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ADDIE-Based Offline Digital Modules for Pre-Service Islamic Teacher Education: Advancing Digital Literacy and Pedagogical Competence

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Abstract

The integration of digital technology into teacher education has become increasingly important for supporting curriculum reforms and preparing future educators for technology-enhanced instruction. Despite this trend, limited attention has been given to offline digital learning resources designed for pre-service Islamic education teachers in contexts where internet access remains constrained. This study investigated the effectiveness of ADDIE-based offline digital learning modules in supporting the implementation of Kurikulum Merdeka while strengthening digital literacy and pedagogical competence. A concurrent mixed-methods approach was employed involving 50 pre-service Islamic education teachers at Universitas Negeri Padang during a six-week implementation period. Quantitative data were collected through pre- and post-intervention assessments, while qualitative evidence was gathered from interviews and participant reflections to provide deeper insights into the learning experience. The findings indicate that the offline digital modules substantially improved participants' digital literacy and pedagogical competence, enabling them to design curriculum-aligned lessons and adopt more student-centered instructional practices. Participants also reported increased confidence in integrating digital technologies into teaching, although challenges related to offline functionality and varying levels of digital readiness remained. This study extends the literature by demonstrating that context-responsive offline digital modules can serve as an effective instructional solution for teacher education in low-connectivity environments. The findings offer practical implications for designing inclusive digital learning resources that support equitable technology integration and sustainable curriculum implementation in teacher education.

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INTRODUCTION

The ever-changing environment of education in the era of technology requires new forms of education in order to cope with the needs of modern learners. The introduction of *Kurikulum Merdeka* in Indonesia marks an educational trend toward a more flexible and learner-centered form of education. It highlights the importance of independent learning when learners acquire knowledge independently via various experiences. Nevertheless, one of the major problems encountered by teachers, particularly prospective Islamic education teachers, is how to integrate technology into their teaching (Hasanah, 2023; Hazmi, 2019; Nurjannah et al., 2025; Sanjani, 2020; Zubaidah et al., 2023). As technology increasingly

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becomes a vital tool in education, there is a pressing need to design effective and accessible digital learning modules that align with the *Kurikulum Merdeka* framework (Ndiung et al., 2023; Nurhayati et al., 2022).

The ADDIE (Analysis, Design, Development, Implementation, Evaluation) model has emerged as an effective framework for designing digital learning materials. The flexibility of the ADDIE model makes it possible for educators to design their own learning materials that can be customized according to the educational situation, including in Islamic education (Sugiyono, 2015). Additionally, this model allows an iterative approach through which the learning material can be modified through the feedback received from educators and learners alike. This study utilizes the ADDIE model to design offline digital learning modules for pre-service teachers in Islamic education who experience difficulty in getting access to reliable internet connections (Putri et al., 2020; Shobrina et al., 2020).

Digital literacy among teachers is a significant factor influencing the effectiveness of technology integration in the classroom (Sulistyarini & Fatonah, 2022). While many educators are proficient in traditional teaching methods, there is a growing demand for professional development opportunities focusing on digital skills (Munawir et al., 2022). The *Kurikulum Merdeka* requires teachers to shift from passive content delivery to a more dynamic and interactive approach, utilizing digital tools to foster critical thinking and independent learning (Alfurqan et al., 2024; Febriani & Ritonga, 2022). However, in Islamic education, where the curriculum includes religious content and pedagogical practices, the challenge lies in harmonizing traditional Islamic teaching methods with modern digital pedagogy.

Previous studies have emphasized the effectiveness of the ADDIE model in developing digital learning modules as an instructional design model in different educational settings. The systematic and iterative approach used by ADDIE allows teachers to design flexible digital learning modules that can improve over time through evaluation and feedback (Sugiyono, 2015). Some research works have found that ADDIE-based learning modules can be useful in increasing learner engagement, instructional quality, and learning outcomes (Puspasari, 2019; Yu et al., 2021). The use of digital learning modules has also been suggested as a pedagogically useful tool to promote flexible learning among teachers (Lee & Griffin, 2021). Most of the past research studies conducted on the ADDIE model have concentrated on online learning environments and general educational settings, without considering offline digital modules for specialized purposes like Islamic teacher education.

The growing implementation of *Kurikulum Merdeka* further strengthens the need for innovative digital learning resources (Febrini et al., 2024). As the curriculum emphasizes student-centered learning, critical thinking, and learner autonomy, teachers are expected to adopt more interactive and technology-supported instructional approaches (Aminah & Nursikin, 2023; Nandalawi & Achadi, 2023; Nirmala et al., 2025). Digital learning modules offer opportunities to facilitate these pedagogical shifts by providing multimedia-rich content, interactive learning activities, and flexible learning pathways that support differentiated instruction (Irawan & Mukhlis, 2023; Putri et al., 2020). Nevertheless, the successful implementation of such innovations depends not only on instructional quality but also on teachers' digital literacy and access to appropriate technological resources (Suhono et al., 2025).

Existing studies have reported that limited digital literacy, poor technological infrastructure, and inequity in terms of internet access continue to pose barriers to the effective adoption of digital learning in many educational environments (Hafid & Barnoto, 2020; Muammarulloh & Wiyani, 2023; Nuraini et al., 2022; Siregar et al., 2025; Sulistyarini & Fatonah, 2022; Suwendi et al., 2025). This problem has become especially obvious in rural and distant regions, where access to the internet is not always possible. Even though digital

learning modules have received substantial attention in existing literature, there is still a lack of data on the efficacy of ADDIE-based digital modules, which were created for offline use by pre-service Islamic education teachers in the context of the *Kurikulum Merdeka*.

This study addresses these gaps by examining the implementation of ADDIE-based offline digital learning modules for pre-service Islamic education teachers within the framework of *Kurikulum Merdeka*. The study contributes to the literature in three ways. First, it investigates the use of offline digital modules, an area that has received less attention than online learning environments. Second, it focuses on pre-service Islamic education teachers, a population that remains underrepresented in digital learning research. Third, it examines the integration of instructional design, digital literacy development, and curriculum implementation within a single educational context. Using a mixed-methods approach, the study evaluates the modules' contribution to curriculum alignment, pedagogical competence, and digital literacy while identifying challenges encountered during implementation in low-connectivity learning environments. Specifically, this research addresses the following questions: 1) How can ADDIE-based digital learning modules be effectively designed to align with *Kurikulum Merdeka* in the context of Islamic education?; 2) What is the impact of these digital modules on the teaching practices and digital literacy of pre-service Islamic education teachers?; 3) How do the modules affect pre-service teacher engagement and learning outcomes in Islamic education under *Kurikulum Merdeka*?; 4) What challenges do pre-service Islamic education teachers face in implementing offline digital learning modules, and how can these be mitigated?

METHODS

This study was positioned as Research and Development (R&D) research aimed at developing and evaluating ADDIE-based digital learning modules for pre-service Islamic education teachers at Universitas Negeri Padang (UNP). The ADDIE model served as the instructional development framework guiding the stages of Analysis, Design, Development, Implementation, and Evaluation. To evaluate the effectiveness of the developed modules, a concurrent embedded mixed-methods approach was employed. Quantitative data were used as the primary source for assessing changes in digital literacy and pedagogical competency, while qualitative data were collected to explain and contextualize the quantitative findings. Thus, mixed methods functioned as the evaluation approach within the broader R&D framework rather than as the primary research design (Bryman, 2016; Creswell & Clark, 2017)

Participants

The subjects in this study were sampled from Universitas Negeri Padang (UNP) because UNP actively implements the implementation of *Kurikulum Merdeka* and the use of digital instruments in Islamic education. Fifty pre-service teachers of Islamic Education were chosen based on purposive sampling (Patton, 2014). The purposive sampling technique helped in ensuring that the selected participants satisfied certain qualifications; specifically, they had to be pre-service teachers of Islamic Education from UNP, be exposed to technology before, and also be ready to participate in both qualitative and quantitative research aspects.

To make sure that the sampling is representative, the researchers ensured gender balance, age balance, experience in digital learning, and geographical location (whether the participant is from an urban or a rural area). Ten participants were selected through a qualitative interview to cover a wide spectrum of technological skills and teaching experience. This type of purposive sample was needed to get various perspectives. In addition, there were two instructional design experts and two Islamic education lecturers who participated in the evaluation of digital modules in order to follow the collaborative

design guidelines (Branch, 2009). They played a vital role in making sure that the modules were pedagogically correct and matched Islamic education requirements. In order to explain the characteristics of the participants in the quantitative study, Table 1 provides demographic information about 50 participants.

Table 1. Demographic Profile of Pre-Service Islamic Education Teachers: Gender, Age, Digital Learning Experience, and Regional Distribution

Demographic Variable	Category	Frequency (n)	Percentage (%)
Gender	Male	22	44%
	Female	28	56%
Age	20-22 years	30	60%
	23-25 years	20	40%
	None	12	24%
Experience with Digital Learning	Moderate	28	56%
	Advanced	10	20%
Region	Urban	35	70%
	Rural	15	30%

This demographic data highlights the diversity of participants in terms of gender, age, and prior experience with digital learning. Such diversity is essential for understanding how different factors influence the engagement and effectiveness of digital modules (Bryman, 2016).

Data Collection Procedures

Data were collected throughout the development of the digital learning modules using the ADDIE process. Data related to the Analysis phase entailed conducting classroom observations as well as semi-structured interviews with 10 pre-service Islamic education teachers to determine their level of digital literacy, technological access, instructional challenges, and willingness to use *Kurikulum Merdeka*. Data obtained from the Analysis stage guided the formulation of the module blueprint. The Design and Development stages involved the customization of the modules according to the needs identified. Recommendations made by two instructional design experts and two lecturers in Islamic education were taken into consideration regarding the relevance of the module in relation to the curriculum goals, Islamic educational concepts, instruction quality, usability, and technical functionality.

Implementation of the modules was done with 50 pre-service Islamic education teachers within six weeks. Data on the effectiveness of the digital learning modules were obtained quantitatively through pre-test and post-test on digital literacy and pedagogical competency, and qualitatively through a questionnaire and weekly feedback from users. The Evaluation stage employed both quantitative and qualitative evidence to assess the modules. The quantitative data were gathered through pre-test and post-test outcomes, whereas the qualitative data were gathered through post-implementation interviews and FGDs. This data helped in evaluating the effectiveness of the modules, highlighting issues in implementation and explaining the quantitative data.

Data Analysis

Qualitative data from interviews and FGDs were analyzed using thematic analysis, a method widely recognized for identifying patterns and themes in qualitative data (Braun & Clarke, 2006). Thematic coding was used to analyze the problems faced by the participants in relation to digital literacy, culture, and other technical aspects that affected their use of the offline modules. Thematic analysis helped the researchers examine the participants'

experience of the modules regarding their usability and effectiveness as teaching tools. NVivo software was used for coding of the data in order to facilitate a systematic analysis process.

The quantitative data obtained through surveys and pre-test/post-test analysis were examined using the SPSS software. Descriptive statistics were used to describe the participants' perception of the modules, while paired t-tests were used to compare the scores of the pre-test and post-tests in order to determine the impact of the learning modules on the performance of the students (Bryman, 2016). Calculations of the effect sizes were also made in order to evaluate the practical importance of the results. Reliability analysis was carried out as well.

Ethical Considerations

The study was approved ethically by Universitas Negeri Padang. All subjects were made aware of the purpose of the study and gave their consent before the start of data collection. The study was done in an ethical manner, keeping in view the privacy of the subjects and giving them the freedom to leave at any time.

RESULTS AND DISCUSSION

Results

This section presents the findings from the quantitative and qualitative data collected during the study. The results are organized according to the research questions, critically analyzing how ADDIE-based digital learning modules impacted pre-service Islamic education teachers at Universitas Negeri Padang (UNP).

Effectiveness of ADDIE-based Digital Modules in Aligning with *Kurikulum Merdeka*

Research Question 1 addressed how the ADDIE-based digital learning modules can be designed effectively to fit the *Kurikulum Merdeka*. In order to assess participants' perceptions of the developed modules, a survey was conducted with a focus on curriculum alignment and module usability. The findings are illustrated in Figure 1.

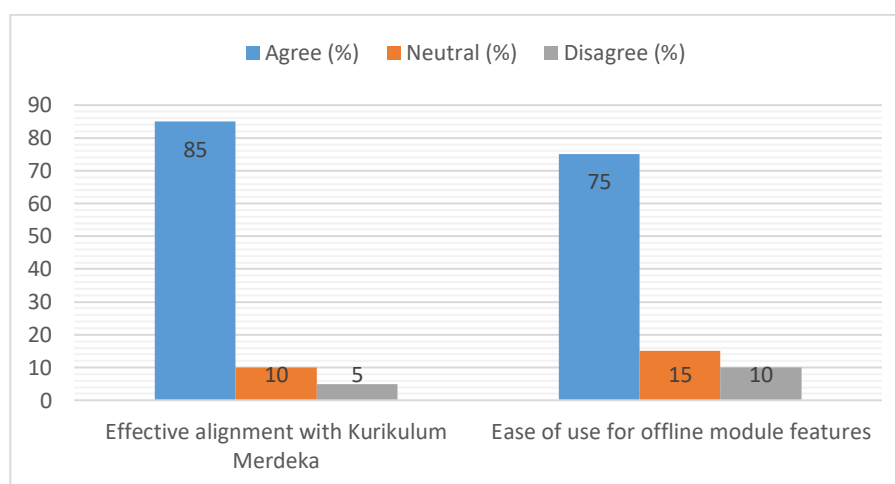


Figure 1. Survey Results on Alignment with *Kurikulum Merdeka* and Offline Module Usability

From the statistical data gathered, it was discovered that 85% of the participants felt that the modules helped them in designing lesson plans that align with the learner-centric method required by the curriculum. From the results of the survey, it can be observed that most of the participants have viewed the module as one that helps in aligning with the curriculum. The interview data shows that the reason behind this is that the modules help

them in designing the learner-centric activities, which are an integral part of the *Kurikulum Merdeka*. On the other hand, 15% of the participants faced problems while integrating the digital tools into the lesson planning process because of technical issues, such as not being able to access interactive content online. The results of this comparison are presented in Table 2.

Table 2. Comparison of Pre-Test and Post-Test Means for Effectiveness in Aligning with *Kurikulum Merdeka*

Metric	Pre-Test Mean	Post-Test Mean	t-value	p-value
Effectiveness in aligning with <i>Kurikulum Merdeka</i>	68.4	82.6	5.48	< 0.001

The t-test results ($t(49) = 5.48, p < 0.001$) indicate a statistically significant improvement in the participants' ability to align their lessons with *Kurikulum Merdeka* after using the modules. This highlights the modules' efficacy in supporting the curriculum's demands. Additional qualitative insights revealed that while most participants found the modules beneficial, those teaching in more remote areas expressed challenges related to module customization and offline feature limitations. Participant 1 stated, "*The module helped me break down my lessons into more student-centered activities, which is the core of the new curriculum.*" However, some teachers still found customization necessary. Participant 2 added, "*While it was useful, I had to adjust some of the lessons to fit the specific learning needs of my students.*" This indicates that while the modules provided a strong foundation, teachers needed to exercise professional judgment in tailoring the content to their classrooms.

Despite these successes, 15% of participants encountered significant technical challenges in integrating the modules. Participant 3 commented, "*I had issues accessing some of the interactive elements when I was offline, which disrupted the flow of my lesson.*" This problem was most commonly noted in regions with unstable electricity, further complicating offline access.

Impact on Digital Literacy and Teaching Practices

The second research question examined the impact of the digital learning modules on the digital literacy and teaching practices of pre-service Islamic education teachers. The results of this analysis are presented in Table 3.

Table 3. Pre-Test and Post-Test Mean Scores for Digital Literacy and Pedagogical Competency

Metric	Pre-Test Mean	Post-Test Mean	Change
Digital Literacy Score	62.3	78.5	+16.2
Pedagogical Competency	65.4	82.7	+17.3

There were indications that there was an improvement in the level of digital literacy, with the mean value of digital literacy increasing from 62.3 in the pre-test to 78.5 in the post-test. The difference was significant, hence proving the effectiveness of the modules in improving digital literacy. In order to test the effect of the digital learning modules created on the participants' digital literacy, a comparison of pre-test and post-test scores was done. The statistical results are presented in Table 4.

Table 4. Statistical Comparison of Pre-Test and Post-Test Means for Digital Literacy Score

Metric	Pre-Test Mean	Post-Test Mean	t-value	p-value
Digital Literacy Score	62.3	78.5	6.72	< 0.001

Based on the results of the t-test ($t(49) = 6.72, p < 0.001$), one may conclude that there was a significant enhancement in the participants' digital literacy due to the use of digital learning modules. The significance of the enhancement in the scores of digital literacy is believed to be related to the participants' greater exposure to technology-based instructional tasks during the six weeks of the intervention. According to the qualitative data, multiple engagements with multimedia, lesson planning options, and offline learning materials have contributed to the gradual development of confidence in using digital devices among the participants.

Participants expressed a range of experiences, with those having no prior experience in digital tools needing more time to adjust. Participant 4, who initially struggled with digital tools, said, *"At first, it was overwhelming, but I quickly became more comfortable with the technology after using the module for a few weeks."* However, not all participants experienced such rapid adaptation. Participant 5 noted, *"I still find it difficult to use some features, especially when things don't work as expected. It takes time, and sometimes I lose patience."* These mixed experiences point to varying readiness levels among pre-service teachers to engage with digital tools, suggesting that more structured training and ongoing support might be required for those with limited prior exposure.

Another challenge is related to classroom implementation. While participants became more comfortable using digital tools, 20% reported difficulties in transferring these skills to classroom settings. Participant 6 reflected, *"The digital tools were useful for lesson planning, but during class, I often had to resort to traditional methods because the students were not familiar with the technology."* This highlights a digital divide that exists not only among teachers but also among students, suggesting that further interventions may be needed to bridge this gap in digital literacy.

Effects on Student Engagement and Learning Outcomes

The third research question focused on the modules' impact on student engagement and learning outcomes. To evaluate the impact of the developed digital learning modules on student engagement and lesson planning competency, pre-test and post-test assessments were conducted. The mean scores for both variables are presented in Table 5.

Table 5. Pre-Test and Post-Test Mean Scores for Student Engagement and Lesson Planning Competency

Assessment Area	Pre-Test Mean	Post-Test Mean	Change
Ability to engage students	66.5	84.3	+17.8
Competency in lesson planning	64.8	81.2	+16.4

Quantitative data from pre-test and post-test scores showed a marked improvement in participants' ability to design learning activities that promoted student engagement. The average post-test score for pedagogical competencies rose from 65.4 to 82.7, reflecting a significant enhancement in the teachers' ability to implement the core principles of *Kurikulum Merdeka*. The results of the comparison are presented in Table 6.

Table 6. Statistical Comparison of Pre-Test and Post-Test Means for Pedagogical Competency Score

Assessment Area	Pre-Test Mean	Post-Test Mean	t-value	p-value
Pedagogical Competency Score	65.4	82.7	6.34	< 0.001

The t-test results ($t(49) = 6.34, p < 0.001$) indicate a statistically significant increase in the participants' ability to implement student-centered pedagogical strategies after using the modules. The significant increase in pedagogical competency scores can be partially

explained by participants' experiences in using interactive learning features embedded within the modules. Interview data showed that participants became more confident in designing student-centered activities and integrating multimedia resources into classroom instruction. This suggests that the digital tools effectively enhanced their ability to engage students and improve learning outcomes.

Qualitative feedback from participants supports these findings. Participant 7 observed, *"My students were much more engaged when I used the interactive quizzes. They were excited to participate, and I could see an improvement in their understanding."* Participant 8 shared a similar experience: *"The multimedia elements helped me explain complex concepts better. My students seemed to grasp the material more easily."* These improvements were especially notable in urban areas where students had prior exposure to digital tools.

However, 20% of participants teaching in rural or under-resourced areas reported that some students struggled to engage with the digital tools due to limited technological familiarity. *"Some students didn't respond well to the digital tools because they weren't familiar with using technology in class. I had to spend extra time helping them."* This suggests that the digital divide not only affects teachers but also students, particularly in less connected regions.

Challenges in Implementing Offline Digital Modules

The fourth research question addressed the challenges pre-service Islamic education teachers face in implementing offline digital modules. Although most participants reported positive experiences, 25% encountered technical difficulties during the implementation phase. These issues primarily revolved around glitches in the offline features, such as occasional difficulty accessing certain multimedia elements without an internet connection. A summary of these challenges is presented in Figure 2.

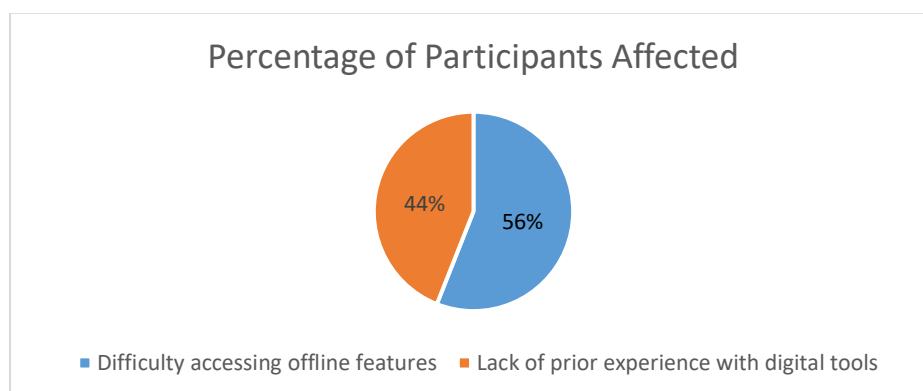


Figure 2. Challenges Faced by Participants in Accessing Digital Tools

Qualitative interviews further highlighted these challenges. Participant 10 explained, *"The modules were great, but the offline features didn't always work properly. I was unable to access some of the videos, which disrupted my lesson plan."* Similarly, Participant 11 shared, *"I had no prior experience with digital teaching tools, so it took me a while to figure everything out. There were times when I wished for more support."* These challenges suggest that while offline digital modules are essential in areas with limited internet access, their technical stability and user-friendliness need improvement.

Despite these difficulties, participants generally expressed optimism about the potential of digital learning tools. Participant 12 summarized this sentiment: *"Once the technical issues are resolved, I think these modules will be incredibly useful for teachers in remote areas."* This indicates a broad willingness to adopt digital methods, provided that the tools are reliable and user-friendly.

Discussion

The outcomes from this research offer some information about the efficiency of ADDIE-based digital learning modules for changing teaching approaches used by future Islamic education teachers in the *Kurikulum Merdeka* environment. The research adds to the current literature on the usefulness of digital devices for education and brings some additional information about the application of those devices in more specific and poorly resourced conditions. Through the analysis of the difficulties and successes in using digital learning devices in both rural and urban environments, this research presents a more nuanced approach to digital adoption.

The improvement in curriculum alignment observed in this study resonates with the broader literature on instructional design models like ADDIE, which are often praised for their structured yet flexible approach to curriculum development (Branch, 2009). Studies have consistently shown that the ADDIE model supports the development of learning resources that can be aligned with student-centered pedagogies through its systematic instructional design process (Puspasari, 2019). In the Analysis stage, educators identify learners' characteristics, needs, prior knowledge, and learning contexts, which helps ensure that instruction is tailored to students rather than solely driven by content. During the Design stage, learning objectives, activities, and assessments are planned to encourage active participation, problem-solving, and learner autonomy. The Development stage translates these plans into learning materials that can incorporate interactive and inquiry-based activities, while the Implementation stage provides opportunities for learners to actively engage with the learning resources. Finally, the Evaluation stage enables continuous improvement based on learners' feedback and learning outcomes (Branch, 2009).

These characteristics align with the principles of *Kurikulum Merdeka*, which emphasize student-centered learning, differentiated instruction, learner autonomy, and meaningful learning experiences (Nandalawi & Achadi, 2023). The significant improvement in post-test scores related to curriculum alignment ($t(49) = 5.48, p < 0.001$) reflects the modules' efficacy in helping teachers adopt and implement the principles of *Kurikulum Merdeka*. However, unlike prior studies that often assume the direct applicability of instructional design models, this research reveals a critical need for flexibility in digital tools. Many participants in this study found themselves needing to customize the modules to fit the unique needs of their students better. This highlights a broader issue in educational technology: while structured design models provide a strong foundation, overly rigid tools can limit teachers' autonomy and adaptability in diverse classroom settings (Confrey et al., 2018; Timotheou et al., 2023). The findings suggest that for digital learning tools to be truly effective, they must balance the structured support of models like ADDIE with the flexibility for teachers to modify content based on their students' needs, a nuance less explored in previous research.

Another important dimension of this study is the significant improvement in participants' digital literacy. The quantitative data demonstrated that the ADDIE-based modules led to statistically significant gains in the pre-service teachers' ability to use digital tools, a finding that is consistent with contemporary literature on the role of technology in teacher development (Sulistyarini & Fatonah, 2022). The 16.2-point increase in digital literacy scores ($t(49) = 6.72, p < 0.001$) highlights the effectiveness of structured digital interventions in improving technological competency.

This improvement can be explained through the systematic nature of the ADDIE model, which provides learners with structured opportunities to interact with digital resources through sequential stages of learning, practice, and reflection (Branch, 2009). According to digital literacy theory, repeated engagement with digital tools in authentic learning activities supports the development of technical, cognitive, and communicative competencies required for effective technology use (Astalini et al., 2024; Rahayu et al., 2019). In the present

study, participants regularly used the modules for lesson planning, instructional preparation, and learning activities throughout the six-week implementation period. Such sustained exposure likely contributed to greater familiarity and confidence in using digital technologies, leading to the observed improvement in digital literacy scores.

Previous studies, such as those by Lee and Griffin (2021), have emphasized how digital tools enhance both teaching and digital competencies among educators. However, this study adds a more nuanced layer by focusing on offline digital modules, often overlooked in global conversations focusing on well-connected urban or suburban contexts (Putri et al., 2020). Despite the offline nature of the modules, the improvement in digital literacy underscores the potential of offline tools to support technological competence in regions with limited internet access (Dinia et al., 2023; Handariani et al., 2023). This is a critical finding because much of the educational technology literature tends to focus on online platforms, assuming that internet connectivity is ubiquitous, which neglects rural and remote areas. Thus, the novelty of this research lies in demonstrating how offline modules can still play a crucial role in developing digital literacy, especially in underserved areas where online resources are not always accessible.

However, despite all the improvements observed, it was evident from the qualitative analysis of data collected that there were differences in how the participants interacted with the modules, especially for those with minimal experience in using technology. This can be attributed to the findings in the study conducted by Engkizar et al. (2017), in which it is indicated that pre-service teachers from rural and poorly funded institutions are unable to adopt technology because of the lack of basic digital skills. It is evident from the findings of this study that the learning curve experienced by some of the participants at the initial stages could only mean that the digital learning tools have to come with extensive training. This is because the challenges encountered by some of the participants prove that digital tools cannot independently transform teaching practices since they need to be incorporated into an integrated ecosystem that also involves training.

The impact of the modules on student engagement and learning outcomes also mirrors findings from contemporary educational research. Multimedia elements, such as videos and interactive quizzes, have increased student engagement and enhanced learning outcomes in various studies (Lee & Griffin, 2021; Timotheou et al., 2023). The study participants noted similar classroom improvements, with students responding positively to the interactive elements of the modules (Handrianto et al., 2025). This aligns with the broader literature on multimedia learning, which suggests that interactive content can make abstract concepts more accessible to students, particularly in subjects like Islamic education, where traditional pedagogical methods may lack engagement (Mayer, 2022). However, the challenges related to students' varying levels of technological familiarity highlight a critical issue often overlooked in the literature: the assumption that all students have the necessary digital skills to engage with these tools effectively. While digital tools can enhance learning for many students, they can also exacerbate the digital divide, particularly in regions where students lack prior exposure to technology.

Another problem with the adoption of offline modules, reported by several interviewees, adds more layers to this issue. Problems with the functionality of some offline digital modules indicate the deficiency of the current design of offline technology tools, which, although promising, tend to lag behind their online versions in terms of technological sophistication (Putri et al., 2020). The unreliable functionality of some offline features, such as difficulties in accessing multimedia content, reflects broader issues in educational technology design for low-resource settings. This finding raises important questions about the scalability of digital learning tools in regions with limited infrastructure. While offline modules offer a solution to connectivity issues, they must be designed with greater technical

robustness to ensure their effectiveness. The frustrations expressed by participants regarding these technical challenges suggest that if digital tools are to become central to educational reform in underserved areas, their reliability must be prioritized. This echoes Mayer's (2022) call for educational technology to be both pedagogically sound and technically robust to prevent technology from becoming a barrier rather than a bridge to learning.

The successful integration of digital tools into this context demonstrates the versatility of the ADDIE model and digital learning modules. Moreover, the study's emphasis on offline digital tools extends the current body of knowledge by addressing the needs of teachers in rural and low-resource areas, a demographic often overlooked in discussions about digital learning (Putri et al., 2020; Sarina & Wardiah, 2019). By focusing on these underrepresented areas, this research contributes to a growing conversation about how educational technology can be made more equitable and accessible.

From a perspective of practical application, these results suggest that offline digital modules can be implemented elsewhere where there is a similar problem to address, either within Indonesia or across the globe. Schools in rural areas in other parts of Southeast Asia, Africa, or Latin America can use the offline digital learning materials in their education process, despite the lack of Internet access. At the same time, the wide implementation requires consideration of the technical problems identified in this research. Developers must work on making more stable offline functions to make sure that teachers can use these modules in their teaching. Finally, the results of this study emphasize the necessity of the development of culturally relevant and context-sensitive modules.

The contribution of this paper to the existing literature on educational technology lies in highlighting the potential of offline ADDIE-based digital learning modules as an efficient means of improving digital literacy, pedagogical competence, and implementation of curriculum in pre-service Islamic teacher education. Considering educational contexts with limited Internet access, the findings of this paper expand the discussion on equitable integration of technology in education.

LIMITATIONS

However, there are still some limitations that should be noted. First of all, it was a rather small number of pre-service Islamic education teachers participating in the study in one particular institution only. It might have affected the possibility of obtaining generalizable results. Secondly, the implementation of the program lasted for only six weeks, and it was impossible to evaluate any long-term effect on the teacher's work. Future research might be carried out using larger and more varied samples and longer implementation periods.

CONCLUSION

The present research explored the development and use of ADDIE-based digital learning modules for pre-service teachers of Islamic education in the *Kurikulum Merdeka* system. The results have revealed that the development and use of the modules facilitated the process of curriculum implementation, developed participants' digital competence, and enhanced their pedagogical competencies related to the student-centered approach to teaching. From the quantitative perspective, there were statistically significant changes in the levels of digital competence and pedagogical competencies of the participants after the six-week implementation of the learning modules. From the qualitative point of view, the participants stated that the development of such modules helped them to develop more interesting and aligned with the curriculum learning activities. Academically, the study adds

to the existing literature on educational technology by expanding the research scope of the ADDIE model application to the field of pre-service Islamic teacher education. Empirically, it demonstrates that offline digital learning modules could be used for promoting the integration of technologies and developing digital literacy in educational systems where internet connection is still not available. In addition, the results could be helpful in enriching discussions on the *Kurikulum Merdeka* system implementation through digital learning resources. The results highlight the potential of offline technology-supported learning as a viable strategy for supporting equitable access to educational innovation, particularly in rural and under-resourced contexts.

AUTHOR CONTRIBUTIONS

AA was involved in the process of conceptualizing, developing the methodology, project administration, supervising, investigating, preparing the original draft, and reviewing the manuscript. BSW was involved in developing the methodology, validating, curating data, and reviewing the manuscript. UF was involved in investigating, data collection, formal analysis, and reviewing the manuscript. WS was involved in investigating, data collection, and providing resources. AK was involved in curating data, formal analysis, and visualization. MI was involved in validating, developing the methodology, and editing the manuscript. ZU was involved in supervising, validating, and editing the manuscript.

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REFERENCES

- Alfurqan, A., Fakhruddin, A., Narulita, S., & Handrianto, C. (2024). Fostering self-regulated learning skills through flipped learning strategy projects: An exploration of pre-service teachers' experiences in Indonesia. *Perspektivy Nauki i Obrazovania*, 72(6), 154–170. <https://doi.org/10.32744/pse.2024.6.10>
- Aminah, S., & Nursikin, M. (2023). Tugas guru di kelas dalam implementasi Kurikulum Merdeka: Perspektif Islam. *Jurnal Edukasi*, 5(4), 12710–12719. <https://doi.org/10.31004/joe.v5i4.2259>
- Astalini, Darmaji, Kurniawan, D. A., & Azzahra, M. Z. (2024). Comparative analysis and the influence of science process skills on students' digital literacy on measurement materials. *Jurnal Ilmiah Pendidikan Fisika Al-Biruni*, 13(2), 131–145. <https://doi.org/10.24042/jipfalbiruni.v13i2.22986>
- Branch, R. M. (2009). *Instructional design: The ADDIE approach*. Springer. <https://doi.org/10.1007/978-0-387-09506-6>
- Braun, V., & Clarke, V. (2006). Using thematic analysis in psychology. *Qualitative Research in Psychology*, 3(2), 77–101. <https://doi.org/10.1191/1478088706qp0630a>
- Bryman, A. (2016). *Social research methods* (5th ed.). Oxford University Press.
- Confrey, J., Maloney, A. P., Belcher, M., McGowan, W., Hennessey, M., & Shah, M. (2018). The concept of an agile curriculum as applied to a middle school mathematics digital learning system (DLS). *International Journal of Educational Research*, 92, 158–172. <https://doi.org/10.1016/j.ijer.2018.09.013>
- Creswell, J. W., & Plano Clark, V. L. (2017). *Designing and conducting mixed methods research* (3rd ed.). SAGE.

- Dinia, Y. S., Abdullah, B., Tafsir, A., Beik, I. S., & Indra, H. (2023). Studi deskriptif peran beban kerja dan kompensasi terhadap kinerja guru pada SDIT dan SDN di Kota Bogor. *JlIP: Jurnal Ilmiah Ilmu Pendidikan*, 6(4), 2835–2844. <https://doi.org/10.54371/jiip.v6i4.1913>
- Engkizar, E., Muliati, I., Rahman, R., & Alfurqan, A. (2017). The importance of integrating ICT into Islamic study teaching and learning process. *Khalifa: Journal of Islamic Education*, 1(2), 148–168. <https://doi.org/10.24036/kjie.v1i2.11>
- Febriani, S. R., & Ritonga, A. W. (2022). The perception of millennial generation on religious moderation through social media in the digital era. *Millah: Journal of Religious Studies*, 22(2), 313–334. <https://doi.org/10.20885/millah.vol21.iss2.art1>
- Febrini, D., Aryati, A., Asvio, N., & Syams, W. A. (2024). Exploring technology integration in Islamic character education: Perspectives from early childhood education. *Online Learning in Educational Research (OLER)*, 4(2), 131–142. <https://doi.org/10.58524/oler.v4i2.482>
- Hafid, & Barnoto. (2022). Manajemen pembelajaran kelas digital berbasis Google Workspace for Education. *Kharisma: Jurnal Administrasi dan Manajemen Pendidikan*, 1(1), 48–58. <https://doi.org/10.59373/kharisma.v1i1.5>
- Handariani, N. L. I., Suarmanayasa, I. N., & Widiastini, N. M. A. (2023). Pengaruh beban kerja, komunikasi dan kepuasan kerja terhadap kinerja guru. *Cakrawala Repos IMWI*, 6(3), 386–398. <https://doi.org/10.52851/cakrawala.v6i3.365>
- Handrianto, C., Jusoh, A. J., Herlina, S., Alfurqan, A., & Nor Azhar, N. F. (2025). Exploring the factors influencing motivation and understanding in Islamic religious education: A mixed-methods study in urban and rural areas. *International Journal of Interdisciplinary Educational Studies*, 20(3), 75–94. <https://doi.org/10.18848/2327-011X/CGP/v20i03/75-94>
- Hasanah, F. N. (2023). Optimalisasi kompetensi pedagogik calon guru PAI melalui implementasi flipped classroom berbasis moodle pada microteaching. *Munaddhomah: Jurnal Manajemen Pendidikan Islam*, 4(2), 261–271. <https://doi.org/10.31538/munaddhomah.v4i2.448>
- Hazmi, N. (2019). Tugas guru dalam proses pembelajaran. *Jurnal Edukasi dan Instruksi*, 2(1), 56–65. <https://doi.org/10.31539/joeai.v2i1.734>
- Irawan, S., & Mukhlis, M. (2023). Keterampilan abad 21 dalam modul ajar Bahasa Indonesia Kurikulum Merdeka di sekolah menengah kejuruan. *Diglosia: Jurnal Kajian Bahasa, Sastra, dan Pengajarannya*, 6(1), 235–246. <https://doi.org/10.30872/diglosia.v6i1.634>
- Lee, A., & Griffin, C. C. (2021). Exploring online learning modules for teaching universal design for learning (UDL): Preservice teachers' lesson plan development and implementation. *Journal of Education for Teaching*, 47(3), 411–425. <https://doi.org/10.1080/02607476.2021.1884494>
- Mayer, R. E. (2022). The future of multimedia learning. *The Journal of Applied Instructional Design*, 11(4), 69–77. <https://doi.org/10.59668/423.10349>
- Muammarulloh, A. G. A., & Wiyani, N. A. (2023). Analisis SWOT implementasi website rapor digital madrasah dalam meningkatkan kualitas lembaga di MA MINAT Kesugihan. *JISIP (Jurnal Ilmu Sosial dan Pendidikan)*, 7(3), 2451–2461. <https://doi.org/10.58258/jisip.v7i3.5458>
- Munawir, M., Salsabila, Z. P., & Nisa, N. R. (2022). Tugas, fungsi dan peran guru profesional. *Jurnal Ilmiah Profesi Pendidik*, 7(1), 8–12. <https://doi.org/10.29303/jipp.v7i1.327>
- Nandalawi, N., & Achadi, M. W. (2023). Apakah Kurikulum Merdeka sebagai pendukung pembelajaran era society 5.0? Analisis konsep dan implementasi Kurikulum Merdeka di jenjang MA. *Pendas: Jurnal Ilmiah Pendidikan Dasar*, 8(3), 3779–3795.
- Ndiung, S., Jediut, M., & Nendi, F. (2023). Kebutuhan modul ajar berdiferensiasi pada pembelajaran IPAS di sekolah dasar. *Jurnal Pendidikan Guru Sekolah Dasar*, 11(1), 1–10. <https://doi.org/10.23887/jjgsd.v11i1.48005>
- Nirmala, P., Suhardi, I., Kaswar, A. B., Surianto, D. F., Fajar, M. B., Soeharto, & Lavicza, Z. (2025). Enhancing computational thinking skills through digital literacy and blended learning: The mediating role of learning motivation. *Online Learning in Educational Research (OLER)*, 5(1), 9–24. <https://doi.org/10.58524/oler.v5i1.504>
- Nuraini, R., Fadlurrohman, F., & Norfaizah, N. (2022). Implementasi penilaian hasil belajar siswa berbasis rapor digital madrasah di MI Mathla'ul Anwar HSU. *Al-Madrasah: Jurnal Pendidikan Madrasah Ibtidaiyah*, 6(4), 1053–1064. <https://doi.org/10.35931/am.v6i4.1174>
- Nurjannah, E., Mangesa, R. T., Fakhri, M. M., Fajar, M. B., Sanatang, & Arifiyanti, F. (2025). Enhancing digital learning outcomes: The combined impact of competence and psychological traits. *Online*

- Learning in Educational Research (OLER)*, 5(2), 277–288. <https://doi.org/10.58524/oler.v5i2.513>
- Nurhayati, P., Emilzoli, M., & Fu'adiyah, D. (2022). Peningkatan keterampilan penyusunan modul ajar dan modul proyek penguatan profil pelajar Pancasila Kurikulum Merdeka pada guru madrasah ibtidaiyah. *Jurnal Masyarakat Mandiri*, 6(5), 1–10. <https://doi.org/10.31764/jmm.v6i5.10047>
- Patton, M. Q. (2014). *Qualitative research & evaluation methods* (4th ed.). SAGE.
- Puspasari, R. (2019). Pengembangan buku ajar kompilasi teori graf dengan model ADDIE. *Jurnal Medives*, 3(1), 137–152. <https://doi.org/10.31331/medivesveteran.v3i1.702>
- Putri, D. P., Ferdianto, F., & Fauji, S. H. (2020). Designing a digital teaching module based on mathematical communication in relation and function. *Jurnal Pendidikan Matematika*, 11(2), 223–236. <https://doi.org/10.22342/jme.11.2.7320.223-236>
- Rahayu, T., Mayasari, T., & Huriawati, F. (2019). Pengembangan media website hybrid learning berbasis kemampuan literasi digital dalam pembelajaran fisika. *Jurnal Pendidikan Fisika*, 7(1), 130–142. <https://doi.org/10.24127/jpf.v7i1.1567>
- Sanjani, M. A. (2020). Tugas dan peranan guru dalam proses peningkatan belajar mengajar. *Serunai Jurnal Ilmiah Ilmu Pendidikan*, 6(1), 35–42. <https://doi.org/10.37755/sjip.v6i1.287>
- Sarina, M. K., & Wardiah, D. (2019). Module development: The utilization of patchwork fabric as teaching materials crafts on the subjects of craft and entrepreneurship for high school students. *International Journal of Science and Technology Research*, 8(5), 124–130.
- Shobrina, N. Q., Sakti, I., & Purwanto, A. (2020). Pengembangan desain bahan ajar fisika berbasis e-modul pada materi momentum. *Jurnal Kumparan Fisika*, 3(1), 33–40. <https://doi.org/10.33369/jkf.3.1.33-40>
- Siregar, H. S., Nurhamzah, N., Munir, M., & Fikri, M. (2025). Enhancing Islamic education through technology integration: A study of teaching practices in Indonesia. *Jurnal Ilmiah Peuradeun*, 13(2), 959–986. <https://doi.org/10.26811/peuradeun.v13i2.1875>
- Sugiyono. (2015). *Metode penelitian & pengembangan*. Alfabeta.
- Suhono, Cahyono, B. Y., Eliyanah, E., Hidayati, M., Pratama, R. D., Sahyoni, & Hidayatullah, M. H. (2025). Digital literacy and digital competence among EFL teachers: A systematic literature review. *Online Learning in Educational Research (OLER)*, 5(2), 519–536. <https://doi.org/10.58524/oler.v5i2.798>
- Sulistiyarini, W., & Fatonah, S. (2022). Pengaruh pemahaman literasi digital dan pemanfaatan media pembelajaran terhadap kompetensi pedagogik guru era digital learning. *Journal of Educational Learning Innovation*, 2(1), 42–72. <https://doi.org/10.46229/elia.v2i1.383>
- Suwendi, Mesraini, Gama, C. B., Rahman, H., Luhuringbudi, T., & Sangsawang, T. (2025). Lecturers' digital readiness in the context of digital scholarchy. *Munaddhomah: Jurnal Manajemen Pendidikan Islam*, 6(2), 208–222. <https://doi.org/10.31538/munaddhomah.v6i2.1674>
- Timotheou, S., Miliou, O., Dimitriadis, Y., Sobrino, S. V., Giannoutsou, N., Cachia, R., et al. (2023). Impacts of digital technologies on education and factors influencing schools' digital capacity and transformation: A literature review. *Education and Information Technologies*, 28(6), 6695–6726. <https://doi.org/10.1007/s10639-022-11431-8>
- Yu, S. J., Hsueh, Y. L., Sun, J. C. Y., & Liu, H. Z. (2021). Developing an intelligent virtual reality interactive system based on the ADDIE model for learning pour-over coffee brewing. *Computers and Education: Artificial Intelligence*, 2, 100030. <https://doi.org/10.1016/j.caeai.2021.100030>
- Zubaidah, S. (2023). Peningkatan kompetensi guru PAI dalam menghadapi revolusi digital: Enhancing Islamic Education (PAI) teachers' competence in facing the digital revolution. *Kharismatik: Jurnal Ilmu Pendidikan*, 1(2), 65–77. <https://doi.org/10.70757/kharismatik.v1i2.17>