

Artificial Intelligence-Based Assessment Training to Improve Teacher Competence

Ike Lusi Meilina^{1*}, Maryani¹, Ernasari¹, Adinda Citra Badarsila¹, Rojabita Dwirgahayu Nurhidayat¹, Aditya Kurniawan²

¹Universitas Jember, Indonesia

²University of Debrecen, Hungary

ABSTRACT

The integration of technology, particularly Artificial Intelligence (AI), into learning assessment plays a pivotal role in improving the effectiveness of education. However, the digital competence gap has caused teachers at MTs. Hidayatul Muhtadi'in Jember will still predominantly use conventional assessments. This community service program aims to improve teachers' professional competencies in designing AI-based assessment instruments. The implementation method combines the development of 4D model materials (Define, Design, Develop, Disseminate) with Direct Instruction and Cooperative Learning model training, which 22 teachers followed. The evaluation instruments included an AI assessment guidebook validation sheet, competency tests, and participant satisfaction questionnaires. The results of the activity show that the developed AI Assessment Guidebook is valid, with a score of 82.00. The effectiveness of the training is evident from the high level of participant understanding, with an average post-test score of 88.67 and a participant satisfaction rating of 89.56 (Very Good). Implicitly, this training significantly contributed to developing teacher competency, as participants can now independently create a variety of questions and assessment rubrics using AI. This program recommends continuous technological adaptation to support the digital madrasah (Islamic school) ecosystem.

ARTICLE INFORMATION

Keywords:

artificial intelligence; assessment; learning; teacher competency

*Correspondent Author:

Ike Lusi Meilina

Email:

ikelusimeilina.fkip@unej.ac.id

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INTRODUCTION

The national curriculum is the main guideline for the implementation of education in Indonesia, designed to achieve national education goals as stated in Law Number 20 of 2003 concerning the National Education System. This curriculum serves as the basis for formulating graduate competencies, learning content, learning processes, and national assessment standards (Mubarok et al., 2021; Rodliyah et al., 2024). Through the national curriculum, the government seeks to cultivate students who are faithful, pious, noble, intelligent, creative, and able to contribute to the life of society, the nation, and the state (Ningsih et al., 2025). The purpose of education is to develop students' potential for balanced competence in knowledge, skills, and attitudes through the learning process. In its implementation, the learning process comprises three main stages: introductory activities, core activities, and closing activities. Teachers must have strong competence in carrying out the three stages of learning to achieve the set learning objectives (Mahrus, 2021).

Teacher competence is a combination of knowledge, skills, values, and attitudes that is reflected in the way teachers think and act. Teacher competence is also defined as the teacher's ability to master four main aspects: pedagogical, personality, social, and professional competence (Sitompul, 2022).

Pedagogic competence is the teacher's ability to manage learning in the classroom (Syaputri et al., 2025). This includes the ability to plan, implement, and assess. Professional competence is the teacher's ability to master the subject matter. This ability involves teacher creativity in developing subject matter. Personality competence is the ability to exhibit a stable personality, demonstrate noble character, and serve as a role model for students (Mu'arif, 2023). Social competence is the teacher's ability to communicate with various parties, including students, leaders, peers, parents, and the community. With this competence, teachers can manage learning optimally, act as innovators, and become agents of change in the educational environment (Zulkipli et al., 2022).

The implementation of learning in schools is inseparable from various challenges, including at the madrasah tsanawiyah (MTs) level. In practice, not all teachers are competent at conducting classroom assessments. One of the problems identified is the limitation in integrating learning assessment with technology (Suryadi et al., 2021). Based on preliminary studies conducted through observation and interviews at the partner school, MTs Hidayatul Muhtadi'in, it was found that the majority of teachers still conduct assessments conventionally. One factor contributing to this is teachers' personal ability to use technology. Teachers in schools have various ages, so the ability to use technology in the classroom varies. Some younger teachers tend to be more proficient than older teachers. Older teachers often face obstacles when using technology, so they are reluctant to use it in the classroom. Teachers' motivation to continuously improve their competence is also low. This makes it difficult for teachers to develop themselves and innovate with technology. Currently, classroom assessment implementation involves technology to make it more effective and efficient (Amaliyah & Bidala, 2024). This low level of technology adoption is not only due to a lack of supporting facilities and infrastructure, but also to gaps in educators' knowledge and technological skills.

Assessment is an important part of the classroom learning process. Assessment is a systematic series of activities that yield relevant information about student development and achievement (Mujiburrahman et al., 2023). Assessment conducted in the classroom refers to process standards and assessment standards (Badan Standar, Kurikulum, dan Asesmen Pendidikan, 2025). The assessment standards used are guidelines for classroom learning (Baroroh & Sukiman, 2023). Assessment has an important role for both educators and students. For educators, assessment serves to monitor student learning progress, identify weaknesses in the learning strategies used, and become the basis for improving the learning process. For students, assessment helps them understand their abilities and learning achievements, as well as a means to improve their learning so that the results are more optimal (Arends, 2011; Nurani et al., 2022; Munaroh, 2024).

A less-than-optimal assessment process will create obstacles to further learning. Teachers need to design assessments carried out at the beginning of learning to identify students' learning needs; the results are used to design learning that suits students' needs (Nandini et al., 2024). This assessment is needed for reflection on the whole learning process. Reflection is used as a reference for planning the next lesson, including revising if there are shortcomings (Fatawi & Abidin, 2024). The types of assessment recommended in the national curriculum are formative assessment and summative assessment (Yuni et al., 2025). Formative assessment assesses the beginning of learning and the learning process, while summative assessment assesses the end of learning (Budiono & Hatip, 2023).

The development of Artificial Intelligence (AI) in education presents new opportunities for assessment implementation (Yusuf, 2025). Artificial intelligence becomes increasingly relevant because it can offer effective, innovative solutions to address various challenges in education (Farwati et al., 2023; Zulkifli et al., 2025). The implementation of AI in education can be utilised for administration, assessment and evaluation, learning systems, virtual reality, and augmented reality (Anggraeni & Meilina, 2024). Through the use of AI in assessment, the process of creating questions can be accelerated, the level of difficulty can be automatically adjusted to the student's ability, and the

assessment results can be analysed in depth to provide more accurate feedback (Zahara et al., 2023). The use of this technology also allows teachers to save time in correcting and processing grades, so that the focus of learning can shift to student support. Thus, AI not only reduces the time required for grading, which previously involved a lengthy process, but also helps personalise the learning process, identify errors and difficulty patterns for each student, and provide relevant recommendations (Oktavianus et al., 2023).

However, challenges arise when some teachers still experience limitations in using digital technology, so training and mentoring are needed so that the use of AI for assessment can make the assessment process faster, more accurate, flexible, and interactive. Based on several previous studies, the utilisation of technology in assessment faces many obstacles. Wiguna (2023) found that teachers' digital literacy was at an intermediate level. Teachers aged 24-40 years showed higher digital competence than those aged 41 - 61 years. Hanifah et al. (2021) showed that although teachers have a basic understanding of technology, in practice, they still need further training. Although these studies focus on teachers' digital competencies, there is still a gap: there are not many programs that specifically train madrasah teachers to use AI to develop assessment instruments.

The main challenge in implementing AI-based assessments in schools is teachers' lack of knowledge about the concepts and working principles of these technology-based assessments. Addressing this competency gap is urgent, as delaying the adoption of AI in assessment risks hindering the digital madrasah (Islamic school) ecosystem. Based on the analysis of the partners' problems and these gaps, this community service activity aims to provide concrete solutions through AI-based assessment training. The purpose of this service is to provide teachers with knowledge of AI-based assessments, improve their ability to create various types of AI-based assessments, and develop assessments independently to enhance teacher competence.

METHOD

This research employs a descriptive qualitative approach specifically participatory action research (PAR). PAR is a process in which a group of people work together to change their own practices for the better (Kemmis et al., 2014). The primary focus of research is AI (Artificial Intelligence) assessment training for 30 teachers at MTs Hidayatul Mubtadi'in which is located in Rowotamtu Village, Rambipuji District, Jember Regency. The implementation of this programme was carried out by a team consisting of four lecturers from the Faculty of Teacher Training and Education, University of Jember, as well as two students who have expertise in information technology and assessment development. The evaluation instruments consist of product validation sheets, competency tests to measure cognitive understanding, and satisfaction questionnaires compiled using a Likert scale based on program success indicators. The action research approach was chosen to enable active involvement of the implementation team in identifying and addressing real problems faced by the school partners. In addition, this approach provides an opportunity to evaluate the impact of the intervention empirically so that the results can be used as a basis for developing similar programmes in the future.

The programme planning stage began with preliminary observations to identify the challenges faced by teachers at MTs Hidayatul Mubtadi'in, located at Jalan Semeru 10, Glagasan Rowotamtu, Rambipuji District, Jember Regency. The first step is to analyse the characteristics of the partner's problems. Next, analyse what the partners need. The results of this analysis are the basis for determining the appropriate form of mentoring activities. Furthermore, the community service team held a planning meeting that included training materials, task division, schedule preparation from the preparation stage through evaluation, implementation of activity outcomes, and preparation of the final report. To support implementation, an activity guidebook was also prepared to facilitate the

management of the learning process, ensuring it takes place in a structured and optimal manner. The activity procedure is shown in [Table 1](#).

Table 1. Activity Procedure

Stages	Activity
Preparation and coordination	Formulate appropriate mentoring materials Make a mentoring schedule Prepare the necessary tools and materials Division of team duties Develop a partner guidebook
Programme implementation	Artificial Intelligence (AI) based assessment training using a direct instruction model (knowledge and skills) Artificial intelligence (AI) based assessment development training using a cooperative learning model (designing assessments in groups)
Monitoring and evaluation	Conduct mentoring, monitoring, and evaluation during the training process

The Artificial Intelligence (AI)-based assessment guidebook was developed using the 4D model (Define, Design, Develop, Disseminate). The define stage aimed to identify and analyse partner needs. At the design stage, the team developed a book structure that included the concept of AI-based assessment, technical guidelines, and examples of its application in learning. The next stage is development, which involves creating a prototype of the guidebook and conducting expert validation of its construct, content, and language. After validation, the revision is carried out in accordance with the experts' input on the validation sheet. The last stage is dissemination during the service's implementation.

The training phase was designed in two main meetings that complemented each other. The first training was conducted on 28 May 2025 using the direct instruction method. At this stage, the material presented covered the introduction and basic understanding of educational assessment, the implementation of AI technology for digital-based assessment, and the development of teacher competence in managing AI-based assessment. The second training was held on 30 July 2025, using the cooperative learning method, in which teachers worked in groups to design AI-based assessment instruments for their respective subjects. All training sessions were interactive, with material presented, discussions held, and hands-on practice, with lecturers serving as facilitators and students as technical assistants. The session concluded with a question-and-answer segment regarding the material presented. An evaluation was conducted to assess improvements in teacher competence across cognitive and psychomotor domains. The cognitive aspect was measured using a post-test in the form of a quiz and a questionnaire about the training to determine the extent to which teachers' understanding of AI-based assessment increased after the training. Meanwhile, the psychomotor aspect was assessed through teachers' skills in designing and developing digital assessment instruments. The programme's sustainability is ensured through post-training monitoring, online communication with partner teachers, and follow-up in the form of the publication of scientific articles, news in the mass media, and video documentation of activities.

RESULTS AND DISCUSSION

Based on the flow of the community service programme, activities are carried out from preparation through to evaluation. This service activity begins with the development of a partner guidebook. This guidebook was prepared by a service team comprising lecturers and students. The guidebook developed uses the 4D development model (Define, Design, Develop, and Disseminate). The

Define stage is the needs analysis stage, which aims to identify partners' real needs. The Development Team conducted interviews with several partners about current needs. The next stage is Design, which involves developing a prototype of teaching materials (guidebooks). The service team held discussions to develop an effective, interactive guidebook design tailored to MT teachers' needs. Hidayatul Muhtadi'in Rowotamtu, Rambipuji District, Jember Regency. The guidebook to be developed is entitled the Artificial Intelligence (AI) based assessment guidebook to improve teacher competence. The third stage is develop, which is modifying the prototype of the partner handbook. Although many designs were made in the previous stage, it is still an early version of the teaching material, so it needs to be modified before it becomes an effective final version. At the development stage, feedback is received through formative evaluation and appropriate revision of the materials. In this development, Expert appraisal is used, a technique for obtaining suggestions and input to improve the teaching materials. Several experts were asked to evaluate the construct, content, and language in the developed guidebook. Two experts involved in the development of this guidebook are two education lecturers from FKIP University of Jember who teach courses on teaching materials and learning media. The results of the expert evaluation are shown in [Table 2](#).

Table 2. Expert Validation of Partner Handbook

Component	Expert Validation Score		Average	Interpretation
	A1	A2		
Construct	0,86	0,78	0,82	Valid
Content	0,80	0,80	0,80	Valid
Language	0,87	0,80	0,83	Valid
Average	0,84	0,79	0,82	Valid

Based on expert validation, the average value for the construct component is 0.82, which meets the valid criteria; for the content component, 0.80; and for the language component, 0.83, which also meets the valid criteria. The average validation result of the partner guidebook is 0.82, with a valid interpretation for use. Based on the expert's feedback, the guidebook was improved to be more suitable, effective, and of higher quality. Suggestions from subsequent experts were followed up on and revised. The fourth stage is the dissemination stage, the final stage in the 4D development process. The dissemination stage is the process of disseminating ideas, information, or content to the general public. The guidebook has received positive feedback and good ratings. The revised and approved guidebook was registered with Intellectual Property Rights (IPR) number EC002025066035. The IPR process is carried out to obtain legal protection for the guidebook that has been developed.

After the development of an Artificial Intelligence (AI)-based assessment guidebook to improve teacher competence is completed, the next step is direct service activities in schools. The service activities, in the form of training, were held on Wednesday, 28 May 2025, and Wednesday, 30 July 2025, involving partner school teachers, namely MTs Hidayatul Muhtadi'in Rowotamtu, Rambipuji District, Jember Regency. The method of implementing this service is direct instruction and cooperative learning. The direct instruction method is used to deliver technology-based learning assessment materials, while cooperative learning is used when developing AI-based assessment instruments in groups.

The service activity on 28 May 2025 began with remarks from the Head of MTs Hidayatul Muhtadi'in Rowotamtu. The school welcomed the University of Jember service team and expressed appreciation for the collaboration between the academics and the school. The material presented at this first meeting included an introduction and basic understanding of educational assessment, the implementation of AI technology for digital-based assessment, and the development of teacher

competence in managing AI-based assessment. This material presentation activity was carried out using the direct instruction method and concluded with discussion and question-and-answer. The activity began by explaining the purpose of the training at the first meeting. This method focuses on the resource person, offering a clear, structured explanation. The next stage is to explain the material and provide concrete examples so the trainees can easily understand. The third stage is guided practice, during which the resource person provides guidance on using one of the AI-based assessment applications. Teachers can try it out by utilising the laptops that have been brought before the activity. In the fourth stage, the resource person can provide feedback and corrections on the AI-based assessment results.

The last stage of the first meeting was the discussion and question-and-answer session between the resource persons and the training participants. Some teachers asked the presenters interesting questions about the assessments at school. After the 1st training activity ended, it was announced that the activity would continue in the second training, which would be held in July after the school holiday. The second training activity will use the cooperative learning method to develop AI-based assessment instruments in groups. The second training was held on Wednesday, 30 July 2025, involving teachers from MTs Hidayatul Mubtadi'in Rowotamtu. The second meeting used the cooperative learning method. The activity stages began by conveying the objectives of the second training, presenting preliminary information about the assessments to be carried out, and organising teachers into 10 groups to work on the task of creating assessments for their respective subjects. The service team's task is to guide each group in practicing AI-based assessments using various applications. Evaluation at the end of the cooperative learning activity is conducted through presentations and giving awards to groups that come forward to present. The material presented is more specific to various AI assessment applications and explains their advantages and disadvantages. The last stage of this second activity was completing the questionnaire and quiz provided by the committee. Based on post-training quiz results, the participating teachers demonstrated a strong understanding of assessment in education. The accuracy rate was very satisfactory, with an average of 88.67, indicating that the majority of participants answered the questions correctly. The results of the post-test on understanding AI assessment can be seen in Figure 1.

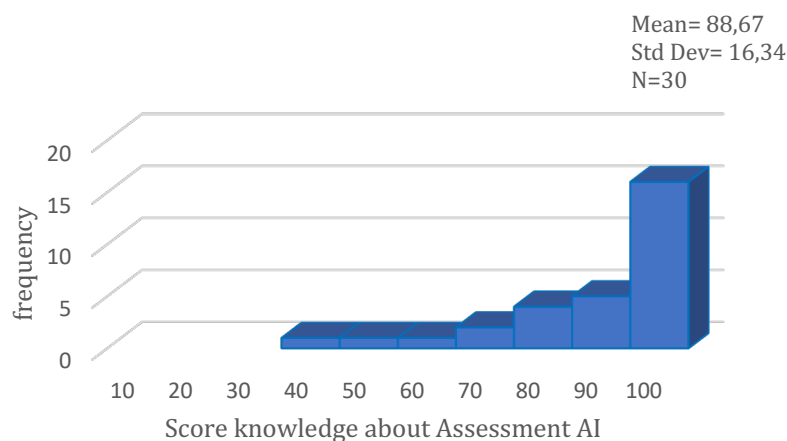


Figure 1. Score Knowledge about Assessment AI Post Test Results

More specifically, the partner teachers grasped various important aspects of the training objectives, namely a basic understanding of educational assessment, the use of artificial intelligence (AI) technology in implementing digital-based assessments, and the development of competencies in designing and managing AI-based assessments. This was reflected in the high percentage of correct answers to questions about the benefits of AI in assessment, the role of teachers in the digital age, and

the application of relevant assessment tools. As a form of appreciation, awards were given to teachers who were able to present the best results and also to participants with the highest quiz scores. Throughout the stages of this activity, various obstacles were found, especially in the process of making learning assessments. Many teachers still have difficulty applying assessments to various applications that utilise AI. This can still be overcome with the help of presenters and also students who participate in guiding the teachers to complete the assessment task. The partner guidebook is indispensable at this stage because it includes clear tutorials. Some teachers lacked proper equipment, including no personal email, unsupported laptops, and insufficient skill with laptops. The evaluation results of the service implementation were obtained through a questionnaire administered to MTs Hidayatul Muhtadi'in Rowotamtu teachers. The questionnaire was created in the form of a Google Forms survey, consisting of 6 Likert-scale questions (1-5) and 3 essay questions. The evaluation results were recapitulated, and the average score was calculated in Table 3.

Table 3. Results of Questionnaires on the Implementation of Service

Respondent	Calculated Score						Total Score	Score
	Q1	Q2	Q3	Q4	Q5	Q6		
Respondent 1	5	5	5	4	5	5	29	97
Respondent 2	3	3	3	3	3	3	18	60
Respondent 3	4	4	4	3	3	3	21	70
.....								
Respondent 30	5	5	5	5	5	5	30	100
Total Score	4,6	4,4	4,6	4,4	4,5	4,4	26,87	89,53

Based on the questionnaire completed by the trainees, the average total score was 26.87, with a maximum score of 89.53. Based on the total and cumulative scores, it can be concluded that the training activities have been quite satisfying for the trainees. The service theme aligns with the partners' needs, and the material presented is easy to understand and useful for the trainees. The training method was quite effective because many activities were conducted in groups. Group activities were chosen to help trainees feel confident and work in teams. The questions in the service implementation questionnaire are shown in Figure 2.

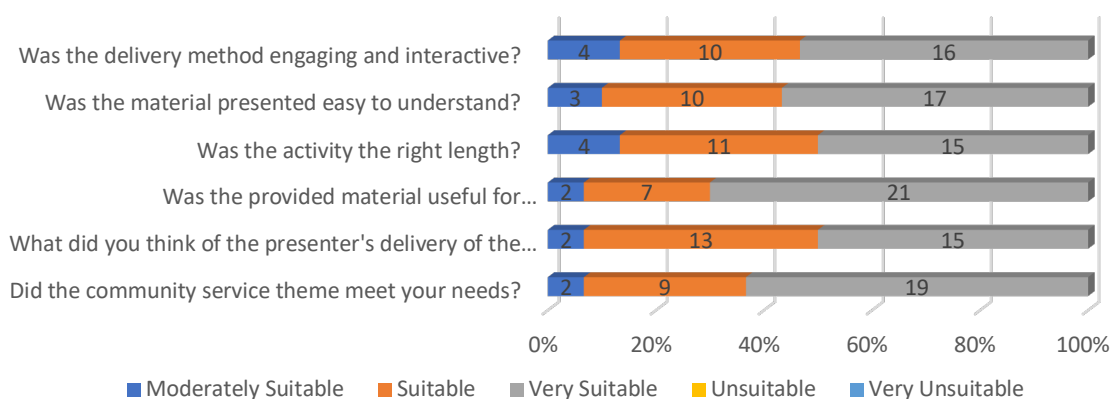


Figure 2. Results of Questionnaires

Improvements in teachers' understanding and skills were measured to assess the impact of this activity. Figure 2 shows that the participating teachers' post-test scores were high on average. Furthermore, the results of the participant questionnaire provide qualitative evidence that the AI-

based assessment training met the needs of the participating teachers and achieved positive results. This community service programme is carried out in the form of training activities that focus on understanding and applying Artificial Intelligence (AI)-based assessments in the learning process. This activity was prepared as an effort to address various problems faced by partners, especially related to teachers' limited knowledge and understanding of the use of AI in assessments to support the improvement of teacher competence. In addition, teachers still face difficulties in designing AI-based assessments that suit learning needs and do not have adequate skills to develop them independently. Through this programme, teachers are expected to gain knowledge, practical skills, and hands-on experience in integrating AI technology into the assessment system to improve the effectiveness of the learning assessment process in schools.

The programme's implementation uses two main methods: direct instruction and cooperative learning. In the first stage, direct instruction allows teachers to understand the fundamental concepts of AI and its application in assessment. This approach is effective because it provides systematic guidance on the working principles of AI and its advantages over conventional assessments (Oktavianus et al., 2023). In terms of impact on teacher competence, this activity not only improves conceptual understanding but also practical skills and teacher motivation to develop assessments independently. In the second stage, cooperative learning allows teachers to work together, discuss, and develop AI-based assessments according to the subjects they teach. This method is effective because it groups teachers into several groups, allowing activities that help those who are proficient and those who are less proficient learn from each other. This increase in teacher competence is evident in the post-test and questionnaire results, which show that teachers' understanding of the concept of AI-based assessment has increased significantly since the training. Unlike previous studies that focused solely on the use of existing applications, the novelty of this approach lies in its structured training. Teachers are taught about assessment knowledge and practice in creating AI-based assessments, enabling them to design unique instruments according to the specific needs of their subjects.

The utilisation of technology in Indonesia is still quite low. Oktavianus presented this from Muqorobin et al. (2025), who revealed that the application of Artificial Intelligence (AI) technology in the secondary school environment in Indonesia still faces various complex obstacles. These challenges are not only related to limited infrastructure and supporting resources, but also to the low level of digital literacy among teachers and students, which causes the utilisation of this technology to be suboptimal. The programme successfully addressed the main obstacles identified in the early stages, namely the low digital literacy of senior teachers and the lack of motivation to develop technological skills. Wiguna (2023) corroborates this phenomenon, finding that young teachers (24-40 years old) are better digitally prepared than teachers aged 41-61 years to address the problems that occur. Amaliyah and Bidala (2024) also discussed that some young teachers tend to be more proficient than older teachers. Older teachers often face resistance or obstacles to adapting digital technology into their learning. The findings from this activity provide new insights that, through intensive peer-based tutoring in cooperative learning, senior teachers' resistance to technology can be minimized, making AI technology more inclusive for all age groups of teachers.

From the perspective of classroom implementation, AI-based assessment provides significant advantages: the creation of assessment instruments is faster, analysis of learning outcomes is more accurate, and the resulting feedback is personalised for each student. This aligns with Zahara et al. (2023), which states that AI in assessment can support adaptive learning and encourage student engagement through real-time, data-driven assessment. This finding also indicates that AI is not just an administrative tool, but a strategic partner for teachers in personalising student learning (Farwati et al., 2023). Based on the questionnaire results, the benefits that teachers feel most from this training

activity are additional insight/knowledge, understanding of technology, increased skills, and practical experience. Teachers were able to recognise various new AI tools for learning assessment. The real contribution of this activity to science lies in strengthening the TPACK (Technological Pedagogical Content Knowledge) theory. Technology is now positioned not merely as an administrative tool but as a strategic partner for teachers to conduct assessment for learning.

Artificial Intelligence (AI)-based assessment training plays an important role in providing an initial understanding and improving teachers' competence in utilising AI technology for learning. This introduction to AI concepts is designed to enable teachers to adapt to the demands of 21st-century learning, which emphasises the integration of digital technology across every aspect of the teaching and learning process (Jaramillo & Chiappe, 2024). It also enhances teachers' practical skills in designing various types of AI-based digital assessments and in developing self-assessments that can be displayed during classroom learning. Through this training, teachers not only gain theoretical insights into how AI works but are also directed to develop practical skills in designing interactive, adaptive digital assessments tailored to student needs. A long-term impact of this activity is the development of teachers' independence in creating interactive, adaptive digital assessments that previously relied heavily on conventional methods. Another impact of this training is increased teacher motivation to experiment with various AI features in developing assessment instruments. This motivation encourages teachers to be more creative and innovative, as evidenced by Norahmi et al. (2024), who found that teachers who received technology-based training were more likely to innovate and explore new assessment methods to create more interesting and relevant learning experiences for students. This program contributes to the creation of an educational ecosystem that is more responsive to technological developments and student needs.

Although this program has proven effective in improving teachers' assessment competencies, implementing the training was not without obstacles. The relatively short training duration limited exploration of advanced AI features, and internet connection stability issues at partner locations, as well as the heterogeneity of teachers' initial skills, which required extra assistance for senior participants. An important reflection that can be drawn from this situation is that digital transformation in madrasahs cannot rely solely on sophisticated tools, but requires a humanistic approach to build teachers' confidence in creating innovative assessments. As a sustainability implication to maintain long-term impact, the AI-Based Assessment Guidebook product developed has been designated as a reference for creating engaging classroom assessments, enabling the technology-adaptation process to continue independently after training.

CONCLUSION

The implementation of Artificial Intelligence (AI)-based assessment training at MTs Hidayatul Muftadi'in Jember has proven effective in enhancing teachers' competence in designing digital learning evaluations. The success of this activity is demonstrated by the main outcome, namely the AI-Based Assessment Guidebook, which was declared valid with a score of 82.00, as well as a significant increase in participants' understanding, with an average post-test score of 88.67 and a satisfaction response score of 89.56 (very good). The practical impact of applying the training results is the formation of teacher independence in efficiently compiling various AI-based assessment instruments. This directly overcomes the obstacle of limited technological literacy in partner schools. To sustain this positive impact, periodic support and adequate digital infrastructure are needed so that the integration of AI into the madrasah learning ecosystem can run optimally and comprehensively.

DECLARATION OF GENERATIVE AI

The authors declare that no generative AI or AI-assisted technologies were used in the writing process of this manuscript.

CONFLICTING INTEREST STATEMENT

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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