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Artificial Intelligence Intervention for Digital Literacy and Digital Amnesia Among Islamic Education Students at Universitas Terbuka in Society 5.0

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Abstract

This study examines the impact of Artificial Intelligence (AI) interventions on digital literacy, digital amnesia, and the readiness of Universitas Terbuka (UT) students in the Islamic Education Study Program to face the challenges of the Society 5.0 Era. Using a mixed methods approach with a sequential explanatory case study design, quantitative data from 100 students were analyzed using simple linear regression, while qualitative data were processed inductively. The findings reveal that AI interventions significantly enhance digital literacy by 81% (high category) and reduce digital amnesia by 65.7% (moderate category). AI interventions also prepare students for the Society 5.0 Era through active participation, the use of AI applications, positive interactions with tutors, technology utilization, and student collaboration. The study recommends strengthening technological infrastructure, providing tutor training, and developing AI-based learning materials to optimize learning at UT, enabling students to better face the challenges of the Society 5.0 Era.

Keywords: Artificial Intelligence, Digital Amnesia, Digital Literacy, Society 5.0

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INTRODUCTION

The development of information and communication technology has brought significant changes to various aspects of human life, including education. Universitas Terbuka (UT), as the largest distance education institution in Indonesia, plays a crucial role in ensuring that its students are not only able to keep up with technological advancements but also capable of optimizing them in the learning process. One of the greatest challenges faced by UT students in today's digital era is how they can develop strong digital literacy while avoiding the phenomenon known as digital amnesia.

Digital literacy, which includes the ability to access, use, read, create, and communicate digital information (Hagel, 2015), has become an essential skill for students facing the challenges of Society 5.0 (Veronika, 2023). This era is characterized by the integration of advanced technologies such as Artificial Intelligence (AI), the Internet of Things (IoT), and big data into all aspects of life (Anshori, 2020). To remain competitive in this increasingly technology-driven

society, students of Universitas Terbuka must possess adequate digital literacy skills.

However, as students become increasingly immersed in digital environments, a new cognitive risk begins to emerge—digital amnesia. Technological advancements bring not only benefits but also new challenges, one of which is digital amnesia. This term refers to the tendency of individuals to rely excessively on technology for storing and accessing information (Dirin, 2019a), which can weaken their cognitive ability to independently recall and understand that information (Yan, 2020). When students depend more on digital devices than on meaningful comprehension, their critical thinking and problem-solving abilities may be adversely affected.

In this context, Artificial Intelligence (AI) offers a potential solution to address these challenges. AI can be used to enhance students' digital literacy (Liu, 2021) while also helping to mitigate digital amnesia (Călinescu, 2022) by providing adaptive learning tools, virtual learning assistants, and analytical platforms tailored to individual learning needs. However, the extent to which AI interventions can be effectively implemented in a distance education environment such as Universitas Terbuka remains an open question. Can AI truly enhance the digital literacy of UT students—particularly in the Islamic Education Study Program—without exacerbating the phenomenon of digital amnesia? How can AI be used to balance the benefits of digital tools with the preservation of students' cognitive capacities?

These questions point to a significant research gap. First, there is a lack of studies that simultaneously examine the relationship between digital literacy and digital amnesia in the context of distance learning. Second, few empirical studies have explored the dual role of AI in both improving digital literacy and reducing cognitive dependency on digital technologies. Third, there is a noticeable absence of research focusing specifically on students in the Islamic Education Study Program at Universitas Terbuka, a group that faces unique challenges in integrating modern technology with religious educational values. This research is therefore designed to address these gaps by analyzing the role of AI in enhancing digital literacy among students in the Islamic Education Study Program at Universitas Terbuka while also exploring how AI can help overcome digital amnesia in order to prepare students for active, independent, and productive participation in the Society 5.0 era.

From a novelty perspective, this study provides an interdisciplinary and context-specific approach. It is among the first to integrate the topics of digital literacy, digital amnesia, and artificial intelligence into a single, holistic educational framework, particularly in the realm of Islamic distance education. Moreover, this research aims to develop AI-based learning strategies that not only improve students' technological competencies but also maintain their ability to think critically and retain information. Thus, the outcomes of this study are expected to contribute meaningfully to the development of more effective educational strategies in the digital era and to strengthen the cognitive and digital competencies of Universitas Terbuka students in facing the challenges of the future.

RESEARCH METHOD

Research Design and Rationale

This study employs a mixed methods approach combining both quantitative and qualitative research (Creswell, 2014), specifically using a sequential explanatory design. The rationale behind this choice is to enable a comprehensive understanding of the research problem by starting with a broad measurement of variables (quantitative), followed by deeper exploration through participants' experiences (qualitative). This design is particularly suitable for answering the central research question regarding the effectiveness of AI intervention in enhancing digital literacy and reducing digital amnesia among students. The initial quantitative phase identifies trends and relationships, while the subsequent qualitative phase helps explain the "why" and "how" behind those findings, providing richer contextual insight (Tashakkori, 2010).

A case study method is used within the qualitative phase to allow in-depth analysis of a specific group of students undergoing AI-based learning interventions. This design is deemed appropriate because it facilitates detailed exploration of both individual and group-level experiences, which are crucial for understanding the nuanced impact of AI on cognitive and digital behavior in an open and distance learning environment.

Data Generation and Collection Procedures

Data generation in this study follows the sequential explanatory structure, where quantitative data are collected first, followed by qualitative data collection to elaborate on the initial results. The quantitative phase includes the administration of a structured questionnaire aimed at measuring: (1) students' levels of digital literacy; (2) symptoms of digital amnesia; and (3) the initial perceived impact of AI tools in learning activities.

After the quantitative findings are analyzed, the qualitative phase proceeds to deepen the interpretation of those results through observations, semi-structured interviews, and documentation analysis. The interviews aim to explore students' and lecturers' perceptions, experiences, and behavioral changes related to AI usage in the learning process.

Participants in this study include students and lecturers from the Islamic Education Study Program at Universitas Terbuka. A purposive sampling technique is used to ensure that selected individuals have relevant experience and knowledge about the integration of AI in distance education. The qualitative case study focuses particularly on a group of students involved in a specific AI intervention, selected based on their active participation and availability for follow-up interviews.

Data Source, Informants, and Key Informants

The data for this study were obtained from students enrolled in the Islamic Education Study Program at Universitas Terbuka. Quantitative data were collected through questionnaires distributed to 100 second-semester students, while qualitative data were gathered through in-depth interviews with 20 students, selected purposively based on their active engagement in AI-based learning activities. The research was conducted during the period of June to July 2024.

In this study, the informants refer to the students who participated in the survey and interviews, providing information about their experiences in using AI to enhance digital literacy and reduce symptoms of digital amnesia.

The key informants consist of course instructors and academic program coordinators, selected for their in-depth understanding of curriculum design, learning strategies, and the integration of technology in the teaching and learning process at Universitas Terbuka. These key informants provided contextual and strategic insights that supported the interpretation and analysis of the research findings.

Data Analysis Procedures

The analysis of data follows the mixed methods structure, where quantitative and qualitative data are analyzed separately but integrated in interpretation.

Quantitative analysis uses simple regression statistical methods to determine the effect of AI intervention on two main variables: students' digital literacy and digital amnesia. This helps quantify the relationship and provide a generalizable overview of patterns in the student population.

Qualitative analysis is conducted through thematic analysis to interpret and elaborate on the quantitative results. Data from interviews, observations, and documentation are coded to identify recurring themes related to students' experiences with AI. For instance, a conceptual theme such as "AI as a cognitive extension" may emerge, while operationally this could refer to students' reduced efforts in memorizing information due to reliance on digital tools.

An example: If the regression analysis reveals a statistically significant improvement in digital literacy but also a rise in indicators of digital amnesia, the qualitative phase might uncover underlying causes—such as students using AI for quick answers without critical engagement. Throughout this process, relevant literature (e.g., Creswell, 2014; Tashakkori, 2010) serves as a guide to ensure methodological consistency and validity.

Ethical Considerations

All participants will be informed about the purpose and procedures of the study, and their consent will be obtained prior to data collection. Confidentiality and anonymity will be maintained throughout the research process. Participation is voluntary, and respondents have the right to withdraw at any stage. Ethical clearance is obtained in accordance with the guidelines of Universitas Terbuka's research ethics committee.

RESULTS AND DISCUSSION

Based on the data collected, the findings reveal that Digital Literacy vs. Digital Amnesia: AI Intervention among Universitas Terbuka Students in the Islamic Education Study Program in the Society 5.0 Era encompasses three key aspects. First, AI intervention plays a significant role in enhancing the digital literacy of students in the Islamic Education Study Program, helping them acquire essential skills to navigate the digital era. Second, AI intervention assists in overcoming digital amnesia, enabling students to rely less on technology for information recall and fostering better cognitive engagement. Third, the intervention significantly impacts students' readiness to face the challenges of the Society 5.0 Era by equipping them with the necessary technological competence and adaptability. Each of these findings will be discussed in detail in the subsequent sections.

AI intervention in improving the digital literacy of Universitas Terbuka students in the Islamic Education Study Program

AI intervention has a highly significant impact (81%) on improving the digital literacy of students in the Islamic Education Study Program at Universitas Terbuka. The strong/high influence category indicates that students respond very positively to AI intervention (Ocaña-Fernández, 2019), which is likely due to the relevance of AI to the learning needs in the digital era (Sappaile, 2024). This also reflects the students' readiness to adapt to new technologies in supporting the teaching and learning process (Singh, 2016).

Table 1. The Extent of AI Intervention's Impact on Enhancing Students' Digital Literacy

Model Summaryb				
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.810[a]	.657	.653	6.721

a. Predictors: (Constant), AI Intervention in Learning

b. Dependent Variable: Digital Literacy Skills

The calculation results for the path coefficient of AI intervention's impact on improving the digital literacy of Universitas Terbuka students in the Islamic Education Study Program indicate a path coefficient value in the Beta column (Standardized Coefficients) of 0.810 for the path coefficient between X (AI intervention) and Y (digital literacy). The calculation details are as follows:

Table 2. Path Coefficient of AI Intervention's Impact on Students' Digital Literacy

Coefficients[a]						
Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	33.230	5.149		6.453	.000
	AI Intervention in Learning	.678	.050	.810	13.693	.000

a. Dependent Variable: Digital Literacy Skills

Based on the coefficients table, the AI intervention in improving students' digital literacy yielded a calculated t-value (t_{hitung}) of 13.693 and a p-value of 0.000, which is smaller than the significance level (α) used, i.e., 0.000 < 0.05. This indicates that the AI intervention variable (X) has a direct positive impact on the students' digital literacy skills variable (Y).

The path coefficient of AI intervention's impact on improving students' digital literacy was calculated, followed by significance testing using analysis of variance (ANOVA). The results of the significance test for the impact of AI intervention on enhancing students' digital literacy are as follows:

Table 3. Significance Testing of AI Intervention's Impact on Students' Digital Literacy

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	8469.530	1	8469.530	187.510	.000[b]
	Residual	4426.510	98	45.168		
	Total	12896.040	99			

a. Dependent Variable: Digital Literacy Skills

b. Predictors: (Constant), AI Intervention in Learning

Based on the results of the significance testing of AI intervention's impact on improving students' digital literacy, it was found that the p-value is smaller than the significance level (α) used (0.05), specifically 0.000 < 0.05. Therefore, the hypothesis of this study is accepted. This indicates that AI intervention has a significant impact on improving students' digital literacy.

This indicates that the path coefficient of the AI intervention's impact on improving the digital literacy of Universitas Terbuka students in the Islamic Education Study Program is significant and explains the direction and strength of the influence. In other words, based on the path coefficient, it is evident that there is a positive relationship between the AI intervention in learning and students' digital literacy skills. This means that as the level of AI intervention in learning increases, students' digital literacy skills also improve.

The magnitude of the AI intervention's impact on students' digital literacy in the Islamic Education Study Program at Universitas Terbuka is 81%, which is categorized as strong/high influence. For further clarification, please refer to the figure below:

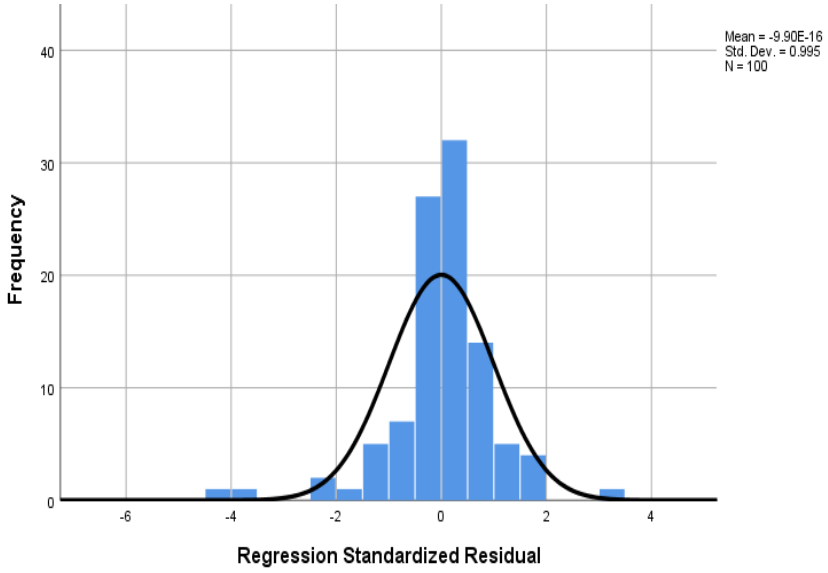

Figure 1. The Impact of AI Intervention on Students' Digital Literacy

Based on the results of the above tests, it is concluded that AI intervention in learning has been proven to significantly influence students' digital literacy skills

(Koranuva, 2020). Therefore, the hypothesis stating that "AI intervention can enhance the digital literacy of Universitas Terbuka students in the Islamic Education Study Program" is validated (Prastyo, 2024; Joseph, 2024; Muawanah, 2024). Consequently, the research objective to analyze the role of AI intervention in improving the digital literacy of Universitas Terbuka students in the Islamic Education Study Program can be realized/achieved.

AI Intervention in Assisting to Overcome Digital Amnesia Among Universitas Terbuka Students in the Islamic Education Study Program

The impact of AI intervention in overcoming digital amnesia is 65.7%, categorized as moderate/fairly strong (Ali, 2024). This percentage indicates that while AI is effective in helping students address digital memory loss, its influence is not as significant as in the aspect of digital literacy (Shanmugasundaram, 2023). This may be due to the complexity of the digital amnesia phenomenon, which requires not only technological solutions but also deeper psychological and educational approaches (Robert, 2024; Călinescu, 2024).

The extent of the impact of AI intervention in overcoming digital amnesia among students of Universitas Terbuka in the Islamic Education Study Program can be observed in the following calculation results:

Table 4. The Extent of AI Intervention's Impact in Overcoming Students' Digital Amnesia

Model Summary[b]				
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.682[a]	.466	.460	8.385
a. Predictors: (Constant), AI Intervention in Learning				
b. Dependent Variable: Digital Amnesia				

The calculation results for the path coefficient of AI intervention's impact in overcoming digital amnesia among students of Universitas Terbuka in the Islamic Education Study Program yielded a path coefficient value in the Beta column (Standardized Coefficients) of 0.903 for the path between X (AI intervention) and Y (digital amnesia). The detailed calculation is as follows:

Table 5. Path Coefficient of AI Intervention's Impact on Students' Digital Amnesia

Coefficients[a]						
Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	52.420	5.552		9.442	.000
	Digital Amnesia	.480	.052	.682	9.241	.000
a. Dependent Variable: AI Intervention in Learning						

Based on the coefficients table of AI intervention in reducing students' digital amnesia, the calculated t-value (t_{hitung}) is 9.241, and the p-value is 0.000, which is smaller than the significance level (α) used, i.e., 0.000 < 0.05. This indicates that the AI intervention variable (X) has a direct positive influence on the digital amnesia variable (Y) among students.

The calculated path coefficient of AI intervention in reducing students' digital amnesia was further tested for significance using analysis of variance (ANOVA). The following are the results of the significance test for the impact of AI intervention in reducing students' digital amnesia:

Table 6. Significance Testing of AI Intervention's Impact on Students' Digital Amnesia

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	6005.072	1	6005.072	85.401	.000[b]
	Residual	6890.968	98	70.316		
	Total	12896.040	99			

a. Dependent Variable: AI Intervention in Learning

b. Predictors: (Constant), Digital Amnesia

Based on the significance testing results of the impact of AI intervention in reducing students' digital amnesia, it was found that the p-value is smaller than the significance level (α) used (0.05), specifically 0.000 < 0.05. Therefore, the hypothesis in this study is accepted. This indicates that AI intervention has a significant impact on reducing students' digital amnesia. For further clarification, please refer to the figure below:

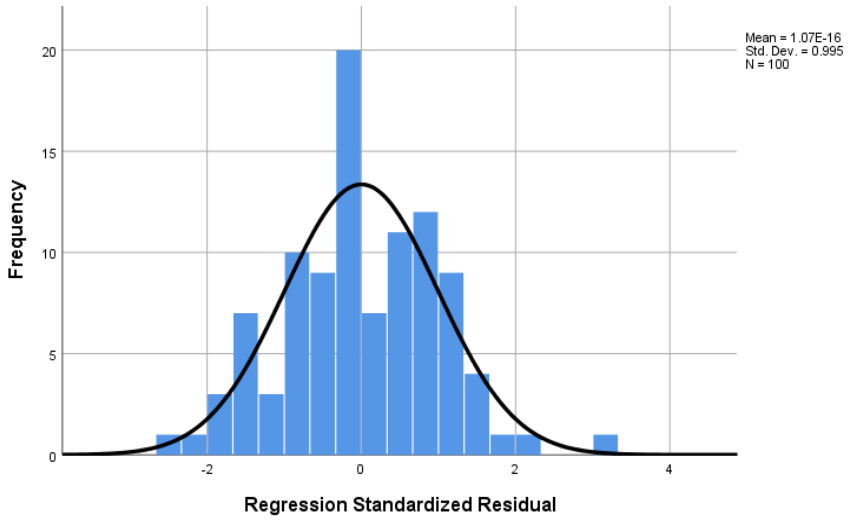

Figure 2. The Impact of AI Intervention on Students' Digital Amnesia

Based on the results of the above testing, it is concluded that AI intervention in learning has been proven significant in reducing students' digital amnesia (Dirin, 2019b; Yan, 2020; Tkachenko, 2024). Therefore, the hypothesis stating that "AI intervention can reduce digital amnesia among Universitas Terbuka students in the Islamic Education Study Program" is validated. Consequently, the research

objective of analyzing AI intervention in assisting to overcome digital amnesia among Universitas Terbuka students in the Islamic Education Study Program can be realized/achieved.

The Impact of AI Intervention on the Readiness of Universitas Terbuka Students in the Islamic Education Study Program to Face the Challenges of the Society 5.0 Era

Based on the data collected using an observation method with a checklist technique administered to 100 UT students, the following data were obtained:

Table 7. The Use of AI in Learning for UT Students

	Yes	No	Explanation
Students actively participate in discussions involving AI	60	40	60 out of 100 students actively participated in discussions involving AI, while 40 students were less engaged. This indicates that student participation varies, with some being more active than others.
Students utilize AI applications in assignments or presentations	55	45	The use of AI applications is limited to certain tasks. Students commonly use ChatGPT, Google Assistant, Grammarly, Canva, Mendeley, Cap Cut.
There is positive interaction between students and tutors regarding AI	50	50	The interaction between students and tutors regarding AI remains focused on technical aspects, without in-depth discussions about its benefits or impacts, highlighting the need for improvement.
Students demonstrate enthusiasm toward the use of AI	65	35	Based on the observation, 65 out of 100 students showed enthusiasm toward the use of AI, while 35 did not. This indicates a generally positive response, although interest is not yet consistent among all students.
The use of AI appears to facilitate understanding of the taught materials	58	42	58 out of 100 students felt that the use of AI helped them understand the material, while 42 students experienced difficulties. This suggests that AI is beneficial for many, but

	Yes	No	Explanation
			some still struggle with its application.
Students are able to explain how to use the AI tools employed	45	55	Only 45 out of 100 students were able to explain how to use the AI tools, while 55 students still needed assistance. This indicates that many students still require guidance in using AI effectively.
There is the use of AI-related tools (hardware/software)	70	30	70 out of 100 students reported using AI-related tools (hardware/software), while 30 students did not. This shows that most students use laptops or similar devices, though not all have access or use them regularly.
Students provide feedback on the effectiveness of AI usage	55	45	Feedback varies, requiring further analysis.
There is collaboration among students in using AI	40	60	Collaboration is still minimal, with students often working individually.
Tutors provide clear guidance on the use of AI	75	25	Guidance is generally good but occasionally lacks detail.
Average (%)	57%	42,7%	

These results provide a general overview of the challenges and opportunities in implementing AI among UT students and can serve as a basis for developing better strategies for integrating AI into learning (Owoc, 2021; Rahayu, 2023). The overall calculation shows that, on average, 57.3% of students are engaged in various aspects of AI usage in learning, while 42.7% are not fully active or face obstacles.

The results of the checklist-based observation were followed by direct interviews conducted with 20 Universitas Terbuka students. To enhance student participation in discussions involving AI, it is essential to create an inclusive and supportive classroom environment (Salas-Pilco, 2022),where students feel safe to share their opinions. Tutors should provide emotional support and gradually encourage shy students to speak (White, 2022; He, 2024). Implementing collaborative learning techniques can help students share ideas in small groups before speaking in front of the class. AI can also be utilized to facilitate discussions, such as by generating group-specific questions. Providing positive feedback to participating students and offering effective AI usage training can boost their confidence (Brandon, 2021; Delfino, 2019). Additionally, icebreaker activities involving AI can help students feel more at ease before the discussion begins (Verma, 2011).

Furthermore, AI intervention can enhance the readiness of UT students to face the challenges of the Society 5.0 Era. On the second indicator, data revealed that

some students use AI applications to support their assignments and presentations. However, there is also an awareness of the importance of maintaining creativity and avoiding over-reliance on technology. The data indicates that students need to balance the use of AI applications, such as Grammarly and ChatGPT, with the development of creativity and critical thinking (Vincent-Lancrin, 2020; Reddy, 2022; Rong, 2022). They should set boundaries for AI usage, such as limiting it to grammar checks or generating initial ideas (Bonner, 2023). Additionally, students are encouraged to independently explore ideas before utilizing AI and to participate in creativity training programs (Eapen, 2023; Ivcevic, 2024). Reflecting on AI usage is also essential to evaluate its impact on the learning process and outcomes achieved (Pretorius, 2023; Bozkurt, 2023).

Positive interactions between students and tutors regarding AI were observed, with tutors providing guidance and sharing their experiences. However, students expressed a desire for more concrete examples to enhance their understanding. The interview results indicate that students should request tutors to provide more concrete examples of AI utilization during learning, even though interactions between students and tutors are already positive (Escalante, 2023; Hutt, 2024). Tutors can continue offering guidance and sharing personal experiences, but incorporating practical examples would better assist students in addressing challenges when using AI.

Students' enthusiasm for using AI is relatively high; however, they recognize the importance of gaining a deeper understanding to effectively utilize AI in learning. The interview results indicate that both students and tutors need to enhance their deeper understanding of effectively using AI in learning (Kashive, 2020; Markus, 2024). While enthusiasm for AI is high and new applications can accelerate the learning process, deeper learning will ensure the optimal utilization of AI to improve material comprehension.

The use of AI generally helps students better understand the material, although there is still a need for direct guidance from tutors in certain cases. The interview results indicate that students should utilize AI for additional explanations and quick access to information, but they must also rely on tutor guidance to grasp deeper concepts. This combination will help them better understand challenging materials.

The readiness of Universitas Terbuka (UT) students to face the challenges of the Society 5.0 Era through AI utilization is also reflected in the interview results**.** Based on the research data, only 45 out of 100 students were able to explain how to use the AI applications they employed. This indicates that while some students possess a basic understanding, a majority (55 students) still require further guidance in effectively navigating AI features. Students also acknowledged that several features remain unexplored, and additional training would be beneficial to enhance their comprehension. Moreover, many reported that some features remain unclear and that they often feel confused by application updates. Follow-up actions may include organizing additional training sessions facilitated by tutors to help students understand new features of frequently used AI applications. Regular briefings on application updates should also be provided to ensure that students stay informed and up to date. Additionally, creating forums or discussion groups is essential as a platform where students can share tips, experiences, and challenges in using AI applications. Additional resources such as online tutorials or instructional videos should be made available to help students independently explore new features (Bye,

2017). Lastly, surveys or evaluations can be conducted to gather feedback from students on the training provided and their future needs regarding AI usage.

Both students and tutors need to ensure the availability of devices (Owoc, 2021), such as laptops and smartphones, to effectively access AI applications. Additionally, maintaining a stable internet connection is crucial, as internet speed can significantly impact the learning process. Tutors are expected to provide support in optimizing the use of AI to make learning more effective.

Students should continue providing positive feedback regarding the use of AI in learning (Hutt, 2024), as AI helps them complete tasks more quickly and efficiently. However, they must remain critical of the information generated by AI, considering the potential for inaccuracies. It is therefore essential to verify information from other sources. Additionally, students should actively seek feedback from tutors, as such input can help them better understand how to effectively utilize AI and improve their learning approaches. In this way, they can enhance their learning outcomes while optimizing AI usage.

Students need to enhance collaboration in utilizing AI by engaging in more group activities that involve discussions and shared learning (Ito, 2021; Kueper, 2024). Although they already share experiences and discuss AI applications, more structured collaboration could help deepen their understanding. Tutors are also encouraged to facilitate more group activities involving AI, allowing students to learn from one another and develop collaborative skills. This approach will enrich and broaden their learning experiences, making them more comprehensive.

Overall, AI intervention has significant potential to enhance the readiness of UT students in facing the challenges of the Society 5.0 Era. However, further efforts are needed in providing training, fostering collaboration, and deepening the guidance provided by tutors to ensure that the utilization of AI becomes more optimal and effective in the learning process.

CONCLUSION

Based on the findings and discussions of this research, it can be concluded that AI intervention has a significant impact on various aspects of learning for students in the Islamic Education Study Program at Universitas Terbuka. *First*, AI intervention has a significant impact of 81% on improving students' digital literacy, categorized as a strong/high influence. *Second*, AI helps in overcoming students' digital amnesia with a significant impact of 65.7%, categorized as moderate/fairly strong influence. *Third*, AI intervention also enhances students' readiness to face the challenges of the Society 5.0 Era. This is reflected in students' active participation in discussions involving AI, the use of AI applications in assignments and presentations, and positive interactions between students and tutors. Students demonstrate high enthusiasm for using AI, ease in understanding materials, and the ability to explain the use of AI applications. Additionally, students utilize AI-related tools, provide positive feedback on the effectiveness of AI, and collaborate in its usage. Clear guidance from tutors further supports the optimization of AI usage in learning.

These conclusions indicate that AI intervention has great potential in enhancing digital literacy, addressing digital amnesia, and preparing students to face the challenges of the Society 5.0 Era, although further development is needed in training, collaboration, and tutor guidance.

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