Developing Instructional Media Artificial Intelligence Of Arabic Language Teaching and Learning

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Abstract
Innovation in instructional artificial intelligence (AI) has attracted the interest of learning practitioners and many educational institutions. AI is rooted in offering convenience and solving learning problems. Improving easy and enjoyable Arabic language learning requires the creation and design of instructional technology itself. Challenges and concerns include issues related to academic integrity, stemming from algorithmic bias, incomplete data, inaccurate content, and the potential for reduced human interaction. Research and development were used to develop an Instructional Media AI model. This study used a combination of the three-stage Plomp and ASSURE models. The findings of this study highlight the development of AI for Arabic language students and the advancement of AI design research by examining practical, functional, and effective options. This research includes an analysis of annual scientific production, the most relevant sources, a thematic map, and a factorial analysis. Research Limitations: This study demonstrates the potential of AI not only as a trending topic but also as a valuable resource for instructional development. AI-based instructional development has a speed and interactive variety contributing to deep learning and immersive teaching. The results of this study provide a product in the form of AI-based Arabic language media innovation learning. Concrete evidence of innovative instructional design models developed through chatbot development, steps, and AI-assisted learning media creation products. These findings also serve as a reference for future researchers to more easily identify innovative Technology of Arabic Language Teaching and Learning pedagogical foundations in future research.
Keywords: Artificial Intelligence; Instructional Media; Arabic Language Learning

INTRODUCTION

Artificial intelligence (AI) plays a key role in instructional transformation, AI is a tool to personalize and enhance learning experiences (Alshumaimeri & Alshememry, 2024; Bond et al., 2024; Kamalov et al., 2023). AI was expected to significantly influence instructional practices across disciplines. Thus, AI implementation in education has the potential to improve institutional quality worldwide by providing new platforms for learning and readjusting teaching approaches. It has been a subject of research for over 30 years with significant progress made by developed countries (Tahiru, 2021); however, according to (Mondal, 2020) can be traced back to the 1950s, focusing on enhancing teaching and learning through digital technologies (Hamal et al., 2022).

AI The development of modern chatbots started in 2016 and has rapidly progressed to the present day (Hwang & Chang, 2023). These advancements have enabled chatbots to become more sophisticated and capable of handling complex conversations, leading to their widespread adoption across various industries. As chatbots continue to

evolve, they are expected to play an increasingly important role in providing personalized customer experiences and streamlining business operations. The integration of chatbots in Higher Education Institutions (HEIs) offers a range of applications aimed at enhancing the educational experience. These AI-driven tools are utilized for streamlining administrative tasks, providing research support, and improving student services (Chukwuere, 2024; Dempere et al., 2023). Chatbots serve as virtual agents, assisting in customer service and potentially improving the efficiency of student services support (Mohd Rahim et al., 2022).

Chatbot's capabilities extend to automating mundane tasks and offering accessibility, which is beneficial in various domains of education (Meshram et al., 2021). Interestingly, while the benefits of chatbots in HEIs are well-documented, some challenges and concerns need to be addressed. Problems with academic integrity, security, privacy, and the potential for decreased human interaction were challenges. Moreover, the readiness of HEIs to adopt such technologies varies, with some institutions not fully prepared to integrate AI chatbots effectively (Mohd Rahim et al., 2022). While some others strictly prohibited and banned the use of generative AI (Kamalov et al., 2023). In summary, chatbots are increasingly being recognized for their potential to revolutionize HEIs by providing support in administrative functions and enhancing learning experiences. As HEIs continue to adapt to technological advancements, chatbots stand as a significant tool in the pursuit of a more efficient and effective educational environment. Thus, for educators, the primary benefits are time-saving support and enhanced teaching methods (Labadze et al., 2023).

While AI presents many advantages, researchers emphasize the importance of enhanced ethical considerations (Leta & Vancea, 2023; Ray & Ray, 2023), interdisciplinary collaboration, and solid pedagogical foundations in future research (Bond et al., 2024). Identifying and implementing policies to safeguard against the misuse and abuse of generative AI is essential (Dwivedi et al., 2023). Nevertheless, several obstacles persist that must be addressed, including the necessity for extensive educator training and the revision of curricula to ensure they are compatible with the current social context (Walter, 2024). It seems that impossible to hinder AI uses from the students perspective (Stokel-Walker, 2022). Instructional AI faces challenges such as limited critical reflection on risks, weak connections to pedagogical theories, and ethical concerns (Zawacki-Richter et al., 2019). Fairness and inclusiveness in AI education are crucial issues, with problems stemming from algorithmic biases, incomplete data, and inaccurate content (Sijing & Lan, 2018).

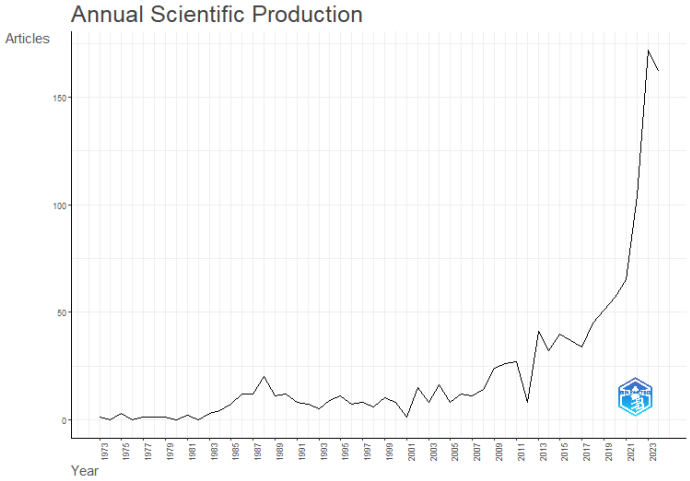
Modern technologies such as smart machines and computers are designed to understand and accommodate the unique needs of individuals (Bhutoria, 2022). In addition to the scientific advancement reflected in technology, it also changes and disrupts society, morality, laws, and education (Jiang et al., 2022). Education systems worldwide are embracing this by moving towards more individualized, technology-enhanced, and student-centered curricula. AI is a rapidly advancing field of computer science focused on creating intelligent machines that can simulate human-like thinking and behavior (Garg, 2021). AI systems use pattern matching, logical relationships, and computational techniques to process information and make predictions. The core goal of AI is to develop computational approaches to intelligent behavior, encompassing various aspects of human cognitive activity; however, they are not susceptible to fatigue, emotions, irrational thinking, and engaging in criminal or corrupt activities (Maksubova

et al., 2024). That branch of computer science focused on developing intelligent machines that simulate human intelligence (C & Salis, 2021; Kuleto & Ilić, 2021; Ray & Ray, 2023). These tasks include pattern recognition, learning, and decision-making (Briganti, 2023). AI can be conceptualized based on its level of performance and autonomy, with potential actions including task performance, decision-making, and prediction (Gil de Zúñiga et al., 2024). Modern AI represents a shift from rule-based problem-solving to machine learning to solve problems independently using algorithms.

Thus, this technology, translated with the newer version of AI, has profoundly transformed educational and academic practices over the past decade. The introduction of Generative Pre-trained Transformers (GPT), such as OpenAI's ChatGPT, has generated significant interest owing to its ability to produce humanlike text and facilitate automated conversations, impacting various sectors (Grassini, 2023). The emergence of advanced language models, such as ChatGPT, has sparked both excitement and apprehension in the educational community. As AI becomes increasingly prevalent in higher education, institutions face challenges in adopting these technologies for teaching, learning, student support, and administration (Popenici & Kerr, 2017). This may related what is known as generative AI. Generative AI tools such as ChatGPT have the potential to revolutionize teaching practices and improve student engagement (Shoufan, 2023). This technology can facilitate data analysis, visualization, and adaptive learning (Vafadar & Amani, 2024). Educators can leverage Generative AI to create interactive content, personalize learning experiences, and conduct adaptive assessments (Kadaruddin, 2023). AI offers significant potential for personalized learning, automated grading, and improved administrative efficiency (Ogunode & Gregory, 2018). Such integration also supports immediate feedback and leverages the special needs of students. Thus, compared to human instruction without feedback, the AI tutor outperformed performance, and students perceived their affective and cognitive domains to be the same as those of humans (Fazlollahi et al., 2022). Furthermore, AI technologies are transforming teaching methodologies and learning styles and shifting the role of teachers to facilitators (Mondal, 2020). AI-powered tools enhance instructional design by providing personalized learning and engaging multimedia, showing promise in creating learning outcomes, assessments, and standard-setting parameters (Sridharan & Sequeira, 2024).

The integration of AI in education often overlaps with instructional AI, creating a multifaceted impact on both learning and teaching methodologies. Artificial Intelligence in instruction (instructional AI) has emerged as a significant field of research, combining AI techniques with learning sciences to enhance teaching and learning experiences (Feng & Law, 2021). Based on Scopus database on August 2024 (**Error! Reference source not found.**), there is rising interest over instuctional AI. In-depth research was carried out on 1179 document factorial analyses of R Studio with the Scopus database. Scientific publications has implied in the year 2017 onwards there was a growing interest among researchers. In the year 2021-2023 was the peak for and the instructional AI boomed. This may caused by the release of one of the popular AI ChatGPT. Additional AI chatbots on the market include Microsoft's Bing Chat (2023), Google's Bard (Language Model for Dialogue Applications, 2023), and Anthropic's Claude (2023) (Bravo & Cruz-Bohorquez, 2024). In other words, when it comes to instructional activity, it has brought about significant advancements and conveniences. The implementation of AI in education has the potential to improve instructional quality worldwide by providing new platforms for learning and readjusting teaching approaches.

Figure 1. Annual Scientific Publications



Even though advancements of rapid generative AI research, there is a significant gap in the currect research that AI-assisted Technology of Arabic Language Teaching and Learning Teacher Training is not available. Some studies utilize chatbots specifically for language learning purposes (Aleedy et al., 2022; Belda-Medina & Calvo-Ferrer, 2022; Mageira et al., 2022; Zhang & Huang, 2024). This in line with (Liang et al., 2023) that the research include writing, reading, and vocabulary acquisition. While chatbots show promise in language education, more research is needed to develop and refine these tools for optimal learning outcomes (Dwivedi et al., 2023; Na-young Kim et al., 2019). So that, students can maximized their learning experience as stated in a meta-analysis chatbots has a significant medium effect (g = 0,48) (Alemdag, 2023). Moderating factors included the type of instruction in comparison groups, experimental duration, chatbot type, and tasks. These findings suggest that chatbots can effectively contribute to learning outcomes, although their effectiveness may vary depending on specific implementation factors and contexts (Bravo & Cruz-Bohorquez, 2024). Given the significant potential of this chatbot, it can serve as a valuable topic for research in higher education (Dwivedi et al., 2023). Further there were AI applications to support higher education students, namely Lola, AutoTutor, Dina, Chatbot, NerdyBot, StudyBuddy, SmarterChild, CourseQ, Differ, LTKAbot, CEUBot, FITEBot, Duolingo, Whatsapp Bot, CALMsystem, CSIEC, NDLTutor, StratcThAI (Pérez et al., 2020).

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Figure 2). There are articles The prominence of "intelligence" linked with "educator" and "instructional designer" suggests a strong focus on how AI and intelligent systems are influencing educational roles and instructional design.

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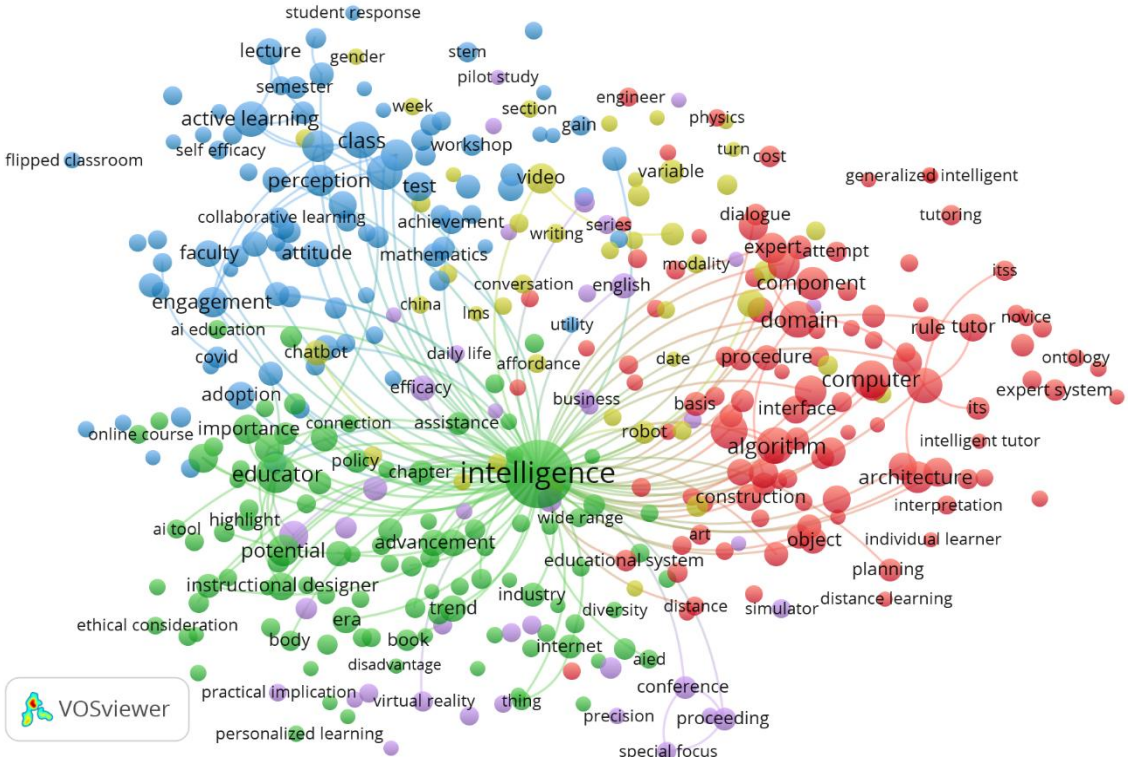
Figure 2. Network Map



Based on the development and challenges of AI for the development of instructional models. We conclude that there is no recent development related to teaching on how to develop learning media for HEI students. A chatbot AI application is used to help students improve their ability to develop and design instructional learning media. We develop steps for designing instructional learning media with factor analysis of research results on AI and its applications. A prototype design is also made to meet the results of the program design.

Challenges in technology of arabic language teaching and learning that can be overcome with the development of AI include the Limitations of Personal and Adaptive Media Teaching. Students have different abilities and backgrounds. Conventional teaching often finds it difficult to adjust to individual needs. AI enables adaptive learning that adjusts the material's difficulty level based on progress and automatic feedback and recommendations for additional materials. Developing AI-based chatbots requires research to answer questions about religious learning media in relevant contexts. Learning media is often monotonous, less interactive, and does not utilize modern technology.

METHOD

This study explores the development and integration of AI technologies to enhance instructional design. This study employs a research and development (R&D) method as its primary approach. The research and development method is a scientific approach used to investigate, design, produce, and test the validity of the resulting product (Sugiyono, 2012). Gay et al. argue that R&D is not intended to formulate or test a theory, but rather to develop effective products that can be used in schools (Gay et al., 2012). We employed a combination of ASSURE and three-stage Plomp model as proposed by (Adhi et al., 2022). These include preliminary research, prototyping stage, and assessment stage. The preliminary research consists of learner analysis about learning theories, laws and ethics using AI, and learning analysis. The second step of the RnD consists of protyping a instructional media. This means that the instructional media must be have formulated learning objectives with its test and syntax. The third step involves validation testing and product trials. These activities were undertaken to ascertain the validity of the product from the perspective of experts. There are also students' responses and revision stage. **Error! Reference source not found.** shows the overall research design.

Table 1. Combined Plomp and ASSURE Model

3-stage (Plomp, 2013)	ASSURE (Smaldino, 2005)	Explanation
Preliminary Research	A = Analyze Learners	Knowing the students characteristics
	S = State Objectives	Objectives from the course syllabus
Prototyping Stage	S = Selecting Methods, Media, and Materials	AI-assisted instructional tool were selected
Assessment Stage	U = Utilize Media and Materials	Preview the product
	R = Require Learner Participation	Students were taken to use the instructional media
	E = Evaluate and Revise	Evaluate and revise based on the expert appraisals

RESULTS AND DISCUSSION

Chatbot integration in higher education institutions (HEIs) offers a variety of applications, but research on the development of the Technology of Arabic Language Teaching and Learning instructional design is still very rare. The findings on 1179 documents with factorial analysis using R Studio with Scopus database (1973-2024). The application of AI in education has the potential to improve the quality of teaching.

Preliminary Research

Finding subfields is aided by the data reduction approach known as factorial analysis. There are several dimensionality reduction methods that can be used, including principal component analysis (PCA), multidimensional scaling (MDS), correspondence analysis (CA), and multiple correspondence analysis (MCA). Algorithms for clustering can be applied to factorial or network analysis.

Figure 2 A network cluster is represented by each bubble. The words in the bubble names are those that are more frequently occurring within the cluster.The bubble size corresponds with the frequency of clusterwords. The cluster is used to determine the bubble position. Callon density and centrality. Basic themes consist of artificial intelligence, teaching, and computer-aided instruction. The themes that become motor

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themes are learning systems, e-learning, education computing, students, engineering education, and curricula. The emerging or declining themes are natural language processing systems, learning algorithms, knowledge-based systems, problem-solving, and learning. Niche themes include human, articles, and humans.

Table 2. Factorial Analysis

Word	Dim1	Dim2	Cluster
artificial.intelligence	0,01	-0,18	1
students	0,62	-0,35	1
learning.systems	0,29	0,19	1
teaching	0,43	-0,89	1
computer.aided.instruction	0,24	0,37	1
e.learning	0,43	-0,01	1
education	0,01	-0,76	1
education.computing	0,52	0,05	1
engineering.education	0,88	-0,87	1
curricula	0,88	-0,6	1
active.learning	1,09	-1,16	1
instructional.designs	0,23	0,1	1
intelligent.tutoring.system	0,16	0,77	1
human	-2,99	-1,84	1
instructional.system	-0,27	0,92	1
personnel.training	0,1	0,22	1
teachers.	0,36	0,13	1
knowledge.based.systems	-0,77	0,08	1
natural.language.processing.systems	-0,33	1,33	1
problem.solving	-0,94	-0,68	1
design	0,57	-0,4	1
learning	-1,93	-0,96	1
computers	-0,49	1,02	1
computer.science	-0,43	1	1
virtual.reality	-0,41	-0,2	1
learning.algorithms	0,04	1,62	1
instructional.strategy	0,45	-0,58	1
surveys	0,78	-1,04	1
decision.making	-0,9	0,02	1
human.computer.interaction	-0,63	0,79	1
learning.environments	0,75	-0,26	1
computer.simulation	-1,14	0,13	1
data.mining	0,31	0,32	1
machine.learning	-0,78	1,59	1
instructional.materials	0,61	-0,33	1
article	-3,64	-2,21	1
humans	-3,63	-2,49	1
student.learning	1,09	-0,62	1
computational.linguistics	-0,19	1,03	1

learning.outcome	0,9	-0,72	1
cognitive.systems	-0,89	0,16	1
collaborative.learning	0,94	-0,64	1
expert.systems	-1,06	0,36	1
teaching.and.learning	0,33	-0,64	1
artificial.intelligence.in.education	0	1,05	1
computation.theory	0,65	-0,03	1
machine.learning.1	-0,04	2,06	1
behavioral.research	-0,02	-0,42	1
instructional.methods	1,1	-0,48	1
knowledge.representation	-0,65	0,67	1

Figure 3. Thematic Map

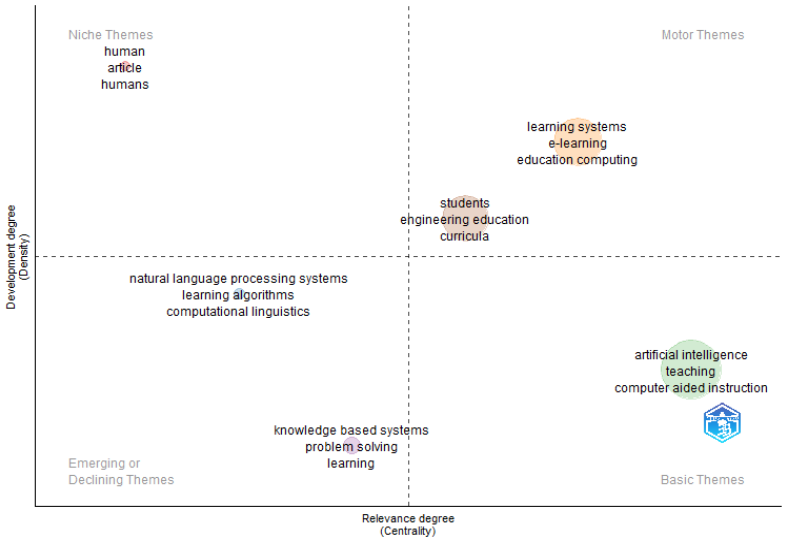
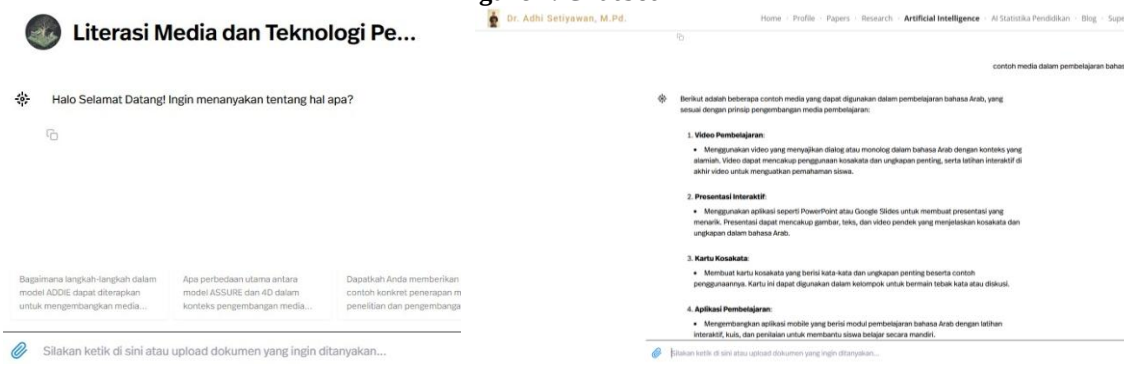


Figure 3 Correspondence Analysis and Dendrogram of Word Grouping shows Height indicates the distance between words or word groups. “Distant words” define different “concepts” or “topics”, while “similar words” describe comparable “concepts” or “topics”.

Prototyping Stage

The prototyping Stage can be seen in Figure 4 Chatbot. AI integration at this stage displays the title, greeting, and space to enter prompts. This display can continue to develop through updating the chatbot settings.

Figure 4. Chatbot



The interface displayed in the image is an prototype of educational platform focused on media literacy and technology. The greeting "Halo Selamat Datang! Ingin menanyakan tentang hal apa?" invites users to engage by asking questions related to the field. The prompts provided reflect a structured inquiry into instructional design and research methodologies. They include questions on the practical application of the ADDIE model for media development, a comparison of the ASSURE and 4D models within media development contexts, and requests for concrete examples of implementing research and development models. This platform serves as a resource for students seeking to deepen their understanding and application of educational media and technology models. The interface's design suggests a user-friendly approach to facilitating academic discourse and inquiry within this specialized field.

Assessment Stage

The Assessment stage displays table 3 which contains the responses of teachers, students, and practitioners. Description of the process/flow of the development stage, Use of clear, simple and communicative language, Use of terms, symbols or icons, Orderliness and cohesiveness of the flow of thinking, Clarity of the content of infographic/poster material, Ease and practicality of the model to be applied.

Table 3. Assessment Stage

Task	Teachers	Students	Practitioners
Process description/development stage flow	4	4	5
Use of clear, simple and communicative language	5	4	4
Use of terms, symbols or icons	5	3	5
Sequence and integration of thought flow	5	4	5
Clarity of infographic/poster material content	5	4	4
Easy and practical model to implement	5	4	4

point description
5 = strongly agree 4: agree 3: neutral 2: disagree 1: strongly disagree

The ratings are on a scale from 1 to 5, where 5 represents "strongly agree." Overall, Practitioners consistently gave higher ratings, particularly for the process description and use of terms, symbols, or icons, with a perfect score of 5 across multiple categories. Teachers also rated most tasks highly, especially in clarity of language and sequence of thought flow, with scores of 5. Students, while generally positive, gave slightly lower ratings in some areas, such as the use of terms, symbols, or icons, where they scored it a 3. This indicates that while the model or process is well-regarded, there may be a need for improved clarity or simplicity, particularly from the student perspective

In this study, we explored the development of an AI-assisted tool integrated into Technology of Arabic Language Teaching and Learning lectures. To assess the tool's validity, we collected feedback from experts and analyzed students' perceptions of its effectiveness. Researcher also pre-train the chatbots to getter better result when it is used by students. We consider the recommendation from (Sridharan & Sequeira, 2024) that AI tools are valuable supports for planning instructional methods, but experts need to review the content validity of the AI-generated output. This related from (Mazumder et al., 2018) that it is recommended to developing continuous knowledge learning engines for chatbots, enabling them to acquire new information through interactions. Therefore we solve a challenge in developing chatbots include a lack of adequate training datasets (Labadze et al., 2023). We conducted three stages. For the first stage, Preliminary research is crucial in the R&D process because it establishes the foundational understanding necessary for effective project development. In the context of creating an AI chatbot for Technology of Arabic Language Teaching and Learning, preliminary research helps by providing an overview of the field, identifying key concepts

and current trends. It also highlights existing gaps and challenges, enabling researchers to address specific needs and refine project objectives. This initial phase informs the design and functionality of the chatbot, ensuring that its knowledge base and interactions are well-structured and relevant.

Table 2 shows the first dimension reflects a thematic spectrum that could range from concepts focused on traditional education (e.g., "students," "teaching," "instructional materials") to more technical aspects of AI (e.g., "machine learning," "learning algorithms"). Keywords with higher positive values, like "students" (0.62) and "curricula" (0.88), may indicate a strong association with educational contexts, whereas keywords with negative values, such as "learning" (-1.93) and "humans" (-3.64), might reflect more human-centered or broad educational approaches. Dim2 (Dimension 2): The second dimension may distinguish between AI-driven technologies and their educational applications. For instance, keywords like "natural language processing systems" (1.33) and "machine learning" (1.59) have higher positive values, potentially representing advanced AI techniques. On the other hand, terms like "instructional system" (-0.74) and "instructional methods" (-0.48) with negative values could be more closely tied to traditional instructional design.

Figure 3 shows thematic analysis. In the Motor Themes quadrant (top-right), which includes topics like learning systems, e-learning, and education computing, these themes are highly developed and central, indicating they are both influential and mature in the research field. In the Niche Themes quadrant (top-left), themes such as human, article, and humans are highly specialized and developed but have low relevance, suggesting they are limited to specific subtopics. The Emerging or Declining Themes quadrant (bottom-left) includes themes like natural language processing systems, learning algorithms, and computational linguistics, indicating these areas are either new and emerging or are losing research interest. Lastly, the Basic Themes quadrant (bottom-right), which includes artificial intelligence, teaching, and computer-aided instruction, represents foundational topics with high centrality but lower development, signifying they are core themes that require further exploration.

Given that motor themes like education systems and e-learning are already mature and well-established, while artificial intelligence (AI) in education has high centrality but low development, there is a clear gap that presents an opportunity for research and innovation. This suggests that while AI is recognized as a fundamental component in educational technologies and still underdeveloped. This also inline that while AI is recognized as a fundamental component in educational technologies, its application in higher education is still underdeveloped and lacks critical reflection on challenges and risks (Zawacki-Richter et al., 2019). The thematic map highlights the need for more focused research and development on AI-driven tools like Technology of Arabic Language Teaching and Learning chatbot, which could significantly enhance personalized learning and automate administrative tasks. By bridging this gap, future work could help integrate AI more effectively into education, making it a more robust and practical tool for both teaching and learning. Investing in developing and refining AI technologies, especially in niche areas like educational chatbots, could align with the growing demand for scalable, intelligent, and responsive educational solution.

Figure 5. displays the infographic to show the overall model that has been developed. There are three main stages namely preliminary stage, prototyping stage, and assessment stage. The diagram illustrates the integration of the ASSURE and Plomp

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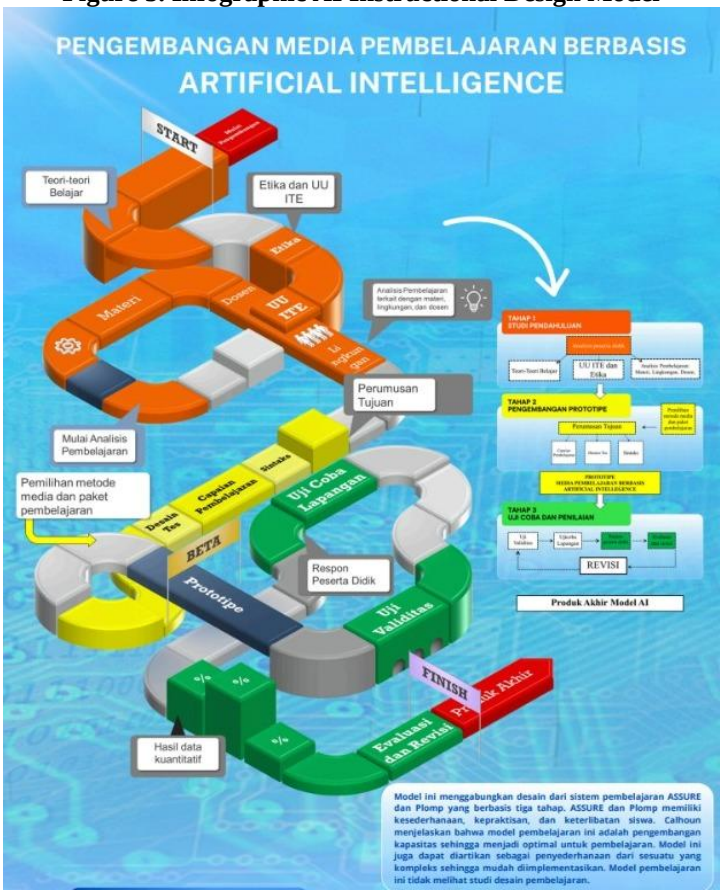
models, which are frameworks used in instructional design. The process begins with Preliminary Research, where learners are analyzed based on learning theories and specific needs. This analysis informs the Prototyping stage, where clear learning objectives are set, and a prototype is developed by selecting appropriate strategies, technologies, media, and materials. The prototype is then rigorously tested in the Assessment phase, which includes validity tests, field trials, and learner feedback. The model undergoes continuous evaluation and revision to ensure it effectively meets the learning objectives. This cyclical process highlights the importance of iterative development in creating effective educational programs.

Figure 5. Infographic AI Instructional Design Model



CONCLUSION

Innovation in technology of arabic language teaching and learning through AI is an important step in making prospective teachers and lecturers Arabic utilize AI in learning media. Chatbot integration enables the creation of a literature collaboration platform that encourages student-centeredness, and academic integrity, which comes from algorithmic bias, incomplete data, and inaccurate content, as well as the potential for decreasing human interaction in sharing thoughts and experiences. The findings of the Technology of Arabic Language Teaching and Learning design model make it easier for teachers, practitioners, and students to play a role in developing AI-based teaching materials. The Model Design considers learning theories, norms related to laws and

regulations, and other instructional components. Innovation still pays attention to Technology of Arabic Language Teaching and Learning values and digital ethics so as to support easy and enjoyable learning.

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