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Implementation of Digital Literacy Based Hybrid Classes in Islamic Education (PAI) Study Programs in Higher Education

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ABSTRACT

Background: The rapid development of digital technology has encouraged universities to integrate technology into the learning process, including in Islamic education. The implementation of hybrid classes has become an innovative learning solution that combines online and offline learning to enhance the digital literacy of students and lecturers. However, the implementation of hybrid learning in the Islamic Education Study Program still requires the development of an effective model aligned with Islamic educational values.
Purpose: This study aims to develop a hybrid class-based Islamic education model to improve the digital literacy skills of the academic community in the Islamic Education Study Program, Faculty of Islamic Studies, Muhammadiyah University of South Tapanuli.
Method: This study employed a qualitative approach using the Plomp Model, which consists of the stages of Planning, Learning, Organizing, Operating, Monitoring, and Product. Data were collected through observation, interviews, and documentation, and then analyzed through data reduction, data presentation, and conclusion drawing.
Results: The findings revealed that the implementation of hybrid classes significantly improved students' digital literacy skills, lecturers' competencies in utilizing learning technology, and the overall quality of digital-based learning within the faculty. Hybrid learning also encouraged active student participation through the use of Learning Management Systems (LMS), virtual discussions, and collaborative digital projects.
Conclusion: The hybrid class-based Islamic education development model proved effective in enhancing digital literacy and supporting learning transformation that is relevant to technological advancements while maintaining Islamic educational values.

KEYWORDS

Digital Literacy, Hybrid Learning, Islamic Education

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INTRODUCTION

The development of digital technology has brought significant changes to various aspects of life, including education. The world of education is currently facing the challenge of integrating digital technology into the learning process in order to remain relevant to contemporary needs (Rosfiani 2025). One of the innovative approaches that has begun to be implemented is the use of hybrid classrooms, which combine online and offline learning (Siregar 2023). This approach is expected to improve digital literacy among both students and lecturers, as digital literacy is considered

Universities are currently undergoing a transformation driven by the rapid development of information technology (Cut et al., 2023). In this context, hybrid classrooms are considered a strategic approach because they combine the flexibility of online learning with the advantages of face-to-face interaction. The use of appropriate learning development models is believed to create a more interactive and collaborative learning environment, thereby increasing student engagement and supporting academic success (Suwana, 2021). This is in line with the view that active student participation is one of the key indicators of learning success. In addition, the hybrid model allows for more efficient use of educational infrastructure, reduces the burden on physical classrooms, and supports distance learning with adequate technological support (Guerrero-Quiñonez et al., 2023). Furthermore, hybrid learning has been proven to improve digital literacy competencies among both students and lecturers (Nørgård, 2021). This demonstrates that skills in managing digital platforms, online communication, and virtual collaboration have become urgent necessities in the era of globalization (Nykvist dkk., 2021).

In the context of Islamic education, the Faculty of Islamic Religion (FAI) at University of Muhammadiyah South Tapanuli has begun implementing hybrid classes as a strategic solution to meet the needs of adaptive, flexible, and technologically relevant learning. However, the level of digital literacy among students and lecturers in utilizing hybrid classes still requires further investigation to ensure its effectiveness. The development of hybrid classroom-based Islamic education is not only intended to improve digital literacy but also to support the achievement of the Tridharma of Higher Education, namely education, research, and community service. (Hamid 2024). However, the implementation of hybrid learning in the context of Islamic education still requires validation, both in terms of model development and its effectiveness in improving the quality of learning. (Colina-ysea et al. 2024).

This research represents a concrete example of the implementation of hybrid classes in Islamic education. It creates opportunities to measure the impact of hybrid learning in enhancing students' knowledge, validating Islamic education models, and strengthening digital literacy skills within an international framework. Therefore, the Faculty of Islamic Religion (FAI) at University of Muhammadiyah South Tapanuli has conducted research through hybrid-based learning, despite several challenges, such as limited facilities and inadequate digital literacy training for lecturers and students. This condition highlights the need for improved facilities as well as continuous training programs to develop a more effective model of Islamic education in higher education institutions.

In line with this, previous studies have also demonstrated the relevance of implementing hybrid learning to improve digital literacy and the quality of learning (Priyambudi, Nursalim, and Masitoh 2024). Affirming that Project-Based Hybrid Learning can improve students' critical thinking skills as well as digital literacy through involvement in real projects (Fauzan and Arifin 2017). He added that web-based hybrid learning provides flexibility in learning time, allowing students to develop knowledge more independently. Meanwhile, (Lestari, Yuniawatika, and Rahmawati 2024) increasing the role of digital literacy in building students' character by requiring teachers to optimize digital literacy teaching so that students are not only consumers but also producers of critical and creative information (Okamura 2023).

From this discussion, it can be concluded that the novelty of this research lies in its focus on the development of Islamic education through hybrid learning by combining religious approaches with international collaboration. This focus distinguishes the study from previous research, which has generally been broader and less grounded in religious values. However, in terms of digital literacy and the application of the hybrid model, this study shares similarities with previous research,

particularly in adopting a progressive approach to improving the competencies of both lecturers and students in the digital era.

RESEARCH METHODOLOGY

The research method used in this study is a qualitative method. This approach aims to deeply understand the experiences, perceptions, and dynamics of the application of the hybrid classroom model in the context of Islamic education. It allows for an exploration of the "how" and "why" of phenomena, rather than merely answering "what" happened (Samsu 2022). Qualitative research was chosen because it enables an in-depth exploration of the phenomena occurring in the field, especially those related to the application of a hybrid classroom-based Islamic education development model in improving digital literacy skills in higher education (Pangestu, Shohib, and Jinan 2025). This research focuses on understanding the meanings, processes, and experiences faced by lecturers and students in the implementation of hybrid classes (Choiriyah 2023). Data were collected through observations, in-depth interviews, and documentation to obtain a comprehensive picture of the research context. Data analysis was conducted interactively through the stages of data reduction, data presentation, and conclusion drawing, resulting in a holistic description of the ongoing implementation. By using a qualitative approach, this research is expected to provide a broader and deeper understanding of how hybrid classroom-based Islamic education development strategies can contribute to improving students' digital literacy skills in higher education.

The learning development model used in this study is the Plomp Model (Planning, Learning, Organizing, Operating, Monitoring, and Product). According to (Rochmad 2012) the Plomp model consists of five stages: preliminary investigation, design, realization/construction, testing, evaluation, revision, and implementation.

The Plomp development model was chosen because it is considered more flexible, and each step contains development activities that can be tailored to the characteristics of the research. The main objective of the Plomp Model is to provide a systematic and structured approach to the research and development process of a product, program, or curriculum, particularly in the field of education. This model helps researchers and developers ensure that the products developed are not only effective but also relevant to the needs of their users.

The framework for development and design using the Plomp Model is illustrated in the chart below:

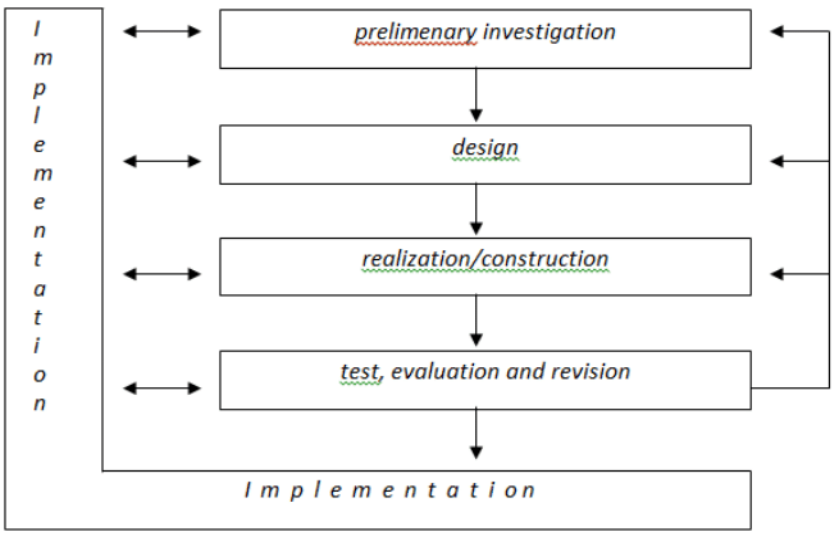

Figure 1. Plomp Development Model Design

Here is a brief explanation of each phase:

The development of learning tools takes place through several interrelated and continuous phases. The first stage is the investigation phase, where a needs analysis is conducted to identify existing problems. At this stage, the main objectives of the development, the users' needs, and the context in which the learning tools will be used are determined. The next stage is the design phase, where an initial design is created that includes content planning, structure, learning strategies, and media, all aligned with the results of the previous analysis (Hariadi et al. 2018). This is followed by the realization phase, which involves implementing the prepared designs to produce tangible products such as modules, learning media, or teaching materials. The next phase is testing, evaluation, and revision, where the developed product is tested to assess its effectiveness, efficiency, and attractiveness. Based on the test results, revisions are made to optimize the product. Finally, the implementation phase involves applying the learning tools on a broader scale, accompanied by a comprehensive evaluation to ensure that they can be used effectively and in accordance with users' needs.

RESULT AND DISCUSSION

The results of this study show that the implementation of the hybrid classroom-based Islamic education development model using the Plomp Model runs through several interrelated stages, namely planning, learning, implementation, operation, monitoring, and products. This model is designed to integrate technology-based learning with Islamic education values in order to improve students' digital literacy skills in the PAI Study Program. The results of the study also show that the hybrid learning approach is able to create learning that is more flexible, interactive, and adaptive to technological developments. These findings are in line with the opinion of (Setiawan, Prasojo, and Mehta 2021) who state that the hybrid learning model can increase students' flexibility and engagement in the learning process.

Table 1. Digital Use and Needs in Islamic Education

Aspect	Finding	Recommendation
Device access	Students have devices (phones/tablets/laptops)	Guide use for learning; set classroom device rules
Usage pattern	Mostly for communication/entertainment	Create digital-learning tasks and assignments
Digital literacy (Islamic content)	Not optimal for finding/evaluating Islamic resources	Provide media-literacy training and curated sources
Teaching method	Dominated by conventional face-to-face	Integrate blended or digital project-based activities
Infrastructure & teacher readiness	Varies; teacher ICT skills uneven	Offer teacher ICT training and offline material options

At the planning stage, research was conducted through needs analysis and the identification of learning problems. The results of the observations showed that students already had access to digital devices, but their use to support Islamic education learning was still relatively low. Students used digital media more for communication and entertainment than for academic activities. This condition indicates that students' digital literacy has not developed optimally, especially in accessing and utilizing digital-based Islamic resources. In addition, Islamic education learning is still dominated by conventional face-to-face methods, limiting students' opportunities to develop digital skills.

The results of interviews with lecturers and faculty leaders showed that the institution actually has policies, academic regulations, and supporting facilities for the digitization of learning that are aligned with the university's vision and mission. The faculty has also provided hybrid and blended

learning tools to support the technology-based learning process. These findings indicate that the development of hybrid learning models is important in creating a learning system that is relevant to the digital era. In this context, the Plomp development model is considered appropriate because it consists of systematic stages ranging from investigation, design, implementation, evaluation, and revision of learning products (Rochmad 2012).

At the learning stage, the researcher explored theories, concepts, and previous studies related to digital literacy, technology-based learning, and hybrid learning approaches. Digital literacy is understood as the ability of individuals to access, understand, evaluate, and produce information using digital technology (Nasrawati 2022). In the context of Islamic education, digital literacy is not only related to technical skills but also to the ability to select credible Islamic sources and utilize digital media as a means of da'wah and the development of Islamic knowledge. This is supported by Eshet-Alkalai's digital literacy theory, which emphasizes the importance of visual, informational, and social literacy in the use of digital technology, as well as the TPACK theory, which integrates technology, pedagogy, and learning content (Cicha et al., 2021).

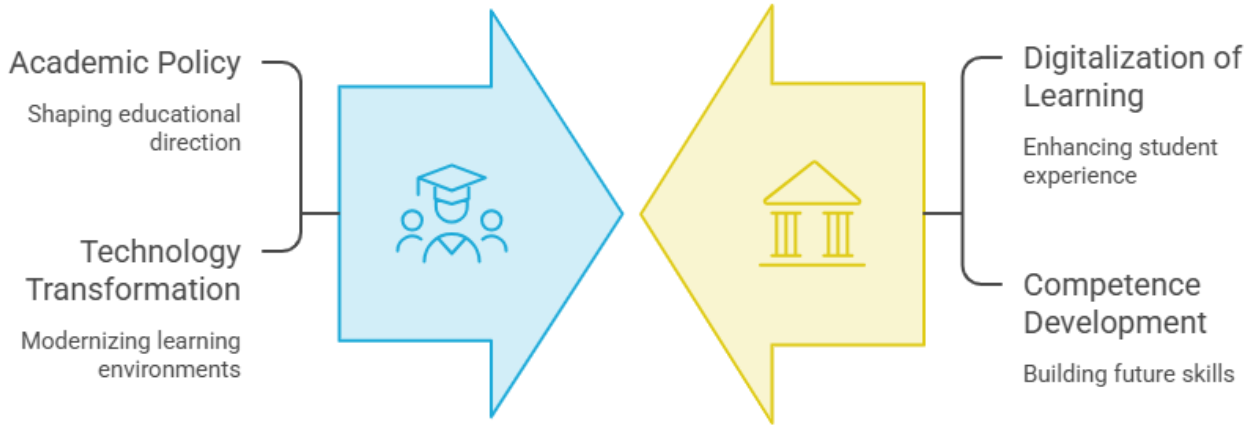

Figure 2. Digital Transformation in Higher Education

The results of the interviews showed that lecturers gained new experiences in implementing hybrid learning strategies that were more interactive and innovative. Lecturers are beginning to understand the importance of using technology as part of improving professional competence in higher education. Meanwhile, the faculty considers the digitalization of learning to be an important part of academic policy development and the transformation of technology-based higher education.

The implementation phase focuses on the preparation of hybrid learning designs through the development of learning tools such as digital-based RPS, electronic modules, learning videos, and the use of the Learning Management System (LMS). Hybrid learning is designed by combining face-to-face learning and online learning through virtual discussions, digital literature searches, and multimedia-based presentations (Simbolon et al., 2019). The results of the study showed that lecturers received technical training in the use of e-learning, while students began to adapt to a more flexible blended learning pattern.

The implementation of hybrid classes in this study is in line with the concept of hybrid learning proposed by (Abdullah and Luhriyani 2018) which states that hybrid learning is a combination of several learning methods aimed at improving students' understanding. In addition, the use of technologies such as LMS, video conferencing applications, and digital media supports synchronous interaction between students who learn online and offline (Simbolon et al., 2019). This approach is also consistent with the Blended Learning Model theory proposed by Horn and Staker,

which emphasizes the integration of technology and face-to-face learning to create a more flexible and personalized learning experience.

At the operational stage, the hybrid model is applied directly in the Islamic Education learning process. Learning is carried out through a combination of offline and online activities. Face-to-face sessions are used for deepening Islamic material, studying verses and hadiths, and discussing Islamic values. Meanwhile, online learning is used for project-based assignments, digital reference searches, online discussions, and the development of simple digital da'wah media. Students are also involved in collaborative learning through the preparation of Islamic literacy-based articles and multimedia presentations.

The results of the implementation show an increase in student participation and enthusiasm in both online and offline learning. Students become more active in seeking digital information, engaging in critical discussions, and utilizing technology to support the learning process. Lecturers are also beginning to adapt better to managing hybrid-based learning. These findings reinforce the opinion of (Decline, 2025) which states that hybrid learning is able to increase student understanding through the use of digital technology that supports effective learning interactions.

At the monitoring stage, evaluation is carried out through observations, interviews, questionnaires, and analyses of student assignments. The results of the evaluation showed a significant improvement in students' digital literacy skills, especially in accessing credible Islamic sources, critically evaluating digital information, and presenting Islamic knowledge in digital form. Lecturers also experienced improvements in their skills in using e-learning, managing LMS platforms, and developing digital teaching materials. At the institutional level, the implementation of hybrid learning has had a positive impact on the quality of learning, the satisfaction of the academic community, and the image of the university as an institution that is adaptive to technological developments.

These findings show that digital literacy is an important competency in higher education in the digital era. Digital literacy is not only related to technical skills, but also to the ability to think critically in managing digital information ethically and productively (Dr. Usman et al. 2022). Thus, the model of developing Islamic education based on hybrid learning is able to create synergy between Islamic values and digital technology, so that students not only possess academic abilities but also demonstrate character and ethics in the use of technology.

Overall, this research produces a product in the form of a hybrid learning model based on Islamic education that can be used as a reference for universities in developing innovative learning that is relevant to the demands of the 21st century (Adnyana , 2022). This model emphasizes the integration of digital technology, digital literacy, and Islamic educational values in order to create effective, adaptive, and holistically oriented learning for student competency development (Park et al., 2021)

The implementation of hybrid learning also indicates a shift in the role of lecturers from being the primary source of knowledge to becoming facilitators who guide students in accessing, evaluating, and applying information. This transformation is particularly relevant in Islamic Education, where students are expected not only to understand religious concepts but also to develop the ability to connect Islamic teachings with contemporary social and technological realities. The availability of digital learning resources enables lecturers to provide students with broader access to Islamic literature, scholarly articles, digital Qur'anic resources, and other academic materials. This learning environment encourages students to become more independent while lecturers maintain an important role in ensuring the validity and relevance of the sources used.

Student independence becomes another important outcome of the hybrid learning model. The combination of face-to-face instruction and online activities requires students to manage learning schedules, complete digital assignments, search for references independently, and participate in virtual discussions. Such activities encourage students to assume greater responsibility for their own learning process. This finding supports the characteristics of student-centered learning, in which students are actively involved in constructing knowledge rather than merely receiving information from lecturers. Increased learning autonomy is particularly valuable in higher education because it prepares students to engage in lifelong learning and adapt to rapidly changing knowledge environments.

The flexibility offered by hybrid learning contributes to improved accessibility of the learning process. Students can access teaching materials, recorded explanations, electronic modules, and assignment instructions beyond regular classroom hours. This flexibility allows students to review materials according to their individual learning needs and learning pace. Students who require additional time to understand Islamic concepts can revisit learning materials through the LMS, while those who learn more quickly can explore additional digital resources. Such flexibility reflects the principle of personalized learning emphasized in blended and hybrid learning approaches.

The integration of digital media also provides opportunities to present Islamic Education materials in more diverse and engaging forms. Religious concepts that were previously delivered mainly through lectures and printed textbooks can be presented through videos, infographics, digital presentations, interactive discussions, and multimedia projects. The variety of learning resources can help students understand abstract concepts through more contextual representations. Learning about Islamic ethics, social responsibility, and religious practices, for example, can be connected with contemporary cases found in digital environments, allowing students to examine the relevance of Islamic values in everyday life.

Collaborative activities within the hybrid learning environment also contribute to the development of students' communication and teamwork skills. Online discussion forums, group projects, and multimedia presentations provide opportunities for students to exchange ideas and develop shared interpretations of Islamic educational issues. Collaborative learning allows students to encounter different perspectives and encourages them to provide arguments supported by relevant religious and academic sources. This process is important because Islamic Education in higher education should develop not only knowledge acquisition but also intellectual openness, mutual respect, and the ability to engage in constructive academic dialogue.

The development of critical thinking is closely related to the improvement of students' digital literacy. The large amount of religious information available on digital platforms creates both opportunities and challenges for learners. Students can easily access religious lectures, articles, interpretations, and discussions, but the quality and credibility of such information vary considerably. Hybrid learning provides an appropriate educational environment for lecturers to train students to distinguish scholarly sources from unverified information. Students can be guided to examine authorship, institutional affiliation, references, evidence, and the academic credibility of digital materials before using them in academic assignments or religious discussions.

This ability to evaluate digital information becomes increasingly important because misinformation and oversimplified religious content can circulate rapidly through social media. Digital literacy in Islamic Education therefore cannot be limited to operating technological devices or accessing online platforms. It must include epistemological awareness regarding the origin, authority, reliability, and interpretation of religious information. Students need to understand that the accessibility of information does not automatically guarantee its accuracy. The hybrid model provides

lecturers with opportunities to incorporate source evaluation activities into regular learning practices, thereby strengthening students' academic and religious responsibility.

Ethical digital behavior also represents an important dimension of the model developed in this study. Islamic Education provides a strong normative foundation for responsible communication, respect for others, honesty, and accountability. These values can be directly connected with students' activities in online learning environments. When participating in discussion forums, submitting assignments, using digital references, or producing online content, students are encouraged to apply ethical principles such as avoiding plagiarism, respecting intellectual property, maintaining appropriate communication, and verifying information before sharing it. Digital competence developed through this model therefore contains both technical and moral dimensions.

The integration of Islamic values into technology-supported learning distinguishes this model from approaches that focus solely on technological innovation. Technology is positioned as a learning instrument rather than the ultimate objective of education. The effectiveness of digital tools depends on how they contribute to the intellectual, spiritual, social, and ethical development of students. This perspective prevents the adoption of technology from becoming merely procedural or symbolic. Hybrid learning becomes meaningful when technological resources are intentionally used to strengthen learning outcomes and support the formation of students who are academically competent and ethically responsible.

Lecturer readiness remains a critical factor in determining the effectiveness of hybrid learning. The findings indicate that technical training contributes to lecturers' confidence in operating LMS platforms, preparing electronic materials, and managing online learning activities. Technical capability alone, however, is insufficient. Lecturers also need pedagogical competence to determine which learning activities should be conducted face-to-face and which can be delivered effectively online. Poorly designed hybrid learning may simply transfer conventional lectures to digital platforms without changing the learning experience. Effective implementation therefore requires careful instructional design that considers learning objectives, student characteristics, teaching methods, assessment strategies, and technological suitability.

The assessment system must also adapt to the characteristics of hybrid learning. Conventional examinations remain useful for measuring certain forms of knowledge, but they may not fully represent competencies developed through digital and collaborative learning. Project assignments, reflective writing, multimedia presentations, online discussions, and digital portfolios can provide complementary evidence of student learning. In Islamic Education, these forms of assessment can evaluate students' ability to interpret religious concepts, apply Islamic values to contemporary problems, communicate ideas, and produce responsible digital content. The use of diverse assessment methods consequently supports a more comprehensive evaluation of students' cognitive, practical, and attitudinal development.

Several challenges observed during implementation should also be considered when interpreting the effectiveness of the model. Differences in internet access, ownership of digital devices, technological competence, and students' learning habits can influence participation in hybrid learning. Flexible learning does not automatically guarantee equal learning opportunities when technological facilities are unevenly distributed. Institutions therefore need to ensure adequate internet infrastructure, technical assistance, accessible digital resources, and alternative learning arrangements for students who experience technological limitations. Addressing these factors is necessary to prevent hybrid learning from creating new forms of educational inequality.

Institutional commitment becomes essential for maintaining the sustainability of hybrid learning beyond an individual course or lecturer initiative. Universities need clear policies regarding

the use of LMS platforms, digital learning standards, lecturer capacity development, technical support, and evaluation mechanisms. Collaboration among academic leaders, lecturers, information technology units, and students can strengthen the implementation process. Continuous evaluation is also required because technological tools, student characteristics, and learning needs continue to change. A hybrid learning model should therefore be viewed as an adaptive system that requires ongoing improvement rather than as a fixed learning format.

The broader implication of these findings is that hybrid learning can contribute to the transformation of Islamic higher education when technological innovation is integrated with appropriate pedagogy and Islamic educational values. The model offers opportunities to develop students who are digitally literate, academically independent, critical in evaluating information, collaborative in solving problems, and responsible in using technology. Its contribution is therefore not limited to improving the efficiency of teaching and learning activities. The model represents an educational approach that responds to the demands of contemporary higher education while preserving the ethical and spiritual orientation of Islamic Education, making it potentially relevant for wider implementation and further development in different Islamic higher education contexts.

The findings also suggest that hybrid learning has the potential to strengthen students' learning engagement by providing multiple forms of interaction throughout the learning process. Engagement is no longer limited to classroom attendance but extends to participation in online forums, digital assignments, collaborative projects, and independent exploration of learning resources. This wider learning space gives students more opportunities to express ideas and respond to academic issues that may not be fully discussed during face-to-face meetings. Such engagement is particularly important in Islamic Education because meaningful learning requires students to reflect on religious concepts and relate them to actual social conditions rather than merely memorizing theoretical knowledge.

Another important aspect is the contribution of hybrid learning to the development of information management skills. Students are exposed to a large number of digital references that require them to select, organize, compare, and synthesize information from different sources. This process can improve their ability to construct arguments based on relevant evidence and credible references. In Islamic Education, information management skills are especially important because students must be able to distinguish between authoritative religious sources, academic interpretations, popular opinions, and unverified content circulating on digital platforms. The learning model therefore contributes to strengthening both academic literacy and responsible religious understanding.

The hybrid learning model also creates opportunities for lecturers to provide more continuous and varied feedback. Feedback can be delivered directly during face-to-face meetings or through LMS comments, online discussions, and digital assessment tools. More frequent feedback enables students to identify weaknesses in their understanding and improve assignments before reaching the final stage of assessment. This process supports formative learning because assessment becomes part of the learning process rather than merely a mechanism for assigning grades. In Islamic Education, formative feedback can also help lecturers correct misunderstandings related to religious concepts and guide students toward more accurate and contextual interpretations.

The implementation of the model further indicates that technological innovation should be accompanied by reflective pedagogical practices. Lecturers need to regularly examine whether the technologies used actually improve learning quality or merely increase the number of digital activities. Excessive use of technology without clear pedagogical purposes can create cognitive overload and reduce the effectiveness of learning. The selection of LMS features, videos, discussion platforms, and digital projects should therefore be based on specific learning objectives. This

consideration is important to ensure that technology remains supportive of meaningful learning rather than becoming an additional burden for lecturers and students.

Finally, the sustainability of hybrid learning depends on continuous improvement based on evaluation data and user experiences. Feedback from students and lecturers can be used to identify technical difficulties, instructional weaknesses, and opportunities for further development. Regular evaluation can also help institutions adjust learning policies, improve digital infrastructure, and design relevant professional development programs for lecturers. The model developed in this study should therefore be regarded as a dynamic framework that can be refined according to institutional conditions and technological developments. Its long-term effectiveness will depend on the ability of universities to maintain a balance between innovation, pedagogical quality, accessibility, and the preservation of Islamic educational values.

CONCLUSION

Based on the results of the research, it can be concluded that the implementation of the hybrid classroom-based Islamic education development model using the Plomp Model is able to improve the quality of learning and the digital literacy of students in the PAI Study Program. This model is implemented through several interrelated stages, namely planning, learning, implementation, operation, and monitoring, resulting in a learning system that is more flexible, interactive, and relevant to the development of digital technology.

The results of the study show that the implementation of hybrid learning has a positive impact on students, lecturers, and institutions. Students experience improvements in digital literacy skills, especially in accessing, evaluating, and utilizing digital-based Islamic resources critically and responsibly. Lecturers also experience increased competence in utilizing learning technology, managing e-learning, and developing digital media and teaching materials. In addition, institutions benefit through improvements in the quality of learning, the strengthening of a technology-based academic culture, and the enhancement of the university's image as an institution that is adaptive to developments in the digital era.

Thus, the hybrid learning model based on Islamic education can be used as an innovative alternative for learning development in higher education because it is able to integrate digital technology with Islamic educational values effectively. This model also supports the creation of learning that is not only oriented toward mastery of technology, but also toward the development of students' character, ethics, and critical thinking skills in accordance with the principles of Islamic education.

DECLARATION OF AI AND AI ASSISTED TECHNOLOGIES IN THE WRITING PROCESS

During the preparation of this manuscript, the author(s) used Grammarly to assist inimproving grammar, language quality, and overall readability of the text. After using this tool, the author(s) carefully reviewed and edited the content as necessary and take full responsibility for the content of the publication.

AUTHORS' CONTRIBUTION

Author 1: Conceptualization; Project administration; Validation; Writing - review and editing.
Author 2: Conceptualization; Data curation; In-vestigation.
Author 3: Data curation; Investigation.
Author 4: Formal analysis; Methodology; Writing - original draft.

DECLARATION OF COMPETING INTEREST

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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