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Implementation of Artificial Intelligence (AI) based Multiple Choice Question Generation Flow in Improving Islamic Education Learning

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Abstract: *This research aims to implement Artificial Intelligence (AI) in the creation of multiple-choice questions to improve the effectiveness of Islamic Religious Education (PAI) learning. As technology develops, AI offers innovative solutions in compiling questions automatically, systematically, and according to the desired level of difficulty. This study uses the literature review method to analyse references related to the application of AI in the preparation of questions. The results of the study identified five main stages in the implementation of AI for question making, namely: (1) preparation and planning, which includes the identification of learning needs; (2) the process of creating questions with AI, where the system compiles questions based on certain parameters; (3) review and validation of questions by educators to ensure quality; (4) implementation in learning as an evaluation instrument; and (5) evaluation and development, which involves the analysis of the effectiveness of the questions. The results show that AI can improve efficiency, objectivity, and adaptability in learning assessment. Teachers can save time in composing questions, while AI helps tailor questions to students' abilities. Thus, the use of AI in the evaluation of PAI learning not only increases efficiency, but also improves the overall quality of education.*
Keywords: *PAI Learning, Artificial Intelligence, Multiple Choise Questions*

Abstrak: Penelitian ini bertujuan untuk mengimplementasikan Artificial Intelligence (AI) dalam pembuatan soal pilihan ganda guna meningkatkan efektivitas pembelajaran Pendidikan Agama Islam (PAI). Seiring berkembangnya teknologi, AI menawarkan solusi inovatif dalam menyusun soal secara otomatis, sistematis, dan sesuai dengan tingkat kesulitan yang diinginkan. Penelitian ini menggunakan metode literature review untuk menganalisis referensi terkait penerapan AI dalam penyusunan soal. Hasil penelitian mengidentifikasi lima tahapan utama dalam implementasi AI untuk pembuatan soal, yaitu: (1) persiapan dan perencanaan, yang mencakup identifikasi kebutuhan pembelajaran; (2) proses pembuatan soal dengan AI, di mana sistem menyusun soal berdasarkan parameter tertentu; (3) review dan validasi soal oleh tenaga pendidik untuk memastikan kualitas; (4) implementasi dalam pembelajaran sebagai instrumen

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evaluasi; dan (5) evaluasi serta pengembangan, yang melibatkan analisis efektivitas soal. Hasil penelitian menunjukkan bahwa AI dapat meningkatkan efisiensi, objektivitas, dan adaptabilitas dalam penilaian pembelajaran. Guru dapat menghemat waktu dalam menyusun soal, sementara AI membantu menyesuaikan soal dengan kemampuan siswa. Dengan demikian, pemanfaatan AI dalam evaluasi pembelajaran PAI tidak hanya meningkatkan efisiensi, tetapi juga memperbaiki kualitas pendidikan secara keseluruhan.
Kata Kunci: *Pembelajaran PAI, Artificial Intelligence (AI), Soal Pilihan Ganda*

Introduction

The rapid growth of internet technology has significantly expanded educational prospects with information access opportunities. In the era of big data, the world affects all aspects of life, philosophy and politics, and this impact significantly affects intellectual and political learning, including the impact on education and education providers. Multicultural education is a pedagogical approach that advocates equitable access to education and seeks to build a heterogeneous and well-rounded academic environment that caters to students of various cultural origins. a comprehensive overview of artificial intelligence, covering basic concepts, types of AI, underlying technologies and AI capabilities.[1] Today, the world is facing tremendous change. Specifically in education, educational institutions are faced with challenges ranging from understanding the different ways students learn, to making decisions about what innovative technologies need to be used to deliver learning content and how to increase student motivation. This perspective proposes two paths that can be followed: exploring ways to improve teaching and learning with tools that have been around for several years, or looking for new tools to achieve the goal of improving the teaching-learning process. The challenge is not only the choice of technology, but also how to integrate it into current didactic strategies that play a fundamental role in improving learning in higher education and developing lifelong learning skills in students.

Artificial intelligence (AI) has influenced many industries in the modern world, and the world of education. Some AI-influenced fields include modeling of complex structures (Marwala in Update of finite element models using computational intelligence techniques: Application to structural dynamics). AI intersects with and changes the way learning systems are conceived, creating both benefits and difficulties. analyzes the relationship between AI and learning, emphasizing its impact on learning practices,

[1] Wolfgang Ertel, *Introduction to Artificial Intelligence Second Edition* (Springer Nature, 2024).

ethical issues, and potential regulatory consequences.[2] Research conducted by Huesca [3] Using an experimental design involving 356 students from a basic programming course in an engineering undergraduate program, we compared the normalized learning gains between a group using a Chat GPT-assisted flipped learning strategy (focus group) and a group following a traditional video-based flipped learning methodology (control group). incorporating Chat GPT into the flipped learning strategy can significantly improve student performance by providing a more active, interactive, and personalized approach during the teaching and learning process. We conclude that the flipped learning strategy, enhanced with the help of Chat GPT, provides an effective way to improve understanding and application of complex concepts in programming courses, with the potential to be extended to other subject areas in higher education. This study opens routes for future research on the integration of artificial intelligence into innovative pedagogical strategies with the aim of building learning experiences and improving educational outcomes.

The application of AI in PAI learning can have both positive and negative impacts on its users. The application of AI in PAI learning is relatively passive; AI is used to complete tasks such as finding references or paraphrasing and as an aid in explaining learning materials in class. The positive impact of this application helps in completing tasks as well as assisting lecturers in managing classes, delivering materials, and evaluating learning. The negative impact of AI applications is the emergence of misinformation and dependence on AI that causes laziness. Therefore, a deep understanding of the use of AI is required. The application of AI in PAI learning can bring changes such as innovation, effectiveness, and efficiency in learning. The negative impacts that arise can be minimized by increasing self-potential, deepening understanding of AI, and getting guidance from experts.[4]

Factors that influence its effectiveness in empowering learners to solve programming problems. In the process of empowering education with Artificial Intelligence Content (AIGC) products, the focus on learners should

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[2] Ryan Abbott, 'The Reasonable Robot: ARTIFICIAL INTELLIGENCE AND THE LAW', *The Reasonable Robot: Artificial Intelligence and the Law*, 2020, 1–196 <https://doi.org/10.1017/9781108631761>.

[3] 'Effectiveness of Using ChatGPT as a Tool to Strengthen Benefits of the Flipped Learning Strategy', *Education Sciences*, 14.6 (2024) <https://doi.org/10.3390/educsci14060660>.

[4] Ahmad Alfaid and Aida Hayani, 'Jurnal AL-Mahira : Pendidikan Agama Islam ANALISIS DAMPAK ARTIFICIAL INTELLIGENCE (AI) PADA PEMBELAJARAN PAI DI UNIVERSITAS ALMA ATA YOGYAKARTA', 1 (2024), 30–41.

shift from developing their AI usage to AI literacy, which becomes the basis for empowering learning with AIGC products. It is recommended to shift from mastery of specialized knowledge to graph-based rules as a method to empower learning with AIGC products. In addition, the focus should shift from increasing learners' intention to use technology to strengthening their technology awareness, thus creating a practical path to empower learning with AIGC products.[5]

Making multiple choice questions for research learning activities conducted by Zuhri et al, [6] recommends viewing AI as a support tool in developing test instruments. The questions generated by AI are only inputs for teachers, not the final instrument. The role of the teacher in this case is to collaborate with AI to optimize the role of AI in the realm of education. Teachers are expected to integrate AI technology creatively and ethically, creating a responsive and innovative learning environment. In conclusion, this workshop is an important step in preparing educators to face the demands of 21st century education and maximize the benefits of AI technology in the learning process.[7] Regarding relevance, more accurate information, and guidance on using ChatGPT in a learning context.

The importance of integrating technology in learning with appropriate and effective approaches, as well as developing competencies for teachers in managing technology-based learning, are important points in this context. [8] Practical steps such as visits, identification, socialization, training on the use of AI, especially storylines to develop multiple choice questions in learning have been carried out involving several SMK teachers in Tigaraksa-Tangerang. The evaluation results showed an increase in participants' understanding and enthusiasm for the use of storylines in preparing multiple-choice questions in practice and examinations. The results show that the utilization of artificial intelligence such as storylines can be an effective tool to improve the quality of learning at the SMK level.

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[5] Yuhui Jing and others, 'What Factors Will Affect the Effectiveness of Using ChatGPT to Solve Programming Problems? A Quasi-Experimental Study', *Humanities and Social Sciences Communications*, 11.1 (2024) <https://doi.org/10.1057/s41599-024-02751-w>.

[6] 'Analisis Validitas, Reliabilitas, Dan Tingkat Kesukaran Soal Bahasa Arab Tingkat SMP Berbasis Artificial Intelligence (AI) Melalui Platform QuestionWell', *Jurnal Pendidikan Dan Pembelajaran Indonesia (JPPI)*, 4.2 (2024), 693–704 <https://doi.org/10.53299/jppi.v4i2.576>.

[7] Hakeu and others, 'Workshop Media Pembelajaran Digital Bagi Guru Dengan Teknologi AI (Artificial Intelligence)', *Jurnal Pengabdian Kepada Masyarakat*, 2.2 (2023), 1–14.

[8] Theo Chanra Merentek, Elni Jeini Usoh, and Jeffri Sonny Junus Lengkong, 'Implementasi Kecerdasan Buatan ChatGPT Dalam Pembelajaran', *Jurnal Pendidikan Tambusai*, 7.3 (2023), 26862–69.

In previous studies oleh Li, [9] The research findings show that integrating IA technology and PDAMCA has successfully fostered cross-cultural competence and awareness among students, as evidenced by an average score of 93.6% on the Cross-Cultural competence index and 82.6% on the multicultural awareness index. The findings of the current study represent a significant alternative to prevailing pedagogical approaches, which increasingly rely on information technology in the process of improving conceptual understanding through the detection of conceptual misconceptions. In addition, recommendations are made for future research.[10]

The framework provides actionable insights for developers, practitioners, and decision-makers, guiding them towards a more equitable AI system. It advocates a holistic and collaborative approach to reducing bias, contributing to an inclusive tech ecosystem.[11] About predicting students' results in the final exam by determining their success or failure. In addition, we explore the importance of feature selection using the ubiquitous Lasso for dimensionality reduction to improve model efficiency, prevent overfitting, and examine its impact on prediction accuracy for each model, both with and without Lasso. This study provides valuable guidance for selecting and applying predictive models for tabular data classification such as student outcome prediction, which seeks to leverage data-driven insights for personalized education.[12]

Although the existing literature highlights the transformative potential of AI and multiple-choice writing, there is a clear lack of research in empirical studies examining their specific impact in the context of prior research into different types of learning integration. The literature synthesis underscores the need for targeted investigations into the utilization, challenges, and outcomes associated with the integration of AI and multiple-choice questions in enhancing PAI learning. Flowchrt Metological Framework:

1) Literature Review: A comprehensive review of existing literature on AI,

[9] 'Multicultural Data Assistance Mining Analysis for Ideological and Political Education in Smart Education Platforms Using Artificial Intelligence', *Wireless Networks*, 2024, 1–15 <https://doi.org/10.1007/S11276-024-03772-8/METRICS>.

[10] Yunus Kökver, Hüseyin Miraç, and Pektaş Harun, *Artificial Intelligence Applications in Education : Natural Language Processing in Detecting Misconceptions*, *Education and Information Technologies* (Springer US, 2024) <https://doi.org/10.1007/s10639-024-12919-1>.

[11] Rawan AlMakinah and others, 'Mapping Artificial Intelligence Bias: A Network-Based Framework for Analysis and Mitigation', *AI and Ethics 2024*, 2024, 1–20 <https://doi.org/10.1007/S43681-024-00609-0>.

[12] Helia Farhood and others, 'Predicting Student Learning Outcomes', 2024, 1–18.

multiple-choice question generation, learning theories, and PAI education.
2) Needs Assessment: Identify specific needs and challenges in current PAI assessment practices.
3) AI Tool Selection and Training: Select appropriate AI tools for generating multiple-choice questions (e.g., GPT models, specialized educational AI platforms). Train teachers on the use of these tools and their ethical considerations.
4) Question Development and Validation: Develop a set of multiple-choice questions using AI tools, followed by rigorous validation by subject matter experts and educators to ensure quality, accuracy, and alignment with learning objectives.
5) Implementation and Data Collection: Implement the AI-generated questions in real-world classroom settings. Collect data on student performance, teacher perceptions, and learning outcomes.
6) Data Analysis and Interpretation: Analyze the collected data using appropriate statistical methods to determine the effectiveness of AI-generated questions in enhancing student learning.
7) Dissemination and Recommendations: Disseminate the findings through publications, presentations, and workshops. Develop recommendations for best practices in integrating AI and multiple-choice questions into PAI education.

This framework provides a structured approach for conducting rigorous research on the integration of AI and multiple-choice questions in PAI learning.

Method

The research conducted uses library research so that the method used in the research is a literature review. The specific characteristics used as the basis for developing research knowledge include; This research is faced directly with the data or text presented, not with field data or through eyewitnesses in the form of events, researchers only deal directly with sources that already exist in libraries or ready-made data, and secondary data used.[13] Penelitian yang dilakukan menggunakan penelitian kepustakaan (library research) sehingga metode yang digunakan dalam penelitian adalah kajian pustaka. Ciri-ciri khusus yang digunakan sebagai dasar pengembangan pengetahuan penelitian antara lain; penelitian ini dihadapkan langsung dengan data atau teks yang tersaji, bukan dengan data lapangan atau melalui saksi mata yang berupa peristiwa, peneliti hanya berhadapan langsung

[13] Hannah Snyder, 'Literature Review as a Research Methodology : An Overview and Guidelines', *Journal of Business Research*, 104.March (2019), 333–39 <https://doi.org/10.1016/j.jbusres.2019.07.039>.

dengan sumber-sumber yang telah ada di perpustakaan atau data yang telah jadi, dan data yang digunakan data sekunder.

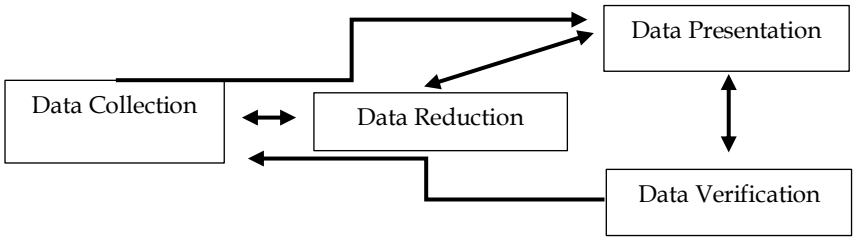

Figure 1: Interactive model of data flow
Reference: Miles dan Huberman (2014)

1. Data collection, is the process of collecting existing data in the field from the process of reviewing journals about making multiple choice questions to improve learning effectiveness using artificial intelligence so as to get the information needed for research purposes.
2. Data reduction, is a data analysis technique that explores, classifies, directs, separates unnecessary data, and organizes data in such a way as to obtain final and verified conclusions. Classifying journals and articles related to making multiple choice questions increase the effectiveness of learning using artificial intelligence.
3. Presentation of data, examining patterns that are useful for research and providing conclusions and taking action from possible data. Recording secondary data in the form of journals and articles about the utilization of augmented reality implemented in the module, thus obtaining some general conclusions from journals and articles about making multiple choice questions increase the effectiveness of learning using artificial intelligence.
4. Drawing conclusions/verification, is the act of concluding new findings that have never existed before. The analysis is done by generating general conclusions that lead to specific conclusions so as to find new findings about creating multiple-choice questions to improve learning effectiveness using artificial intelligence.

This research is also corroborated with references to books by Dagienė, [14] Open access data is currently lacking, and the visibility of national books on WorldCat relies heavily on contributions from national libraries and

[14] 'Mapping Scholarly Books: Library Metadata and Research Assessment', *Scientometrics*, 129.9 (2024), 5689–5714 <https://doi.org/10.1007/S11192-024-05120-1/METRICS>.

metadata suppliers. Encouraging the involvement of national libraries can improve the global visibility of domestic research. Further exploration is needed regarding long-term preservation, metadata ownership, and technical integration for effective standardization and better book evaluation. Analyzing the extent to which Library and Information Science (LIS) publishers use research data policies. Since the research data policy landscape is too complex among different publishers, the authors tried to analyze LIS publishers retrieved from ISI Web of Science according to 12 research data policy features identified from the literature for uniformity in analysis.[15]

Result and Discussion

To determine the effectiveness of the activity implementation, a pre-test was conducted. The pre-test is conducted before the training process begins. Where is the pre-test material taken from? Of course, it is taken from all materials related to learning assessment and evaluation. Items for the pre-test are developed to measure all the learning objectives set out in the lesson plan.

In general, the implementation of the training process begins with a pre-test. The functions of this pre-test include the following [16]:

1) To prepare trainees for the learning process, as the pretest will focus their minds on the questions they have to answer.
2) To determine the level of progress of trainees in relation to the training process. This can be done by comparing the results of the pretest with the post-test.
3) To determine the initial ability of the trainees regarding the teaching materials that will be the topic of the training process.
4) To know where the training process should start, which objectives the trainees have mastered, and which objectives need special emphasis and attention.

Chat GPT's ability to understand questions in natural language and provide responses similar to human responses makes it a popular tool for getting quick answers to a variety of questions, both common and complex. Chat GPT has quickly become a valuable resource for students and professionals alike. The latest version, ChatGPT-4, was released on March 14,

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[15] Kavya Asok, Dinesh Kumar Gupta, and Prashant Shrivastava, 'Research Data Policy : A Library and Information Science Publishers ' Perspective Research Data Policy : A Library and Information Science Publishers ' Perspective', *Quality & Quantity*, October, 2024 <https://doi.org/10.1007/s11135-024-01994-8>.

[16] Pengukuran Kualitas, Air Sumur, and Matsa Halmahera, 'Interaksi : Jurnal Pengabdian Kepada Masyarakat Interaksi : Jurnal Pengabdian Kepada Masyarakat', 1.1 (2024), 20–26.

2023 and is claimed to be more powerful and capable of performing more complex functions. ChatGPT-4 has been trained using a larger and more diverse data set, allowing for more advanced natural language processing capabilities. The larger model size increases its ability to reason and understand commands from different domains, making it more adaptive and capable of handling challenging tasks. For example, if a user submits an image and requests a description, Chat GPT can provide a detailed description of the image. In addition, ChatGPT responds well to handwritten questions presented in graphical form.

The effectiveness of AI-based adaptive learning tools is influenced by various factors. Content quality, student participation, teacher training, and the technology's ability to adapt play important roles. High-quality content ensures relevance and educational value, while an engaging interface helps maintain student interest. Teacher engagement is crucial to facilitate the smooth integration of these tools into the curriculum, creating a supportive environment for both educators and students. The use of artificial intelligence in education acts as a medium and support for learning. Thus, the learning process can run well and maximize. The use of artificial intelligence as a learning medium helps teachers, educators, and mentors in delivering material to students, making it easier for them to understand the lessons.

The flow in this literature study activity is through the following framework:

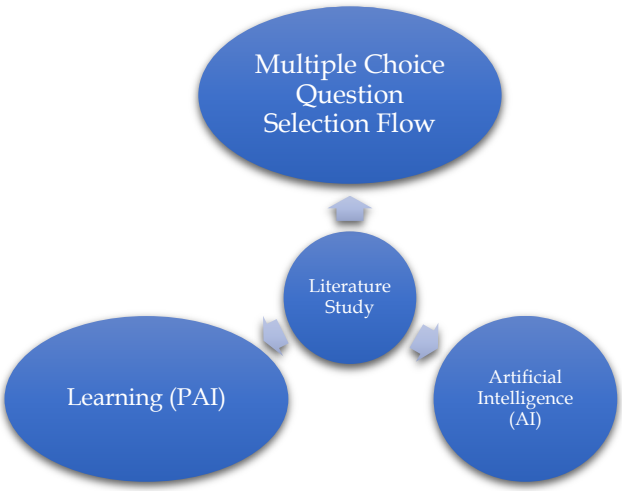

Figure 2. Flow of thinking framework

Selection of articles based on Scopus indexed international journals to be seen directly in various countries, previous research on making multiple

choice questions using artificial intelligence in improving learning effectiveness:

A. Flow of Multiple Choice Question Selection Using Artificial Intelligence (AI) to Enhance Islamic Education Learning

The initial stage of collection is to collect the subject matter that will be used as the basis for making questions. This material can be in the form of book texts, notes, articles, or other sources of information. The more complete and structured the material provided, the better the quality of the questions produced by AI.

1) Question selection

Topic and subtopic determination identifies the specific topics and subtopics to be tested on. This helps the AI to focus question generation on relevant areas. This study takes examples from several countries that carry out multiple-choice test research and other tests support in the thinking of this article.

Selection of articles based on Scopus indexed international journals to be seen directly in various countries, previous research on making multiple choice questions using artificial intelligence in improving PAI learning:

Table 1. Literatur review

Research	Title	Test Selection	Results
Badali [17]	*How do Students Reguler Their Use of Multiple Choice Practice Tests?*	Multiple choice questions	An experimenter-controlled group where participants completed practice tests until they achieved a greater number of correct answers during the exercise.
Butowska-Buczyńska [18]	*Errorful Learningof triva questions and*	Asking questions	A researcher-controlled group where participants completed practice

[17] Sabrina Badali, Katherine A. Rawson, and John Dunlosky, 'How Do Students Regulate Their Use of Multiple Choice Practice Tests?', *Educational Psychology Review*, 35.2 (2023), 1–26 <https://doi.org/10.1007/s10648-023-09761-1>.

[18] Ewa Butowska-Buczyńska, Maciej Hanczakowski, and Katarzyna Zawadzka, 'Errorful Learning of Trivia Questions and Answers: The Role of Study Time', *Memory and Cognition*, 0123456789, 2024 <https://doi.org/10.3758/s13421-024-01608-6>.

Research	Title	Test Selection	Results
	answers: The role of study time		tests until they achieved a greater number of correct answers during practice.
Seban [19]	*Comparing the effectiveness of multiple text reading and rereading on knowledge retention and metacognitive accuracy*	Metacognitive assessment test and accuracy of the multiple text reading group	Implications for educational practices that aim to improve learning outcomes and promote effective learning.
Dignath [20]	*Let Learners Monitor the Learning Content and Their Learning Behavior! A Meta-analysis on the Effectiveness of Tools to Foster Monitoring*	meta-analysis	Theoretical and methodological implications on how to encourage monitoring as an important part of the self-regulation cycle.
Elmabaredy & Gencel [21]	*Exploring the integration of self-regulated*	Moodle platform	Integration of self-regulated learning into online platforms

[19] Peter Seban, Kamila Urban, and Radovan Sikl, 'Comparing the Effectiveness of Multiple Text Reading and Rereading on Knowledge Retention and Metacognitive Accuracy', *Instructional Science*, 0123456789, 2024 <https://doi.org/10.1007/s11251-024-09686-4>.

[20] Charlotte Dignath and others, *Let Learners Monitor the Learning Content and Their Learning Behavior! A Meta-Analysis on the Effectiveness of Tools to Foster Monitoring*, *Educational Psychology Review* (Springer US, 2023), XXXV <https://doi.org/10.1007/s10648-023-09718-4>.

[21] Ahmed Elmabaredy and Nurgun Gencel, 'Exploring the Integration of Self-Regulated Learning into Digital Platforms to Improve Students' Achievement and Performance', *Discover Education*, 3.1 (2024) <https://doi.org/10.1007/s44217-024-00233-4>.

Research	Title	Test Selection	Results
	learning into digital platforms to improve students' achievement and performance	(Experiment and control with pre-post test)	has a positive impact on improving student achievement and performance related to digital competencies.
Deng [22]	*Improving the effectiveness of video-based flipped classrooms with question-embedding*	Pre-test/post-test, between-subjects and six-week design	Pre-class and review it at the beginning of the in-class session to facilitate student learning in the video-based flipped classroom.

The table above describes the various types of tests used to support Islamic Religious Education (PAI) learning. In this context, the use of artificial intelligence (AI) for multiple-choice question selection provides significant assistance for teachers in carrying out learning tasks. AI-assisted multiple-choice question selection offers a number of advantages that can improve the efficiency and effectiveness of the learning process.

First, AI can assist teachers in preparing test materials more quickly and efficiently. Compared to composing questions manually, AI can generate multiple-choice questions based on the inputted learning materials. This saves teachers time and effort, allowing them to focus more on other aspects of learning, such as interaction with students or developing teaching strategies.

Second, AI can help in creating more varied and relevant questions. With its natural language processing (NLP) capabilities, AI can analyze learning materials and generate questions with different levels of difficulty, covering different aspects of the material. This is important to ensure that the test really measures the student's understanding comprehensively. In addition, AI can also help in generating more logical and relevant checkers, making the test more valid and reliable.

[22] Ruiqi Deng, Siqi Feng, and Suqin Shen, 'Improving the Effectiveness of Video-Based Flipped Classrooms with Question-Embedding', *Education and Information Technologies*, 29.10 (2024), 12677–702 <https://doi.org/10.1007/s10639-023-12303-5>.

Third, the use of AI in the selection of multiple-choice questions can also help in analyzing test results in more depth. AI can identify questions that are difficult for students to answer, or questions that have a low level of discrimination. This information can be used by teachers to evaluate the effectiveness of learning and make improvements if necessary. For example, if many students get questions about the pillars of faith wrong, the teacher can repeat the material with a more effective method.

Fourth, with the help of AI, teachers can easily create large and structured question banks. The questions that have been created by AI can be stored and categorized by topic, difficulty level, or other criteria. This question bank can be reused in the future, so teachers no longer need to create questions from scratch every time they want to conduct a test. This saves teachers time and effort.

Thus, the use of AI in the selection of multiple-choice questions is an effective solution to support PAI learning. AI assists teachers in preparing test materials, creating varied and relevant questions, analyzing test results, and building a structured question bank. All of these contribute to improving the overall quality of PAI learning.

2) Effectiveness in PAI learning

Effectiveness in the context of time While regulating students' independent use of multiple-choice questions leads to savings in practice time, it is less effective in improving final test results when compared to a more structured approach (e.g., cued recall questions regulated by the experimenter). Material understanding vs Time efficiency Deeper understanding and better results in the final test often require more focused and systematic learning strategies, not just time efficiency. Students may need further instruction on how to allocate time for more productive practice or how to repeat material in greater depth to improve long-term understanding. Overall, while the use of multiple-choice practice questions provides freedom and efficiency, more structured and planned learning strategies (such as cued recall questions) appear to be more effective in improving student learning outcomes, especially in the context of deeper mastery of material.[23]

The effectiveness of using artificial intelligence (AI) in Islamic Religious Education (PAI) learning, particularly in the preparation of multiple-choice questions, offers the potential for significant improvements in various aspects. AI can help teachers in a number of ways, which ultimately impacts on the overall effectiveness of learning.

First, the efficiency of teacher time and effort increases. The process

[23] Badali, Rawson, and Dunlosky.

of making questions manually often takes a lot of time and effort. Teachers have to think about the material, formulate questions, create answer choices, and ensure their validity. With AI, most of these processes can be automated. Teachers only need to input learning materials, and AI will generate multiple-choice questions automatically. This allows teachers to focus more on preparing teaching materials, interacting with students, and developing more innovative learning methods.

Second, the variety and quality of questions can be improved. AI is able to analyze learning materials in depth and generate questions with varying levels of difficulty, ranging from low cognitive levels (C1-remembering) to high cognitive levels (C4-analyzing, C5-evaluating, C6-creating). AI can also generate more relevant and logical exemptions, making the questions more valid and testing students' understanding more comprehensively. In addition, AI can help avoid biases in question preparation that might occur if done manually.

Third, analysis of test results becomes easier and more in-depth. AI can help analyze students' answers automatically and provide valuable information for teachers, such as the difficulty level of the questions, the discriminating power of the questions, and the material areas that students still need to deepen. This information can be used to evaluate learning effectiveness and make necessary improvements. For example, if many students get the question about the pillars of faith wrong, the teacher can repeat the material with a more effective method or emphasize certain aspects.

Fourth, AI facilitates the creation of structured and easily accessible question banks. The questions that have been created by AI can be stored and categorized by topic, difficulty level, or other criteria. This question bank can be reused in the future, so teachers no longer need to create questions from scratch every time they want to conduct a test. This saves teachers time and effort in the long run.

Fifth, the use of AI in making multiple-choice questions can increase students' motivation and interest in learning. Varied and relevant questions can make students more interested in learning and taking tests. In addition, the use of technology in learning can also provide a more modern and interactive learning experience.

However, it is important to remember that AI is only a tool. Validation and review by teachers are still needed to ensure the quality and accuracy of the questions, as well as their suitability to the curriculum and student characteristics. Using AI wisely and integrating it with the right learning methods will maximize its effectiveness in PAI learning.

3) Implementation of Islamic Religious Education Learning (PAI) Selection of Multiple Choice Questions Using Artificial Intelligence (AI)

The results of the study show that several tests are conducted universally and in-depth using artificial intelligence (AI) in creating multiple-choice questions for PAI learning. The need for a flow of objectives in compiling multiple-choice questions, as follows:

1) The need for a strategy in selecting multiple choice questions, here the teacher becomes a facilitator in preparing the selection of questions in the form of using AI intelligence and must be proficient in technology.
2) Selecting multiple choice questions with various references helps teachers in achieving learning activities so that the effectiveness of learning runs according to objectives.
3) With this context flow, learning effectiveness can be achieved, the success of a learning process between students and students, or students and teachers in achieving learning objectives.
4) Objectives, implementation and evaluation can support multiple choice question creation activities in improving the effectiveness of learning using artificial intelligence.

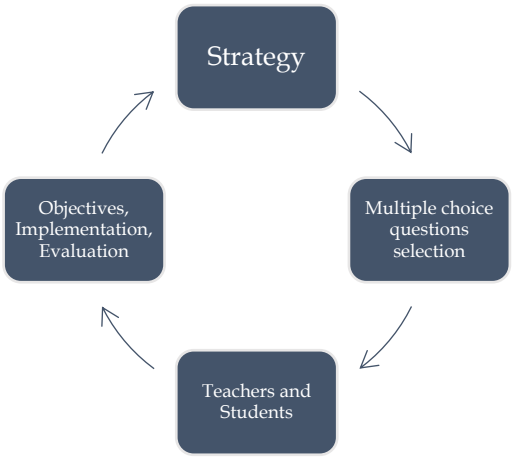

Figure 3. multiple-choice

The results of the description above, the creation of multiple-choice questions increases the effectiveness of learning using artificial intelligence, can be improved by using the flow of strategic needs, planning, implementation and evaluation as well as the selection of multiple-choice questions by taking several references universally and in depth so that it can increase effectiveness in learning.

The implementation of Islamic Religious Education (PAI) learning by utilizing artificial intelligence (AI) for multiple-choice question selection opens up new opportunities to improve the quality and efficiency of the teaching and learning process. This implementation involves a series of stages that need to be considered so that the use of AI is effective and on target. Here is a more detailed explanation:

The initial stage of implementation is thorough preparation and planning. Teachers need to identify specific needs, for example whether the purpose of using AI is to save time in creating questions, increase the variety of questions to make them more challenging, make it easier to analyze test results, or build a structured question bank. Once the goals are set, the selection of AI platforms or tools becomes crucial. Some options that can be considered include generative AI language models (such as the model I use), special AI-based question creation platforms that usually offer more complete features such as Bloom's taxonomy determination and item analysis, or add-ons and plugins to word processing or spreadsheet applications that allow AI to be integrated directly into applications that are already familiar to teachers. Whatever tools are chosen, training for teachers is essential so that they are proficient in using the tools, understand how to give proper instructions to AI (known as prompt engineering), and most importantly, are able to validate and revise questions generated by AI. The preparation stage also includes preparing Islamic Religious Education learning materials that will be the basis for creating questions. Make sure the materials are complete, structured, accurate, and relevant to the applicable curriculum.

The next stage is the process of creating questions with AI. Teachers input Islamic Religious Education learning materials into the selected AI platform or tools. Then, teachers provide specific and clear instructions to AI regarding the type of questions (multiple choice), the number of questions desired, the level of difficulty (e.g. easy, medium, difficult, or based on Bloom's taxonomy such as C1-remembering, C2-understanding, C3-applying, and so on), the topic or subtopic to be tested, and other criteria. The more detailed and specific the instructions given, the better the quality of the questions produced by AI. After AI processes the instructions and materials, AI will produce multiple-choice questions. This is a crucial point where the role of the teacher cannot be replaced by AI, namely the question review and validation stage. Teachers are required to check each question produced by AI to ensure its relevance to the material, clarity and ease of understanding by students, correctness of answers and distractor logic, absence of grammatical and spelling errors, and its suitability to the curriculum. If errors or inconsistencies are found, teachers are required to revise the questions. Some AI platforms may provide features to provide feedback to the AI, so that the AI can learn and improve the quality of the questions it generates in the future.

After the questions are validated, the next stage is implementation in learning. These questions can be used in various forms of evaluation such as quizzes, daily tests, midterm exams, final exams, or as practice and enrichment materials for students.[24] The test data is then analyzed to identify areas of material that students still need to deepen and evaluate the effectiveness of learning. AI can also assist in this analysis by providing statistical data such as the level of difficulty of the questions, the discriminating power of the questions, and item analysis. In addition, questions that have been validated can be collected and managed in a structured digital question bank, making it easier for teachers to access and reuse them in the future.[25]

The last stage that is no less important is evaluation and development. The use of AI in creating questions needs to be evaluated periodically to identify strengths, weaknesses, and areas that need improvement. This evaluation can involve teachers, students, and education experts. Based on the evaluation results, teachers can continue to develop their ability to use AI and take advantage of new features that may be available as technology advances. With proper implementation and continuous evaluation, the use of AI in selecting multiple-choice questions can make a significant contribution to improving the quality of Islamic Religious Education learning. It should be remembered that AI is only a tool, and the role of teachers as educators remains central and irreplaceable in the learning process.

Based on the analysis of the provided text, here are 3 recommendations to improve the effectiveness of AI-based adaptive learning tools:

1. Teacher Training and Support: The successful implementation of AI-based adaptive learning tools relies heavily on teacher training and support. Teachers need to be proficient in using the tools, understand how to give proper instructions to AI (known as prompt engineering), and are able to validate and revise questions generated by AI. In addition to training, teachers also need to be supported in integrating these tools effectively into their curriculum and finding creative ways to use them to enhance student learning.
2. Focus on Deeper Learning: While AI-based tools can be helpful in creating multiple-choice questions and assessing student knowledge, it's

[24] Vino Putra Hadiyani and Haerul Salam, 'Stimulating Motivation of Low Class Students' Interest In Remote Regions Through Card Media and Image Media', *Sustainable Jurnal Kajian Mutu Pendidikan*, 7.1 (2024), 98–105 <https://doi.org/10.32923/kjmp.v7i1.4349>.

[25] V. P. Hadiyani, 'Teacher ' s Efforts in Improving Traditional Dance Art Typical of Malang in Extracurricular Class V Elementary School', *Jurnal Ilmiah Iqra'*, 18.2 (2024), 123–32 <https://doi.org/10.30984/jii.v18i2.2927>.

important to remember that deeper learning goes beyond memorization and rote learning. Teachers should use these tools in conjunction with other instructional methods that encourage critical thinking, problem-solving, and creativity. This can involve activities such as discussions, debates, projects, and research assignments.

3. Student Engagement and Feedback: Student engagement is another crucial factor in the effectiveness of AI-based adaptive learning tools. Teachers should find ways to make these tools engaging and interactive for students. This can involve using game-based elements, allowing students to provide feedback on the questions generated by AI, and encouraging them to reflect on their learning process.

By following these recommendations, teachers can leverage the strengths of AI-based adaptive learning tools while ensuring that they are used to promote deeper learning and student engagement.

Conclusion

It can be concluded that the research conducted has obtained results that are in accordance with the flow of the framework of thinking in the form of a literature study conducted. The results of this success also obtained several things that need to be followed up such as the need for teachers to prepare objectives, planning and evaluation of the selection of multiple choice questions with various references to strengthen selection with the use of artificial intelligence. For further research, it can be developed so that it can help science in the field of making multiple choice questions to improve the effectiveness of learning with the use of technology in the form of artificial intelligence.

Bibliography

Abbott, Ryan, 'The Reasonable Robot: ARTIFICIAL INTELLIGENCE AND THE LAW', *The Reasonable Robot: Artificial Intelligence and the Law*, 2020, 1–196 <https://doi.org/10.1017/9781108631761>

Alfaid, Ahmad, and Aida Hayani, 'Jurnal AL-Mahira : Pendidikan Agama Islam ANALISIS DAMPAK ARTIFICIAL INTELLIGENCE (AI) PADA PEMBELAJARAN PAI DI UNIVERSITAS ALMA ATA YOGYAKARTA', 1 (2024), 30–41

AlMakinah, Rawan, Mahsa Goodarzi, Betul Tok, and M. Abdullah Canbaz, 'Mapping Artificial Intelligence Bias: A Network-Based Framework for Analysis and Mitigation', *AI and Ethics 2024*, 2024, 1–20 <https://doi.org/10.1007/S43681-024-00609-0>

Asok, Kavya, Dinesh Kumar Gupta, and Prashant Shrivastava, 'Research Data Policy : A Library and Information Science Publishers ' Perspective Research Data Policy : A Library and Information Science Publishers '

Perspective', *Quality & Quantity*, October, 2024 <https://doi.org/10.1007/s11135-024-01994-8>

Badali, Sabrina, Katherine A. Rawson, and John Dunlosky, 'How Do Students Regulate Their Use of Multiple Choice Practice Tests?', *Educational Psychology Review*, 35.2 (2023), 1–26 <https://doi.org/10.1007/s10648-023-09761-1>

Butowska-Buczyńska, Ewa, Maciej Hanczakowski, and Katarzyna Zawadzka, 'Errorful Learning of Trivia Questions and Answers: The Role of Study Time', *Memory and Cognition*, 0123456789, 2024 <https://doi.org/10.3758/s13421-024-01608-6>

Dagienė, Eleonora, 'Mapping Scholarly Books: Library Metadata and Research Assessment', *Scientometrics*, 129.9 (2024), 5689–5714 <https://doi.org/10.1007/S11192-024-05120-1/METRICS>

Deng, Ruiqi, Siqi Feng, and Suqin Shen, 'Improving the Effectiveness of Video-Based Flipped Classrooms with Question-Embedding', *Education and Information Technologies*, 29.10 (2024), 12677–702 <https://doi.org/10.1007/s10639-023-12303-5>

Dignath, Charlotte, Reyn van Ewijk, Franziska Perels, and Sabine Fabriz, *Let Learners Monitor the Learning Content and Their Learning Behavior! A Meta-Analysis on the Effectiveness of Tools to Foster Monitoring*, *Educational Psychology Review* (Springer US, 2023), XXXV <https://doi.org/10.1007/s10648-023-09718-4>

Elmabaredy, Ahmed, and Nurgun Gencel, 'Exploring the Integration of Self-Regulated Learning into Digital Platforms to Improve Students' Achievement and Performance', *Discover Education*, 3.1 (2024) <https://doi.org/10.1007/s44217-024-00233-4>

Ertel, Wolfgang, *Introduction to Artificial Intelligence Second Edition* (Springer Nature, 2024)

Farhood, Helia, Ibrahim Joudah, Amin Beheshti, and Samuel Muller, 'Predicting Student Learning Outcomes', 2024, 1–18

Hadiyani, V. P., 'Teacher ' s Efforts in Improving Traditional Dance Art Typical of Malang in Extracurricular Class V Elementary School', *Jurnal Ilmiah Iqra'*, 18.2 (2024), 123–32 <https://doi.org/10.30984/jii.v18i2.2927>

Hadiyani, Vino Putra, and Haerul Salam, 'Stimulating Motivation of Low Class Students' Interest In Remote Regions Through Card Media and Image Media', *Sustainable Jurnal Kajian Mutu Pendidikan*, 7.1 (2024), 98–105 <https://doi.org/10.32923/kjmp.v7i1.4349>

Hakeu, Febrianto, Idan I Pakaya, Djahuno, Ridwanto, Zakarina, and others, 'Workshop Media Pembelajaran Digital Bagi Guru Dengan Teknologi AI (Artificial Intelligence)', *Jurnal Pengabdian Kepada Masyarakat*, 2.2

(2023), 1–14

Huesca, Gilberto, Yolanda Martínez-Treviño, José Martín Molina-Espinosa, Ana Raquel Sanromán-Calleros, Roberto Martínez-Román, Eduardo Antonio Cendejas-Castro, and others, 'Effectiveness of Using ChatGPT as a Tool to Strengthen Benefits of the Flipped Learning Strategy', *Education Sciences*, 14.6 (2024) <https://doi.org/10.3390/educsci14060660>

Jing, Yuhui, Haoming Wang, Xiaojiao Chen, and Chengliang Wang, 'What Factors Will Affect the Effectiveness of Using ChatGPT to Solve Programming Problems? A Quasi-Experimental Study', *Humanities and Social Sciences Communications*, 11.1 (2024) <https://doi.org/10.1057/s41599-024-02751-w>

Kökver, Yunus, Hüseyin Miraç, and Pektaş Harun, *Artificial Intelligence Applications in Education : Natural Language Processing in Detecting Misconceptions*, *Education and Information Technologies* (Springer US, 2024) <https://doi.org/10.1007/s10639-024-12919-1>

Kualitas, Pengukuran, Air Sumur, and Matsa Halmahera, 'Interaksi : Jurnal Pengabdian Kepada Masyarakat Interaksi : Jurnal Pengabdian Kepada Masyarakat', 1.1 (2024), 20–26

Li, Hanjia, 'Multicultural Data Assistance Mining Analysis for Ideological and Political Education in Smart Education Platforms Using Artificial Intelligence', *Wireless Networks*, 2024, 1–15 <https://doi.org/10.1007/S11276-024-03772-8/METRICS>

Merentek, Theo Chanra, Elni Jeini Usoh, and Jeffri Sonny Junus Lengkong, 'Implementasi Kecerdasan Buatan ChatGPT Dalam Pembelajaran', *Jurnal Pendidikan Tambusai*, 7.3 (2023), 26862–69

Seban, Peter, Kamila Urban, and Radovan Sikl, 'Comparing the Effectiveness of Multiple Text Reading and Rereading on Knowledge Retention and Metacognitive Accuracy', *Instructional Science*, 0123456789, 2024 <https://doi.org/10.1007/s11251-024-09686-4>

Snyder, Hannah, 'Literature Review as a Research Methodology : An Overview and Guidelines', *Journal of Business Research*, 104.March (2019), 333–39 <https://doi.org/10.1016/j.jbusres.2019.07.039>

Zuhri, Najwa Zalfa, Syihabuddin Syihabuddin, and Tatang Tatang, 'Analisis Validitas, Reliabilitas, Dan Tingkat Kesukaran Soal Bahasa Arab Tingkat SMP Berbasis Artificial Intelligence (AI) Melalui Platform QuestionWell', *Jurnal Pendidikan Dan Pembelajaran Indonesia (JPPI)*, 4.2 (2024), 693–704 <https://doi.org/10.53299/jppi.v4i2.576>