectively, these studies indicate a growing connection between digital technology, differentiated instruction, and personalized learning, but they also point to the need for learning products that are specifically designed for the practical requirements of the Merdeka Curriculum and the conditions of Indonesian secondary education.

The need for such development is particularly evident in the context of SMAN 1 Lubuk Batu Jaya. Preliminary observations at the school indicated that students showed differences in learning readiness, interests, and learning profiles, while teachers experienced difficulties in providing learning resources that could accommodate these differences in a practical manner. Although digital technology was available, its utilization as an integrated learning resource for differentiated instruction remained limited, and learning materials were still predominantly delivered through conventional approaches. This condition creates a gap between the expectation of the Merdeka Curriculum for learning that responds to student diversity and the availability of practical digital resources that can help teachers implement differentiated learning. Therefore, the development of an interactive module needs to move beyond presenting digital content and instead provide learning pathways, activities, assessments, and reflection opportunities that are intentionally connected to differentiated learning principles.

Based on this gap, the present study develops an interactive teaching module based on differentiated learning to support the implementation of the Merdeka Curriculum in the digital knowledge revolution era. The novelty of the study lies in integrating differentiated learning principles into an interactive digital module through flexible learning pathways, multimedia content, interactive activities, formative assessment, and self-reflection features within one learning resource designed for secondary education. The product is intended not only to improve the accessibility and attractiveness of learning materials but also to provide a practical means for teachers to accommodate differences in student readiness, interests, and learning profiles. Accordingly, this study aims to develop an interactive teaching module based on differentiated learning and examine its feasibility, practicality, and effectiveness in supporting learning among eleventh-grade students at SMAN 1 Lubuk Batu Jaya.

RESEARCH METHOD

This study employed a *Research and Development* (R&D) approach to develop and evaluate an interactive teaching module based on differentiated learning. The development procedure adopted the ADDIE model, consisting of *Analysis*, *Design*, *Development*, *Implementation*, and *Evaluation*. The research was conducted at SMAN 1 Lubuk Batu Jaya during the 2025/2026 academic year, with the implementation and effectiveness test involving

63 eleventh-grade students. The *Analysis* stage identified students' diverse learning readiness, interests, and learning profiles, as well as teachers' needs for learning resources that could facilitate differentiated learning. Data at this stage were obtained through teacher interviews, classroom observations, and document analysis. The *Design* stage involved formulating learning objectives, organizing content, designing differentiated activities, preparing assessment instruments, establishing module navigation, and determining multimedia components. The *Development* stage transformed the design into an interactive digital module containing learning materials, videos, illustrations, interactive exercises, formative assessments, and self-reflection activities, followed by validation and revision based on expert recommendations.

The revised product was subsequently implemented with 63 eleventh-grade students as the subjects of the effectiveness test. The implementation involved the use of the interactive module in learning activities, observation of student activities, collection of teacher and student responses, and administration of a *pretest* before the learning activities and a *posttest* after the implementation. Data were collected through interviews, observations, documentation, questionnaires, and learning outcome tests. The research instruments comprised interview guidelines, observation sheets, material expert validation sheets, media expert validation sheets, teacher response questionnaires, student response questionnaires, and *pretest-posttest* instruments. The validation and response instruments used a five-point Likert scale ranging from 1 (very poor) to 5 (very good). Material experts assessed content relevance, accuracy, completeness, and curriculum alignment, whereas media experts assessed interface design, functionality, usability, and technical quality. Teacher and student questionnaires were used to obtain responses concerning the use of the developed module, while the learning outcome tests were used to obtain data for the effectiveness assessment.

The collected data were analyzed quantitatively and qualitatively according to the type of data obtained. Validation and practicality data were converted into percentages by comparing the obtained score with the maximum possible score, while qualitative information from interviews and observations was used to describe the development process and product use. The feasibility criteria were classified into four categories: 86–100% as very feasible, 76–85% as feasible, 56–75% as moderately feasible, and $\leq 55\%$ as less feasible, with a minimum product feasibility requirement of 76%. The effectiveness of the module was assessed by comparing students' *pretest* and *posttest* results and calculating the *N-Gain* score to determine the normalized increase in learning outcomes. The resulting *N-Gain* value was interpreted according to the improvement category applied in the study. Evaluation was conducted both formatively throughout the development stages and summatively after implementation, with the results used to determine revisions and the final quality of the interactive teaching module.

RESULTS AND DISCUSSION

Result

Development of the Interactive Teaching Module

The development of the interactive teaching module followed the five stages of the ADDIE model, namely *Analysis*, *Design*, *Development*, *Implementation*, and *Evaluation*. At the *Analysis* stage, information was obtained regarding differences in students' learning readiness, interests, and learning profiles, as well as teachers' needs for learning resources that could support differentiated learning. The *Design* stage resulted in the initial structure of the module, including learning objectives, content organization, differentiated activities, assessment instruments, navigation, and multimedia components. At the *Development* stage,

the designed product was completed by integrating learning materials, videos, illustrations, interactive exercises, formative assessments, and self-reflection activities. The product was subsequently reviewed by material and media experts and revised according to the recommendations obtained during validation. At the *Implementation* stage, the revised module was used by 63 eleventh-grade students at SMAN 1 Lubuk Batu Jaya, followed by the collection of teacher and student responses and the administration of *pretest* and *posttest*. The *Evaluation* stage was conducted throughout the development process and after implementation to determine the final quality of the product.

Feasibility of the Interactive Teaching Module

The feasibility assessment was conducted through evaluations by material experts and media experts after the initial product had been developed. The material assessment covered the suitability and quality of the learning content, whereas the media assessment concerned the presentation and technical characteristics of the interactive module. The percentage scores obtained from both types of expert assessment are presented in Table 1. The material expert assessment resulted in a score of 89.52%, while the media expert assessment reached 93.30% after revisions were made based on the validators' recommendations.

Table 1. Results of Expert Validation of the Interactive Teaching Module

Assessment Component	Percentage	Category
Material expert	89.52%	Very feasible
Media expert	93.30%	Very feasible

Table 1 presents the percentage results obtained from the two expert assessments. The material expert gave a percentage score of 89.52%, while the media expert gave a percentage score of 93.30%. Both scores were classified in the very feasible category according to the criteria used in the study. The media validation score represents the assessment after revisions were conducted based on expert recommendations.

Practicality of the Interactive Teaching Module

The practicality assessment was obtained from teacher and student responses following implementation of the developed module. The teacher questionnaire was used to record the teacher's response to the use of the module in the learning process, while the student questionnaire was administered to record students' responses after using the product. The percentage results for both groups are presented in Table 2. The teacher response obtained a score of 93.89%, whereas the student response obtained a score of 93.78%.

Table 2. Results of Teacher and Student Responses

Respondent	Percentage	Category
Teacher	93.89%	Very practical
Students	93.78%	Very practical

As shown in Table 2, the teacher response percentage was 93.89% and the student response percentage was 93.78%. Both response scores were classified as very practical based on the assessment criteria applied in the study. The data were obtained after the interactive teaching module had been implemented in the learning activities. The assessment covered users' responses to the use of the developed learning resource.

Learning Outcomes Before and After Implementation

The effectiveness test was conducted using a *One-Group Pretest–Posttest* design involving 63 eleventh-grade students at SMAN 1 Lubuk Batu Jaya. Students completed a *pretest* before using the interactive teaching module and a *posttest* after the learning activities using the module had been completed. The descriptive results of the two measurements are presented in Table 3. The mean score increased from 59.04 on the *pretest* to 87.96 on the *posttest*, representing an increase of 28.92 points.

Table 3. Descriptive Results of Students' Learning Outcomes

Measurement	Number of Students	Mean Score	Increase
<i>Pretest</i>	63	59.04	—
<i>Posttest</i>	63	87.96	28.92

Table 3 shows the learning outcome scores obtained before and after the implementation of the module. The mean *pretest* score of the 63 students was 59.04, while the mean *posttest* score was 87.96. The difference between the two mean scores was 28.92 points. These descriptive data represent the change in students' learning scores following the implementation of the developed module.

N-Gain Analysis

Further analysis of the learning outcome data was conducted using the *N-Gain* score to determine the magnitude of the normalized improvement between the *pretest* and *posttest* results. The analysis produced an *N-Gain* value of 0.711, equivalent to 71.1%. Based on the categorization used in the study, the obtained score was classified as high. The results of the *N-Gain* analysis are presented in Table 4.

Table 4. Results of the N-Gain Analysis

Analysis	Value	Category
<i>N-Gain</i>	0.711 (71.1%)	High

Table 4 presents the normalized improvement obtained from the *pretest* and *posttest* scores. The calculated *N-Gain* value was 0.711, or 71.1%. According to the criteria applied in the study, the value was included in the high category. The *N-Gain* result provides the numerical measurement of the increase in learning outcomes obtained during the effectiveness test.

Discussion

The development of the interactive teaching module based on differentiated learning produced a learning resource that met the expected criteria of feasibility, practicality, and effectiveness. The expert assessment resulted in a material feasibility score of 89.52% and a media feasibility score of 93.30%, while teacher and student responses reached 93.89% and 93.78%, respectively. These findings indicate that the developed product was acceptable from the perspectives of content, media presentation, and user experience. The feasibility results are consistent with Jafnihirda et al. (2023), who examined the development of interactive *e-modules* and emphasized the importance of appropriate instructional content and interactive design in producing usable digital learning media. Similar findings were also reported by Sandra et al. (2025), whose development of an interactive module demonstrated the potential of structured digital learning resources to support students' learning processes. Thus, the quality of the

developed module in this study can be viewed from the combined contribution of its instructional content and interactive presentation rather than from the technological component alone.

The high feasibility score obtained from the material assessment suggests that the content embedded in the module was sufficiently aligned with the learning requirements and the intended instructional objectives. The media validation result was also high after revisions were made in accordance with expert recommendations, indicating that the product underwent an improvement process before being implemented with students. This development procedure is important because an interactive module should not only contain learning materials but also present them through a format that enables students to navigate and use the learning resource appropriately. Nisa et al. (2024) demonstrated the development of digital teaching materials as an alternative to conventional learning resources, while Juniati et al. (2023) similarly developed digital teaching materials oriented toward specific learning needs and curricular contexts. The present finding therefore reinforces the view that the development of digital instructional materials requires attention to both instructional suitability and the characteristics of the learning environment in which the product will be used.

The practicality assessment further showed that the module received very positive responses from both teachers and students. The teacher response of 93.89% indicates that the product could be used within the learning process, while the student response of 93.78% reflects a similarly positive assessment from the learners who interacted directly with the module. This finding is particularly relevant because the success of a digital learning resource depends not only on its theoretical or expert-based feasibility but also on whether users can operate and utilize it during actual learning activities. Syah (2025), through an analysis of interactive multimedia use in vocational secondary education, highlights the relevance of interactive multimedia as part of technology-supported learning environments. Hafizah (2023) likewise discusses digital learning media in the context of the Merdeka Curriculum and the learning characteristics of the current generation, providing a relevant basis for understanding the importance of digital resources that are compatible with contemporary learning environments. The positive responses obtained in this study therefore demonstrate that the developed module was not only assessed positively by experts but was also acceptable to its intended users.

The effectiveness test showed an increase in students' mean learning outcomes from 59.04 on the *pretest* to 87.96 on the *posttest*, with an increase of 28.92 points. The resulting *N-Gain* score of 0.711, equivalent to 71.1%, was categorized as high according to the criteria applied in the study. This improvement provides quantitative evidence of the change in learning outcomes following the implementation of the interactive teaching module. Bilantua et al. (2024) reported the relevance of differentiated learning to students' learning outcomes, supporting the argument that instructional practices designed around learner differences can be associated with improved academic results. The present finding extends this perspective by placing differentiated learning within an interactive digital module rather than implementing differentiation solely through conventional classroom activities. Nevertheless, the increase observed in this study should be interpreted specifically as evidence from the implemented *one-group pretest-posttest* design and should not be generalized beyond the characteristics of the research participants and learning context.

The contribution of differentiated learning is particularly important in interpreting the effectiveness of the developed module because the product was designed around differences in students' readiness, interests, and learning profiles. Instead of presenting a completely uniform learning pathway, the module incorporated flexible learning activities intended to provide

students with opportunities to engage with materials according to their individual characteristics. Pasaribu (2024) found that differentiated learning was related to students' motivation and involvement in secondary-school learning, while Avivi et al. (2023) demonstrated the implementation of differentiated learning in senior secondary education through classroom learning activities. These findings provide a relevant comparison for the present study because they show that differentiation can be applied to respond to differences among learners in secondary education. The distinctive aspect of the present implementation is that differentiated principles were embedded directly into the structure of a digital interactive module, allowing the pedagogical approach and learning technology to operate within the same instructional resource.

The interactive characteristics of the module also provide an important perspective for understanding the observed learning outcomes. The product combined multimedia content, interactive exercises, formative assessment, and self-reflection activities, thereby providing students with opportunities to interact with learning materials rather than merely reading static content. Misnawati et al. (2025) emphasize the role of feedback in formative assessment as a means of supporting the evaluation of students' learning, which is relevant to the inclusion of formative assessment features in the developed module. The opportunities for students to access learning materials independently and engage in self-reflection are also relevant to learning autonomy, a dimension examined by Ananda et al. (2024) in their systematic literature review of instructional models and students' independent learning. Lu et al. (2025) further examined engagement in technology-enhanced learning and its relationship with academic outcomes, strengthening the relevance of student engagement when interpreting learning in digital environments. Rahayu and Rosti (2023) provide an especially close comparison because their study examined an interactive digital teaching module based on differentiated instruction and its impact on students' problem-solving skills. Taken together, these studies support the relevance of combining interactive digital features, differentiated instruction, formative assessment, learning autonomy, and student engagement, although the present study focuses specifically on the development and testing of a module within the context of the Merdeka Curriculum at the senior secondary level.

The overall findings demonstrate that the developed module provides a practical form of integration between differentiated learning and digital instructional technology. Its contribution is not simply the conversion of conventional teaching materials into a digital format, but the organization of content, interactive activities, assessment, reflection, and flexible learning pathways around differences in student characteristics. This finding is consistent with the broader direction of digital learning research represented by Jafnihirida et al. (2023), Sandra et al. (2025), Nisa et al. (2024), and Juniati et al. (2023), while the differentiated-learning dimension is supported by Bilantua et al. (2024), Pasaribu (2024), and Avivi et al. (2023). The findings are also connected with the perspectives on digital learning environments and student engagement discussed by Hafizah (2023), Syah (2025), Misnawati et al. (2025), and Lu et al. (2025), as well as the closely related interactive differentiated *e-module* developed by Rahayu and Rosti (2023). Therefore, the main contribution of this study lies in the contextual integration of these elements into an interactive teaching module intended to support differentiated learning under the Merdeka Curriculum, while its effectiveness evidence remains limited to the characteristics of the 63 participating students and the *one-group* implementation design.

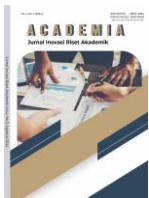
CONCLUSION

The study resulted in an interactive teaching module grounded in differentiated learning that fulfilled the criteria of feasibility, practicality, and effectiveness for use in learning. The product was developed as a digital learning resource that brings differentiated learning into the learning experience through flexible activities and interactive components. Its feasibility was confirmed through expert evaluation, while the responses from teachers and students indicated that the module could be used effectively in classroom practice. The increase in students' learning outcomes after implementation, together with the high N-Gain obtained in the study, further indicates that the developed module has meaningful potential as a learning resource for supporting differentiated learning within the Merdeka Curriculum.

The value of the product extends beyond providing another digital teaching material, as it offers teachers a way to translate differentiated learning into a more structured and accessible learning resource. In practice, this may support learning environments that give greater room for differences among students while maintaining a coherent instructional direction. Further refinement could focus on making learning pathways more adaptive and enriching assessment, feedback, and interactive activities. Future studies should involve larger and more varied groups, different educational contexts, and comparative or experimental designs so that evidence of effectiveness can be examined more rigorously and the longer-term contribution of the module to students' engagement, learning autonomy, critical thinking, and problem-solving can be explored.

REFERENCES

- Ananda, S. C. D., Salim, A., & Mastur, M. (2024). Tinjauan literatur sistematik tentang pengaruh model *flipped classroom* terhadap kemandirian belajar siswa. *JiIP-Jurnal Ilmiah Ilmu Pendidikan*, 7(6), 5269–5274. <https://doi.org/10.54371/jiip.v7i6.4465>
- Avivi, A. A., Pramadhita, A. D., Rahayu, F. F., Saptariana, M., & Salamah, A. U. (2023). Implementasi pembelajaran berdiferensiasi dengan model *project based learning* pada peserta didik sekolah menengah atas kelas X pada materi bioteknologi. *Jurnal Pendidikan Sejarah dan Riset Sosial Humaniora*, 3(3), 251–258. <https://ejournal.penerbitjurnal.com/index.php/humaniora/article/view/336>
- Bilantua, A., Panigoro, M., & Bahsoan, A. (2024). Pengaruh pembelajaran berdiferensiasi terhadap hasil belajar siswa pada mata pelajaran IPS terpadu di SMP Negeri 1 Tomilito Tomilito Gorontalo Utara. *Aksara: Jurnal Ilmu Pendidikan Nonformal*, 10(1), 427–448. <https://ejournal.pps.ung.ac.id/index.php/Aksara/article/view/2422>
- Cholilah, M., Tatuwo, A. G. P., Rosdiana, S. P., & Fatirul, A. N. (2023). Pengembangan Kurikulum Merdeka dalam satuan pendidikan serta implementasi Kurikulum Merdeka pada pembelajaran abad 21. *Sanskara Pendidikan dan Pengajaran*, 1(2), 56–67. <https://doi.org/10.58812/spp.v1i02.110>
- Ermawan, B., & Ps, A. M. B. K. (2024). Analisis efektivitas penggunaan modul ajar digital interaktif dalam implementasi Kurikulum Merdeka Belajar. *Jurnal Edu Aksara*, 3(2), 64–79. <https://jurnal.globalaksarapers.com/index.php/eduaksara/article/view/109>
- Hafizah, N. (2023). Media pembelajaran digital generasi Alpha era Society 5.0 pada Kurikulum Merdeka. *Al-Madrasah: Jurnal Ilmiah Pendidikan Madrasah Ibtidaiyah*, 7(4), 1675–1688. <https://jurnal.stiq-amuntai.ac.id/index.php/al-madrasah/article/view/2699>
- Heng, T. T. (2025). Using technology-enhanced differentiated instruction to support learning in higher education. *Journal of Global Higher Education*, 1(1), 186–201. <https://doi.org/10.25774/jghe.v1i1.10>



- Jafnihirda, L., Suparmi, S., Ambiyar, A., Rizal, F., & Pratiwi, K. E. (2023). Efektivitas perancangan media pembelajaran interaktif e-modul. *Innovative: Journal of Social Science Research*, 3(1), 227–239. <https://j-innovative.org/index.php/Innovative/article/view/2734>
- Juniati, G. A. P. E., Putrayasa, I. B., & Margunayasa, I. G. (2023). Pengembangan bahan ajar digital berorientasi Wana Kerthi Loka Bali pada pembelajaran IPAS kelas IV sekolah dasar. *PENDASI Jurnal Pendidikan Dasar Indonesia*, 7(1), 94–106. https://doi.org/10.23887/jurnal_pendas.v7i1.2018
- Lu, C., Bulut, O., Demmans Epp, C., & Gierl, M. (2025). Impacts of engagement on academic outcomes in technology-enhanced learning. *Distance Education*, 46(2), 318–337. <https://doi.org/10.1080/01587919.2024.2373297>
- Mirari, K. (2022). The effectiveness of adaptive learning systems in personalized education. *Journal of Education Review Provision*, 2(3), 107–115. <https://doi.org/10.55885/jerp.v2i3.194>
- Misnawati, M., Junari, J., Teibang, D., Ilham, I., & Luthfiah, L. (2025). Evaluasi hasil asesmen melalui pemberian umpan balik dalam tes formatif sebagai tolak ukur hasil belajar siswa. *JiIP-Jurnal Ilmiah Ilmu Pendidikan*, 8(2), 2236–2242. <https://doi.org/10.54371/jiip.v8i2.6836>
- Nisa, D. C., Purwidiani, N., Widagdo, A. K., & Astuti, N. (2024). Pengembangan bahan ajar digital dengan aplikasi Flip PDF Corporate Edition pada materi peralatan dapur siswa fase E. *Jurnal Ilmiah Profesi Pendidikan*, 9(3), 1655–1661. <https://doi.org/10.29303/jipp.v9i3.2468>
- Nuraini, A. F. D., & Kusaeri, K. (2025). Systematic literature review: Pengaruh media pembelajaran digital pada pembelajaran berdiferensiasi terhadap motivasi belajar siswa di Indonesia. *PHI: Jurnal Pendidikan Matematika*, 9(1), 58–69. <https://phi.unbari.ac.id/index.php/phi/article/view/439>
- Pasaribu, M. (2024). Pengaruh pembelajaran berdiferensiasi dalam seni tari terhadap motivasi dan keterlibatan siswa di sekolah menengah pertama. *Jurnal Didaktika Pendidikan Dasar*, 8(1), 285–304. <https://ojsdikdas.kemendikdasmen.go.id/index.php/didaktika/article/view/1327>
- Qorib, M. (2024). Analysis of differentiated instruction as a learning solution in student diversity in inclusive and moderate education. *International Journal Reglement & Society (IJRS)*, 5(1), 43–55. <https://jurnal.bundamedia grup.co.id/index.php/ijrs/article/view/452>
- Rahayu, A., & Rosti, R. (2023). Interactive digital teaching module based on differentiated instruction and its impact on students' problem-solving skills. *Jurnal Penelitian Pendidikan IPA*, 9(Special Issue), 1128–1136. <https://doi.org/10.29303/jppipa.v9iSpecialIssue.5072>
- Ramdhani, S., Nurcahyono, N. A., & Nirmala, S. D. (2025). Designing interactive e-modules based on differentiated instruction and the theory of didactical situations for primary mathematics education. *Educational Process: International Journal*, 17, e2025368. <https://www.ceeol.com/search/article-detail?id=1387648>
- Sandra, R., Arif, A., & Saputra, H. D. (2025). Pengembangan modul interaktif berbasis alat praktik untuk meningkatkan hasil belajar pemeliharaan mesin kendaraan ringan (PMKR). *JTPVI: Jurnal Teknologi dan Pendidikan Vokasi Indonesia*, 3(3), 871–882. <https://jtpvi.ppj.unp.ac.id/index.php/jtpvi/article/view/337>



- Sitorus, A. S. (2025). Pembelajaran berdiferensiasi pada Kurikulum Merdeka: Tinjauan teoretis tentang implementasi, tantangan dan peluang. *Action Research Journal Indonesia (ARJI)*, 7(2), 1159–1174. <https://doi.org/10.61227/arji.v7i2.446>
- Syah, M. B. (2025). Analisis penggunaan multimedia interaktif di sekolah menengah kejuruan. *Jurnal Ilmiah Wahana Pendidikan*, 11(5.D), 341–351. <https://jurnal.peneliti.net/index.php/JIWP/article/view/11620>
- Trisnani, N., Effendi, E., Zuriah, N., Kobi, W., Kaharuddin, A., Subakti, H., ... & Yunefri, Y. (2024). Pembelajaran berdiferensiasi dalam Kurikulum Merdeka. *Penerbit Mifandi Mandiri Digital*, 1(1). <http://jurnal.mifandimandiri.com/index.php/penerbitmmd/article/view/48>
- Usmeldi, U., Amini, R., & Darni, R. (2023). Pelatihan pembuatan e-modul interaktif berbasis teknologi informasi untuk meningkatkan literasi digital guru SD dan SMP di Kapau Kabupaten Agam. *Jurnal Pengabdian Pada Masyarakat*, 8(3), 614–622. <http://www.jurnal.unmabanten.ac.id/index.php/jppm/article/view/345>