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Literature Review: Application of Artificial Intelligence in Higher Education Business Education to Improve Students' Computational Thinking

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Abstract

The phenomenon of technology integration in higher education is growing, with Artificial Intelligence (AI) being the main highlight in supporting the teaching and learning process. This research aims to develop a strategy for implementing AI in business education in higher education to improve students' computational thinking skills. The novelty of this research lies in the innovative approach that combines AI with interactive teaching methods and data analysis for learning personalization. The urgency of this research is driven by the pressing need for a computational thinking workforce in the digital era. The method used in this research is Systematic Literature Review (SLR) by collecting relevant previous research through publish or perish then analyzing the articles and narrowing them down with keywords. The results showed that the effective use of AI can improve students' analytical and problem-solving skills. The implications of these findings include policy recommendations for universities to adopt AI as an educational tool, which is expected to better prepare students for the challenges of Industry 4.0.

Keywords*: Artificial Intelligence, Business Education, Computational Thinking*

INTRODUCTION

In the last decade, Artificial Intelligence (AI) has undergone rapid development and its application has expanded to various sectors, including education. AI offers a wide range of applications that enable personalization of learning, data analysis, and increased effectiveness and efficiency in the teaching process.(Ahmad et al., 2021; Pan et al., 2022). On a global level, universities in developed countries have proactively integrated AI into the curriculum. This is doneto prepare students to face new challenges arising from the digital industrial revolution.(Meskó, 2020; Students et al., 2020).. Countries such as the United States, the United Kingdom, and several countries in Europe and East Asia have shown a strong commitment to adopting AI technologies in the education system. Academics have invested heavily in research and development of AI for education, as well as developing the infrastructure that supports the implementation of these technologies(X. Chen et al., 2020; Seters, 2020). In Indonesia, although the adoption of technology in education is increasing, the application of AI in the learning process is still in its early stages. Many universities have yet to fully utilize the potential of AI to improve the quality of education and student skills. On the other hand, the computational thinking skills of Indonesian students still require special attention.

Ideally, universities in Indonesia should be able to integrate AI into the learning process to improve students' computational thinking skills (L. Chen & Chen, 2020; Luan et al., 2020; Safdar et al., 2020). The use of AI should include data analysis, personalization of learning, and development of interactive teaching methods. For example, AI is used to develop adaptive learning systems that can customize materials according to the needs and abilities of individual students (Helo & Hao, 2022;

Nations, n.d.). In addition, AI is also used to analyze academic data to provide deeper insights into student learning patterns and performance, which in turn can be used to develop more effective learning strategies (Kim, 2022; Langley, 2009). The use of AI in higher education includes the development of virtual assistants that can help students complete academic tasks, provide guidance services, and manage academic administration.(Kakani et al., 2020; Koroteev & Tekic, 2021).. The use of these technologies has been shown to increase student engagement, improve learning outcomes, and reduce the administrative burden on lecturers and academic staff. This reflects the understanding that mastery of AI technologies is key to educational advancement and future workforce readiness (Haefner et al., 2021; J. Lee et al., 2019). Thus, the adoption of AI in higher education is not just a temporary trend, but a fundamental transformation that steers the global education system towards a new paradigm that is more adaptive and responsive to the needs of the times.

The integration of AI in education has great potential to address these issues. AI can help create a more adaptive and interactive learning environment, allowing students to learn according to their abilities and needs (Ouyang & Jiao, 2021; Yang, 2022). AI-based learning systems can provide timely and specific feedback, helping students correct mistakes and understand concepts better. In addition, AI can also be used to develop complex simulations and models, which can help students understand CT concepts through practical experience (X. Chen et al., 2020; Ouyang & Jiao, 2021). However, the application of AI in education in Indonesia still faces various challenges, including limited technological infrastructure, lack of skilled human resources, and resistance to changing traditional teaching methods (L. Chen & Chen, 2020; Luan et al., 2020). Many higher education institutions do not have adequate hardware and software facilities to support the implementation of AI. In addition, budget constraints often prevent higher education institutions from making the necessary investments in AI technologies, including the purchase of advanced equipment and the provision of a stable internet network (Seters, 2020; Students et al., 2020). The lack of skilled human resources is also a significant obstacle. Many lecturers and teaching staff do not yet have sufficient knowledge and skills in AI, making training and professional development in this area indispensable. Resistance to changes in teaching methods and academic administration also affects the effectiveness of AI implementation (X. Chen et al., 2020; Luan et al., 2020; Safdar et al., 2020). Many universities still rely on traditional approaches to learning, and there is discomfort or fear of change brought about by new technologies. Policies that support the adoption of AI in education are also less than optimal, so educational institutions are less encouraged to integrate AI thoroughly into the curriculum (L. Chen & Chen, 2020; Helo & Hao, 2022). Low awareness and understanding of the benefits of AI in improving the quality of education as well as the challenge of the technology access gap between urban and rural areas exacerbate this situation.

Addressing these issues requires a holistic and collaborative approach between government, educational institutions, and industry to create an educational ecosystem that supports technological innovation and the development of students' computational thinking skills. Although the development of AI technology and its potential in education has been widely recognized, there are still several studies that have not comprehensively explored the application of AI in business education in Indonesian universities. This research gap tends to focus more on the technical and applicative aspects of AI in the context of general education or STEM (Science, Technology, Engineering, and Mathematics), while business education has not been touched upon in depth. In Indonesia, the adoption of AI in education is still in its early stages and not fully optimized. This research also found gaps in the understanding and awareness of the importance of computational thinking among students. Many higher education institutions do not yet have a clear and structured strategy for integrating AI in learning that aims to develop these capabilities. The lack of training and professional development for lecturers in adopting and implementing AI technologies is also an aspect that is less explored in the existing literature.

Therefore, this research aims to fill the gap by developing a comprehensive strategy for the application of AI in business education in Indonesian higher education. The focus is on improving students' computational thinking skills, taking into account the local challenges and specific needs of educational institutions in Indonesia. This approach is expected to make a significant contribution to

educational literature and practice, as well as help overcome existing barriers to the application of AI in the higher education sector.

This research has an original novelty that distinguishes it from previous studies in the application of Artificial Intelligence (AI) and the development of students' computational thinking (CT) skills in higher education, particularly in business education. First, this study specifically examines the application of AI in business education, a field that is relatively less explored compared to STEM (Science, Technology, Engineering, and Mathematics). This focus is important because business education has different characteristics and needs that require a customized approach. Secondly, this research develops a comprehensive strategy to improve students' CT skills by utilizing AI, including adaptive learning systems, academic data analysis, and interactive teaching methods specifically designed for business education. This research also considers the specific challenges and local needs of Indonesian universities.

The novelty of this research also involves the UTAUT theory to explore the approach theoretically. This research integrates the Unified Theory of Acceptance and Use of Technology (UTAUT) to understand the factors that influence the implementation of Artificial Intelligence (AI) in business education in Indonesian universities. UTAUT theory identifies four main constructs performance expectancy, effort expectancy, social influence, and facilitating conditions (Alvi, 2021; Nur Nabihah Mohd Nizari et al., 2019; Venkatesh, 2022). In the context of this study, performance expectancy relates to the belief that AI will improve students' learning outcomes and computational thinking skills. To meet effort expectancy, this study emphasizes the ease of use of AI technology by providing training and professional development for lecturers, so that this technology can be easily adopted. Social influence is very important in encouraging the adoption of AI technology. Support from higher education leaders, colleagues, and industry plays a key role in shaping positive attitudes toward AI use (Blut et al., 2021; S. W. Lee et al., 2019; Technology, 2014). This research proposes a collaborative approach involving various stakeholders to create a favorable environment for AI adoption. Finally, facilitating conditions highlight the importance of adequate technological infrastructure (S. W. Lee et al., 2019; Technology, 2014; Venkatesh, 2022). This research emphasizes the need for investment in hardware, software, and stable internet connectivity to ensure successful AI implementation. By addressing all aspects of UTAUT, this research aims to increase the acceptance and use of AI in business education, thus improving the quality of education and skills of students in Indonesia.

Based on the description above, seen from the digital era, the ability of computational thinking is very important for students to compete in the global job market. Therefore, the urgency of this research lies in efforts to prepare students with relevant skills, especially in Business education. The results of this study are expected to provide recommendations to universities and policymakers on the importance of AI integration in business education, as well as provide practical guidance to improve students' computational thinking skills.

LITERATURE REVIEW AND DEVELOPMENT HYPOTHESIS

The review of the theories described in this research comes from several relevant previous studies, as the basis for the theoretical framework, determination, and research analysis. Furthermore, in this section, successive discussions of:

UTAUT

Unified Theory of Acceptance and Use of Technology (UTAUT) to understand the factors influencing the implementation of Artificial Intelligence (AI) in business education in Indonesian universities. The UTAUT theory identifies four main constructs performance expectancy, effort expectancy, social influence, and facilitating conditions (Alvi, 2021; Nur Nabihah Mohd Nizari et al., 2019; Venkatesh, 2022). In the context of this study, performance expectancy relates to the belief that AI will improve students' learning outcomes and computational thinking skills. To meet effort expectancy, this study emphasizes the ease of use of AI technology by providing training and professional development for lecturers, so that this technology can be easily adopted. Social influence is very important in encouraging the adoption of AI technology. Support from higher education leaders, colleagues, and industry plays a key role in shaping positive attitudes toward AI use (Blut et

al., 2021; S. W. Lee et al., 2019; Technology, 2014). This research proposes a collaborative approach involving various stakeholders to create a favorable environment for AI adoption.

Business Education

Business education is a learning process that aims to equip students with knowledge, skills, and a broad understanding of business concepts, practices, and principles related to various aspects of business, including management, marketing, finance, human resources, and entrepreneurship (Abbasianchavari & Moritz, 2021; Chairunisa Muchtar et al., 2018; Oumlil & Juiz, 2018). The learning approach in business education includes a combination of theory, practice, and practical experience to help students understand and develop the skills necessary for success in the business world.

Artificial Intelligence

Artificial Intelligence (AI) is a field of technology that focuses on the development of computer systems capable of performing tasks that usually require human intelligence (Ahmad et al., 2021; Meskó, 2020; Pan et al., 2022). This includes the ability to learn from experience, understand natural language, recognize patterns, make decisions, and solve problems autonomously. In the context of this research, AI refers to the application of technology used for personalization of learning, analysis of academic data, and improvement of teaching effectiveness in higher education.

Computational Thinking

A set of skills and thought processes used to solve problems logically and systematically with the help of techniques and concepts derived from computer science (Susilowati et al., 2021). It includes the ability to break down complex problems into smaller parts (decomposition), recognize patterns in data (pattern recognition), devise step-by-step procedures to solve problems (algorithms), and abstract relevant information from irrelevant details (abstraction) (Bryandova, 2021; Colin Angevine, 2022; C. S. Lee & Jiang, 2019; Sriwinarti et al., 2022). In an educational context, computational thinking enables students to approach and solve problems efficiently and effectively, both in technical and non-technical domains.

METHOD

3.1 Research Design

This research uses a *systematic literature review* (*SLR*) method that discusses Artificial Intelligence in Higher Education Business Education to Improve Student Computational Thinking. Literature study research is a process or activity of collecting data from various kinds of literature such as books and journals to compare the results of one study with another (Nowell et.al, 2014). The purpose of this literature study research is to obtain a theoretical basis that can support the solution of the problem being studied and reveal various theories that are relevant to the case, more specifically in this study researchers examine Artificial Intelligence, business education, and computational thinking. This literature study is a comprehensive summary of several research studies determined based on certain themes. The data used in this research is secondary data obtained not from direct observation, but obtained from research results that have been conducted by previous researchers.

Secondary data sources were obtained in the form of articles from reputable journals with predetermined themes. The literature search in this literature study used the Springer, ScienceDirect, and Emerald Insight databases. Searching for publication articles on the search engine (Search Engine) above using keywords namely: "Artificial Intelligence, business education, computational thinking, Higher Education" using Search Engine Dimensions (https://www.emerald.com/insight/).

3.2 Data and Literature Search

In determining the Data and Literature Search, the first stage that the researcher must do is to determine the object to be observed and analyzed based on the research topic. After that, the researcher will conduct a review of the relevant literature separately on the aspects that will be observed in the research. The following relevant literature was collected from comprehensive databases, namely "Artificial Intelligence, business education, computational thinking". The relevant literature collected is in English in the field of Artificial Intelligence, business education, computational thinking.

Table: Search strings in Scopus, Emerald Publishing, and Elsevier.

Database	***Keyword***
Scopus	TITLE-ABS-KEY "Artificial Intelligence, business education, computational thinking."
Emerald Publishing	"Artificial Intelligence, business education, computational thinking"
Elsevier	"Artificial Intelligence, business education, computational thinking"

3.3 Literature Screening Criteria

The researcher used inclusion and exclusion criteria in selecting the literature that would be the source of the paper. Literature that meets the inclusion criteria as follows, (1) literature related to Artificial Intelligence, (2) literature related to business education, (3) literature related to computational thinking (4) literature related to student life (5) literature written in English. While the literature that meets the exclusion criteria, such as (1) literature from books, (2) literature that is not written in English, (3) literature that cannot be accessed, and (4), literature that is not part of the research topic.

RESULTS AND DISCUSSION

RESULTS

4.1. Literature Identification

From the identification results, more than 1742 articles were obtained. Furthermore, article filtering is carried out according to the criteria of access, year, type of content, and abstraction analysis. As a result, 440 article titles were obtained. From the title of the article, further filtered based on the feasibility of the topic of Artificial Intelligence, business education, and computational thinking in Higher Education through abstraction analysis obtained results as many as 4 articles. Details, as shown in the following figure:

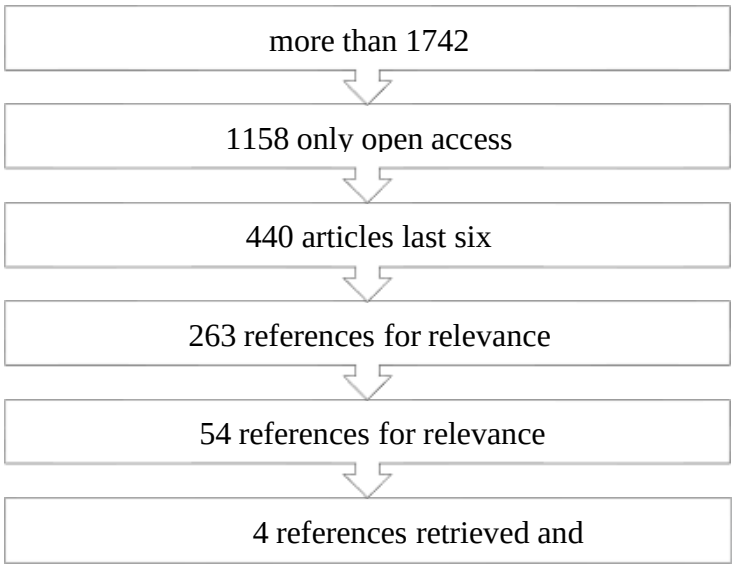

Figure 1. Flowchart of Article Screening
Source: researcher processed, 2024

The results of the review of selected articles answer the problem formulation regarding the distribution of journals that discuss Entrepreneurship Learning in Higher Education through Business Incubators, as follows:

Table 1. Distribution of related Journals on Artificial Intelligence, business education, computational thinking:

No.	Journal Name	Journal Link	Indexation	Total
1	Education + Training	Education + Training | Emerald Insight	Emerald Insight	3
2	Journal of entrepreneurship education	Journal of Entrepreneurship Education | Emerald Insight	Emerald Insight	1
3	The Journal of Technology Transfer	The Journal of Technology Transfer | Springer	Springer	1
4	Technology in Society	Technology in Society | Elsevier	Elsevier	2

Source: processed by researchers, 2024

The table above presents the distribution of journals related to the topics of Artificial Intelligence, business education, and computational thinking. Based on the data presented, journals indexed by leading index providers, such as Emerald Insight, Springer, and Elsevier, show publication activity focusing on issues in these domains. The journal with the highest total publications is Education + Training, with 3 articles, indicating significant research interest in these topics. Further analysis of the content, focus, and progression of publications in each journal can provide a more comprehensive understanding of research trends and current topics in Artificial Intelligence, business education, and computational thinking. This can provide valuable insights for the academic and practitioner communities working in these fields. In general, this journal table illustrates the trends and focus of research in the fields of Artificial Intelligence, business education, and computational thinking, especially those related to higher education. These journals can serve as relevant reference sources for research and development in these fields.

4.2 Resume of Research Articles that are relevant to this Research.

Table 4.2. Resume of related articles on Artificial Intelligence, business education, and computational thinking.

No.	Year	Author (s)	Result
1	2020	Meskó, et al.	This research found that the integration of AI in the business education curriculum significantly improved students' computational thinking skills. Students involved in courses that used AI tools and techniques demonstrated improved abilities in problem decomposition, pattern recognition, and algorithm creation compared to a control group that used traditional teaching methods
2	2020	Students et al.	The level of student digital competency readiness influences entrepreneurial intentions, with entrepreneurial learning that strengthens this aspect encouraging higher entrepreneurial intentions.
3	2020	L. Chen & Chen,	The research results show that lecturers and students have positive perceptions of the application of AI in business education. Most lecturers feel that AI can help them teach more efficiently and provide more relevant and personalized material for students. Students also report that the use of AI makes the

			learning process more interesting and helps them understand complex concepts better.
4	2022	Helo & Hao,	An entrepreneurial learning model that integrates digital technology actively increases students' entrepreneurial intentions in the era of digital disruption.
5	2020	X. Chen et al,	This research measures the effectiveness of AI-based adaptive learning systems in business education. The results showed that students who studied using this system had higher improvements in academic results and understanding of the material compared to those who used conventional methods. The AI-based adaptive system is able to adapt learning materials to individual student needs, thereby increasing learning efficiency
6	2022	Kurdi et al,	Entrepreneurship learning in the era of digital disruption significantly increases students' entrepreneurial intentions.
7	2020	Luan et al,	Challenges and Barriers in AI Implementation in Higher Education: This research identified several key challenges in implementing AI in higher education, including limited technological infrastructure, lack of training for lecturers, and resistance to changes in teaching methods. The study also found that institutions that successfully overcome these challenges generally have strong support from leadership and clear policies regarding the integration of technology in education.
8	2020	Safdar et al,	This research identified several key challenges in implementing AI in higher education, including limited technological infrastructure, lack of training for lecturers, and resistance to changes in teaching methods. The study also found that institutions that successfully overcome these challenges generally have strong support from leadership and clear policies regarding the integration of technology in education.

Based on the analysis of the given journal table, several important things can be concluded. First, the research results that show the effectiveness of AI integration in improving students' computational thinking skills need serious attention from stakeholders in the business education system. Efforts to develop curriculum and learning methods that systematically utilize AI technology can be a prospective strategy for preparing graduates who are more competent in dealing with contemporary business complexities. Second, the findings related to increasing entrepreneurial intention through digital technology-integrated learning indicate the need to revitalize entrepreneurship learning models in higher education. The adoption of cutting-edge technology, including AI, can be an effective enabler in encouraging students' entrepreneurial spirit and competence, in line with the demands of the digital economy disruption era. Furthermore, the positive perception of lecturers and students towards the use of AI in business education is a valuable asset in efforts to accelerate the implementation of these technologies. However, challenges related to infrastructure, human resource capacity, and organizational resistance also need to be addressed comprehensively through clear institutional commitments and policies. Overall, the findings in Table 4.2 emphasize the importance of transforming the business education system to align with the dynamics of technological development and 21st-

century competency demands. Close collaboration between academics, practitioners, and policymakers is a key prerequisite in realizing innovative and adaptive AI and computational thinking-based curricula and learning methods.

Discussion

The results of a systematic research involving a review of several related articles revealed that the implementation of Artificial Intelligence (AI) in business education in higher education is a strategic move that requires careful planning and an evidence-based approach. The integration of AI in business education is not only about the adoption of new technologies but also about the transformation of teaching and learning methodologies to prepare students for the challenges of Industry 4.0. Previous research has shown that AI has great potential to improve the quality of education and students' computational thinking skills (Luan et al., 2020; X. Chen et al., 2020). A study by Kim (2022) showed that the integration of AI into the curriculum can significantly improve students' understanding of complex concepts through more personalized and adaptive learning. Therefore, the first strategy is to develop an AI-based curriculum that includes relevant courses such as management, marketing, and business analytics. AI-based adaptive learning, tailored to students' abilities and needs, can improve learning effectiveness (Helo & Hao, 2022).

Lecturers' readiness to adopt AI is critical to the successful implementation of this technology. Research by Ahmad et al. (2021) emphasized the importance of a comprehensive training program for lecturers on the fundamentals of AI and its applications in education. This training should include continuous professional development, including seminars, workshops, and online courses on the latest developments in AI and technology-based teaching methodologies. To support the implementation of AI, universities need to invest in adequate hardware and software, as well as fast and stable internet networks (Seters, 2020). In addition, the establishment of research centers and laboratories dedicated to innovation in AI can provide a place for students and faculty to experiment and develop new solutions (Koroteev & Tekic, 2021). Partnerships with technology companies can provide students with access to the latest technologies, resources, and internship opportunities (Kakani et al., 2020). In addition, support from the government and policies that favor the adoption of AI in education is essential to create an ecosystem conducive to innovation (Meskó, 2020).

Project-based learning and simulation using AI can make the learning process more interesting and provide practical experience in business decision-making. (Setyawati et al., 2022; Setyawati, Azadilah, et al., 2023; Setyawati, Sugangga, et al., 2023; Wicaksono Ardiansyah et al., 2023). The use of AI-based simulation and gamification has been shown to increase student motivation and engagement and help them understand CT concepts through practical experience (Yang, 2022).

Analysis of learning data using AI can provide timely and specific feedback to help students improve their weaknesses. Continuous assessment of the effectiveness of AI implementation in education should be conducted periodically, with adjustments to strategies based on the results (Lee et al., 2019). By correlating the findings of previous research and implementing these strategies, Indonesian universities can harness the potential of AI to improve the quality of business education and prepare students with relevant and competitive skills in the digital era. This is in line with studies showing that the adoption of AI in higher education is not just a temporary trend, but a fundamental transformation needed to face the challenges of the times. (Maula et al., 2019, 2023; Wardana et al., 2020, 2023, 2023, 2024)

The importance of implementing Artificial Intelligence (AI) in business education in higher education to improve students' computational thinking is highlighted to prepare future generations for the increasingly complex and digitally connected business dynamics. Past research shows that AI can be a powerful tool to enrich student's learning experience, especially in the context of developing critical computational thinking skills. For example, a study by X. Chen et al. (2020) found that the integration of AI into business education curriculum significantly improved students' problem decomposition, pattern recognition, and algorithm generation skills.

The importance of AI in improving students' computational skills is also reflected in Kim's (2022) research, which highlights that AI enables personalized learning tailored to students' individual needs and abilities. With adaptive learning algorithms, AI can identify each student's strengths and weaknesses in computational thinking, enabling the delivery of appropriate and effective learning

materials. Furthermore, a study by Koroteev & Tekic (2021) emphasizes that AI facilitates collaborative and interactive learning, where students can participate in complex problem-solving and business solution development. This creates a learning environment that stimulates discussion and exchange of ideas, which are essential components of developing computational thinking.

In the context of preparing for the challenges of Industry 4.0, AI plays a crucial role in ensuring that students are equipped with relevant and necessary skills in an increasingly digitized business world. According to Haefner et al. (2021), computational skills are becoming increasingly important in the industry 4.0 era, and business education enriched with AI can ensure that graduates are prepared for the challenges and opportunities in the rapidly changing job market. Thus, the application of AI in business education not only aims to improve the quality of learning but also to prepare students with relevant skills to adapt and succeed in an increasingly connected and digitized business environment.

An in-depth understanding of the Unified Theory of Acceptance and Use of Technology (UTAUT) plays a crucial role in the development of learning today, as technology continues to evolve in educational contexts. Past research has provided strong evidence of the relevance of this theory in understanding user behavior towards learning technologies. For example, research by Venkatesh et al. (2003) found that perceived usefulness, perceived ease of use, and social norms have a significant effect on users' intention to accept and use technology.

The role of UTAUT Theory in optimizing learning technology adoption has proven to be important in various educational contexts. Research by Davis (1989) highlighted that perceived clear benefits of using learning technology can increase users' interest and intention to adopt it. Similar findings were found in a study conducted by Taylor and Todd (1995), which showed that the perceived ease of use factor also plays an important role in the acceptance of technology by users.

In addition, recent research by Alvi, (2021); and Venkatesh, (2022) showed that social norms, i.e. pressure from the social environment to accept learning technology, also contribute significantly to users' intention to use it. These research results confirm the importance of understanding the factors stated in the UTAUT Theory to design effective and sustainable implementation strategies in facing the challenges of technological development in education. Therefore, an in-depth understanding of UTAUT Theory provides a strong foundation for the development of more adaptive, interactive, and effective learning strategies. By taking into account the factors that influence technology acceptance and usage, educational institutions can design learning experiences that are more in line with users' needs and preferences. Furthermore, an understanding of this theory also enables educational institutions to predict and overcome barriers that may arise during the implementation process of learning technology, thus ensuring the success and sustainability of technology use in education

Conclusion

Based on the research results of this literature review, it can be concluded that the effective use of AI can improve students' analytical and problem-solving skills. The application of AI in higher education includes the development of virtual assistants that can help students complete academic tasks, provide guidance services, and manage academic administration. Although the adoption of AI technology in Indonesia's education system is still in its early stages, this study provides some important suggestions for higher education institutions. First, universities in Indonesia should be able to integrate AI into the learning process to improve students' computational thinking skills. The use of AI should include data analysis, personalization of learning, and development of interactive teaching methods. Second, universities need to adopt AI as an educational tool to prepare students for the challenges of Industry 4.0. This is important considering the computational thinking skills of Indonesian students still need special attention. Third, there needs to be massive investment in AI research and development for education, as well as the development of infrastructure that supports the implementation of this technology in Indonesia. By implementing these suggestions, it is hoped that Indonesian universities can proactively integrate AI into the curriculum and prepare students to face new challenges arising from the digital industrial revolution.

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