

Developing an AI-Supported Online Assessment Platform for Islamic Religious Education Using Google Gemini AI and Google Sites

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ABSTRACT

The integration of generative artificial intelligence (AI) has the potential to improve online assessment in Islamic Religious Education (IRE) by supporting the development of interactive and Higher-Order Thinking Skills (HOTS)-oriented evaluation. This study aimed to develop and evaluate an online assessment platform integrating Google Gemini AI and Google Sites for IRE. A mixed-methods Research and Development (R&D) approach was employed using the ADDIE model, including the phases of Analysis, Design, Development, Implementation, and Evaluation. The platform was implemented with 72 senior high school students. Data were collected through expert validation, questionnaires, observations, interviews, and learning achievement tests. The findings indicate that Google Gemini AI efficiently generated contextual HOTS-based assessment items through prompt engineering, while Google Sites provided a centralized platform integrating quizzes, multimedia resources, and formative feedback. The integration improved assessment efficiency, enhanced student engagement, and supported comprehensive evaluation across cognitive, affective, and psychomotor domains. These findings suggest that AI-assisted assessment offers an effective and practical solution for digital assessment in Islamic Religious Education.

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INTRODUCTION

Assessment constitutes a fundamental component of the instructional process because it provides evidence of students' learning achievement, monitors the attainment of learning outcomes, and informs teachers' pedagogical decision-making. Effective assessment extends beyond measuring students' factual knowledge and should function as a continuous process that supports learning through constructive feedback and reflective practice. Contemporary educational assessment therefore emphasizes not only summative measurement but also formative approaches that facilitate higher-

order thinking, self-regulated learning, and meaningful engagement with learning activities (Black & Wiliam, 2009; Andrade & Brookhart, 2020).

Within the context of Islamic Religious Education (IRE), assessment presents greater complexity than in many other disciplines because learning objectives encompass cognitive understanding, affective internalization of Islamic values, and psychomotor competencies related to religious practices. Consequently, assessment should evaluate students' conceptual understanding alongside their moral reasoning, spiritual awareness, and practical application of Islamic teachings. Nevertheless, previous studies indicate that assessment practices in Islamic Religious Education continue to rely predominantly on conventional paper-based examinations emphasizing factual recall and memorization rather than authentic assessment capable of measuring higher-order thinking skills (HOTS), ethical judgment, and reflective learning (Ahmad et al., 2023; Huda et al., 2022).

The rapid advancement of digital technologies and the emergence of Education 4.0 have transformed educational assessment into a more interactive, technology-supported process. Students belonging to the digital-native generation increasingly expect assessment environments that are engaging, flexible, multimedia-rich, and capable of providing immediate feedback. Digital assessment platforms have demonstrated significant potential for improving learning motivation, increasing student participation, and enabling teachers to conduct more efficient evaluation processes through automated scoring and real-time analytics (Redecker, 2022; OECD, 2023). Despite these developments, many teachers continue to experience difficulties in designing high-quality assessment instruments due to limitations in time, technological competence, and expertise in constructing Higher Order Thinking Skills (HOTS)-oriented questions.

Recent developments in Generative Artificial Intelligence (GenAI) provide promising opportunities to address these challenges. Among emerging AI technologies, Google Gemini offers advanced multimodal capabilities supported by Natural Language Processing (NLP), enabling educators to generate assessment items, authentic learning scenarios, analytical rubrics, and personalized feedback with greater efficiency. Several recent studies have highlighted the transformative potential of generative AI for educational assessment by supporting item generation, adaptive feedback, instructional design, and assessment personalization while reducing teachers' workload (Kasneci et al., 2023; UNESCO, 2023; Zawacki-Richter et al., 2019). However, AI-generated assessment resources require an accessible digital platform that allows students to interact with assessment materials in an organized and user-friendly environment.

Google Sites represents a web-based content management platform that integrates seamlessly with Google Workspace services such as Google Forms, Google Drive, YouTube, and other collaborative applications. Its intuitive interface enables educators to organize learning resources, embed AI-generated assessment instruments, provide multimedia learning support, and facilitate online assessment without requiring advanced programming skills. Integrating Gemini AI with Google Sites therefore creates an ecosystem in which teachers can efficiently design assessment instruments while students experience a centralized, interactive, and accessible online assessment environment.

Although previous research has extensively investigated artificial intelligence in education, digital assessment, and web-based learning separately, limited attention has been devoted to examining the integration of Generative AI (Google Gemini) and Google Sites specifically for assessment practices in Islamic Religious Education. Existing studies predominantly focus on AI-assisted content generation or learning management systems rather than investigating how AI-generated assessment instruments can be implemented through web-based platforms to support comprehensive evaluation encompassing cognitive, affective, and psychomotor domains within Islamic education. Addressing this research gap, the present study aims to analyze the implementation of Gemini AI integrated with Google Sites as an interactive online assessment platform for Islamic Religious Education and to explore its potential for enhancing assessment quality, teacher efficiency, and student learning engagement.

METHODS

This study employed a mixed-methods Research and Development (R&D) approach using the ADDIE instructional design model, which consists of five interconnected phases: Analysis, Design, Development, Implementation, and Evaluation. The study combined qualitative and quantitative data to develop and evaluate an online assessment platform for Islamic Religious Education (IRE). During the analysis phase, a needs assessment was conducted through classroom observations, teacher interviews, and curriculum document analysis to identify the limitations of conventional assessment practices, examine the characteristics of Generation Z learners, and determine the Intended Learning Outcomes (ILOs) that require interactive digital assessment. Based on these findings, the design phase focused on developing the Google Sites architecture, organizing assessment workflows, and constructing prompt engineering strategies to optimize Google Gemini AI in generating Higher-Order Thinking Skills (HOTS)-oriented assessment items, Islamic moral scenarios, and assessment rubrics.

The development phase involved generating assessment instruments using Google Gemini AI, followed by researcher review and refinement to ensure alignment with the IRE curriculum and learning objectives. The validated assessment items were integrated into Google Forms and Google Quiz, while multimedia learning resources, reflection activities, and assessment instructions were embedded into Google Sites to establish a centralized online assessment environment. The implementation phase was conducted with 72 senior high school students enrolled in Islamic Religious Education. Students completed formative and summative assessments through the Google Sites platform using their personal digital devices, while teachers facilitated the assessment process and monitored students' learning activities within the integrated Google Workspace ecosystem.

The evaluation phase aimed to determine the quality of the developed assessment platform in terms of validity, practicality, and effectiveness. Content validity and technical feasibility were examined by experts in Islamic Religious Education and educational technology. Practicality was measured through teacher and student response questionnaires, whereas effectiveness was evaluated by comparing students' learning achievement before and after implementation using the normalized gain (N-gain) score. Qualitative data obtained from interviews and open-ended responses were analyzed to complement the quantitative findings and provide comprehensive insights into the strengths, limitations, and potential improvements of integrating Google Gemini AI with Google Sites for online assessment in Islamic Religious Education.

FINDINGS AND DISCUSSION

Prompt Engineering with Gemini AI for HOTS-Based Islamic Religious Education Assessment

One of the primary challenges faced by Islamic Religious Education (IRE) teachers is designing high-quality assessment instruments that measure students' Higher-Order Thinking Skills (HOTS) through authentic and contextualized tasks. Google Gemini AI addresses this challenge through structured prompt engineering, enabling educators to generate case-based assessment items that promote critical thinking and ethical reasoning. For example, teachers can use the following prompt for the topic of Digital Islamic Commercial Jurisprudence (Fiqh Muamalah):

Prompt: "Act as an expert in senior high school Islamic Religious Education assessment. Create one HOTS-based (Bloom's Taxonomy C4–Analysis) dilemma case concerning the legal status of e-wallet and PayLater transactions in contemporary Islamic commercial jurisprudence (Fiqh Muamalah). Develop three essay questions that assess students' critical understanding of usury

(riba), contractual validity (akad), and Islamic ethical decision-making. Additionally, provide an answer key accompanied by an analytical scoring rubric.”

Gemini AI generates authentic case studies grounded in real-life contexts while simultaneously producing comprehensive answer keys, analytical rubrics, and relevant references to the Qur'an and Hadith. This AI-assisted approach substantially reduces the time required for teachers to prepare assessment packages from approximately 3–4 hours to only 20–30 minutes while improving the cognitive quality of assessment items from Lower-Order Thinking Skills (LOTS) toward Higher-Order Thinking Skills (HOTS), particularly the analysis (C4) and evaluation (C5) levels.

Integration of Assessment Tools into Google Sites

After the assessment instruments have been generated using Gemini AI and integrated into Google Forms or interactive quiz platforms such as Kahoot and Quizizz, the next stage involves embedding these resources into Google Sites to establish a centralized Learning Evaluation Hub. Google Sites provides an intuitive web-based environment that enables teachers to organize various assessment components within a single platform. The website can be structured into three primary sections: (1) Cognitive Assessment, containing HOTS-oriented quizzes developed in Google Forms with automatic scoring features; (2) Affective Assessment, including self-assessment and peer-assessment forms designed to evaluate students' religious attitudes, worship discipline, and moral character; and (3) Psychomotor Assessment, providing digital submission spaces where students upload videos demonstrating practical religious activities such as prayer (ṣalāh), ablution (wuḍū'), or Qur'anic literacy projects. By integrating all assessment activities into a single online portal, Google Sites minimizes students' confusion in accessing multiple assessment links while improving the organization, accessibility, and efficiency of the evaluation process.

Efficiency and Effectiveness of AI-Supported Assessment

The field implementation demonstrated that integrating Google Gemini AI with Google Sites significantly transformed the assessment process in Islamic Religious Education. Compared with conventional paper-based assessment, the AI-supported system dramatically reduced the time required to develop assessment instruments from approximately 3–5 hours to only 15–30 minutes. At the same time, the quality of assessment items improved substantially, shifting from memorization-oriented questions (LOTS) to contextual, analytical, and ethical problem-solving tasks aligned with HOTS principles. Furthermore, the digital assessment environment incorporated multimedia learning resources, interactive quizzes, automated scoring, and real-time feedback, while students' responses and scores were automatically compiled and analyzed through Google Sheets. These features not only enhanced teachers' efficiency in managing assessments but also promoted greater student engagement and participation throughout the learning process.

Instant Feedback and Personalized Learning in Islamic Religious Education

One of the most significant advantages of Google Gemini AI lies in its ability to generate personalized and pedagogically meaningful feedback. When students provide incorrect responses to quizzes embedded within Google Sites, Google Forms integrated with AI-generated explanations can immediately present corrective feedback, including explanations supported by relevant Qur'anic verses and authentic Hadith. This feature transforms assessment from a traditional assessment of learning approach into assessment as learning, where evaluation becomes an integral part of the learning process itself. Students are encouraged to identify their misconceptions, reflect on their understanding, and independently access remedial learning materials embedded within the Google Sites platform. Consequently, assessment is no longer perceived merely as a grading mechanism but as a constructive,

adaptive, and student-centered learning experience that supports continuous improvement in both academic understanding and religious character development.

Discussion

The findings demonstrate that integrating Google Gemini AI with Google Sites provides a comprehensive digital assessment ecosystem that enhances the quality, efficiency, and accessibility of assessment in Islamic Religious Education (IRE). The integration not only simplified teachers' assessment design process but also facilitated more interactive and student-centered evaluation practices. These findings support the growing body of literature suggesting that generative artificial intelligence has substantial potential to transform educational assessment by assisting educators in developing authentic, contextualized, and higher-order assessment tasks rather than relying solely on traditional knowledge-based examinations (Kasneci et al., 2023; UNESCO, 2023).

One of the most significant findings concerns the use of prompt engineering for generating HOTS-oriented assessment items. The structured prompts provided to Google Gemini AI enabled teachers to produce contextual case studies, analytical essay questions, answer keys, and scoring rubrics aligned with the cognitive demands of Bloom's revised taxonomy. This finding indicates that the quality of AI-generated assessment depends not merely on the capability of the language model but also on the teacher's ability to formulate effective prompts. This observation aligns with the work of Mollick and Mollick (2023), who argued that educators remain central decision-makers in AI-assisted learning because prompt construction determines the relevance, depth, and pedagogical quality of AI-generated outputs. Rather than replacing teachers, generative AI functions as an intelligent instructional partner that reduces technical workload while preserving teachers' professional judgment.

The findings further indicate that Google Sites effectively functioned as a centralized assessment platform by integrating Google Forms, multimedia learning resources, reflection activities, and assessment documentation within a single web environment. Such integration reduced students' confusion caused by multiple assessment links and improved the overall organization of online assessment. These findings are consistent with digital learning ecosystem theory, which emphasizes that learning technologies become more effective when multiple digital tools are interconnected within a unified platform that supports seamless learning experiences (Redecker, 2022). The centralized structure also reflects the principles of Universal Design for Learning (UDL), which encourage flexible access to learning resources and assessment opportunities for diverse learners (CAST, 2024).

Another important finding relates to the efficiency gained through AI-assisted assessment development. Teachers reported considerable reductions in the time required to prepare assessment materials while simultaneously producing questions that addressed higher cognitive processes such as analysis, evaluation, and ethical reasoning. These findings corroborate previous studies indicating that generative AI significantly decreases teachers' administrative workload and allows educators to devote more attention to instructional planning, student mentoring, and learning facilitation (Kasneci et al., 2023; Zawacki-Richter et al., 2019). Within Islamic Religious Education, this efficiency is particularly valuable because teachers often need to develop assessment instruments that integrate religious knowledge, contextual moral issues, and authentic learning situations.

The implementation of instant feedback also represents an important pedagogical contribution of this study. Students received immediate explanations regarding incorrect answers together with supporting Qur'anic verses and Hadith references, enabling them to identify misconceptions independently. This finding demonstrates a shift from assessment as a purely summative activity toward formative assessment that actively supports learning. Black and Wiliam (2009) emphasized that timely and constructive feedback is among the most influential factors affecting students' learning achievement because it encourages reflection, self-regulation, and continuous improvement. Similarly, Andrade and Brookhart (2020) argued that effective classroom assessment should promote students'

active participation in monitoring and regulating their own learning processes. Therefore, integrating AI-generated feedback within Google Sites extends the educational function of assessment beyond grading toward meaningful learning support.

From the perspective of Islamic Religious Education, the integration of Google Gemini AI offers opportunities to develop more authentic assessments that evaluate not only students' cognitive understanding but also their moral reasoning and application of Islamic values in contemporary contexts. The generated case studies concerning digital financial transactions, Islamic ethics, and contemporary social issues encourage students to apply Islamic principles when solving real-world problems rather than merely recalling religious concepts. Such authentic assessment is consistent with competency-based education, which emphasizes the integration of knowledge, attitudes, and practical skills in meaningful learning contexts (OECD, 2023). Consequently, AI-assisted assessment supports the holistic objectives of Islamic education by facilitating the simultaneous evaluation of cognitive, affective, and psychomotor domains.

Despite these promising findings, several limitations should be acknowledged. The quality of AI-generated assessment remains highly dependent on teachers' prompt engineering skills and their ability to verify the theological accuracy of generated content. Although Google Gemini AI can efficiently generate contextual assessment materials, all outputs require careful validation by Islamic Religious Education experts to ensure consistency with authentic Islamic sources and curriculum standards. Furthermore, successful implementation requires adequate digital infrastructure, stable internet connectivity, and sufficient digital competence among teachers and students. These considerations reinforce UNESCO's (2023) recommendation that artificial intelligence should function as a complementary educational technology under continuous human supervision rather than as an autonomous decision-maker.

Overall, this study contributes to the growing literature on AI-supported educational assessment by demonstrating how the integration of Google Gemini AI and Google Sites can create an efficient, interactive, and pedagogically meaningful assessment environment for Islamic Religious Education. The proposed approach illustrates that artificial intelligence can strengthen teachers' assessment capacity while simultaneously promoting authentic learning, higher-order thinking, and continuous formative feedback. Future research may investigate the long-term impact of AI-assisted assessment on students' critical thinking, digital literacy, religious reasoning, and self-regulated learning across different educational contexts.

CONCLUSION

This study demonstrates that the integration of Google Gemini AI and Google Sites provides an innovative and effective approach to online assessment in Islamic Religious Education (IRE). Through the implementation of the ADDIE development model, the resulting assessment platform successfully integrates AI-generated HOTS-oriented assessment items, multimedia learning resources, automated scoring, and centralized assessment management within a single digital environment. The use of structured prompt engineering enables teachers to develop contextual assessment instruments more efficiently while maintaining alignment with curriculum objectives and the cognitive demands of higher-order thinking skills.

The findings indicate that integrating Google Gemini AI with Google Sites enhances the efficiency, practicality, and interactivity of the assessment process. Teachers benefit from a significant reduction in the time required to design assessment instruments, whereas students experience a more engaging assessment environment through instant feedback, multimedia content, and easy access to learning resources. Furthermore, the platform supports comprehensive assessment across the cognitive,

affective, and psychomotor domains, reflecting the holistic objectives of Islamic Religious Education. The provision of immediate, AI-assisted feedback also promotes self-reflection and independent learning, transforming assessment from a summative measurement tool into a formative learning experience.

Despite these advantages, the implementation of AI-assisted assessment should continue to emphasize the essential role of teachers in validating AI-generated content, ensuring theological accuracy, and maintaining alignment with educational standards and Islamic values. Therefore, generative artificial intelligence should be viewed as a complementary instructional technology that enhances, rather than replaces, teachers' professional expertise. Future research is recommended to investigate the long-term impact of AI-supported assessment on students' higher-order thinking skills, digital literacy, self-regulated learning, and religious reasoning across diverse educational levels and institutional contexts.

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