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The Importance of Pedagogical Competence in an Artificial Intelligence-Based Curriculum Towards the Golden Era of Indonesia 2045

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Abstract

This study aims to explore the strategies and roles of teachers in the success of an artificial intelligence (AI)-based curriculum by strengthening pedagogical competencies to improve the quality of education towards the vision of Golden Indonesia 2045. The method used is library research with content analysis of secondary sources such as journals, books, policy documents, and academic databases (Google Scholar, Garuda, Scopus). The results show that teacher pedagogical competencies, including student understanding, learning design, technology utilization, and evaluation, are key to optimizing the AI curriculum. However, challenges such as the low increase in pedagogical competency (0.23) and the digital infrastructure gap hinder implementation. Proposed solutions include teacher training, development of an adaptive AI platform, collaboration with the technology industry, and integration of critical pedagogical approaches to shape a competitive generation. This study concludes that the synergy between teacher pedagogical competencies and the AI curriculum can create personalized, innovative, and relevant learning to meet the needs of the digital era, while supporting the development of superior human resources for Golden Indonesia 2045.

Keywords: *Artificial Intelligence, Curriculum, Golden Indonesia 2045, Pedagogical Competence.*

PRELIMINARY

In the world of education, the existence of teachers is very important, their competence is expected to develop multiple intelligence and facilitate students to learn independently (Sumartini, 2021). Therefore, the education system must be managed by experts in their fields in order to be successful (Paluja et al., 2023), including professional teachers who need to fulfill the competencies as stated in Law no. 14 of 2005 concerning Teachers and Lecturers, Article 10 paragraph (1) states that: there are five competencies that teachers must have, namely professional competency, pedagogical competency, social competency, personality competency and leadership competency (Indonesia, 2005). Not only these five competencies, spiritual competencies are also included in the competencies that a teacher needs to have (Jateng, 2021).

The competency that a teacher needs to have first is pedagogical competency (Kemendikdasmen, 2024). These competencies play a crucial role in curriculum implementation, because good pedagogical skills enable educators to design, deliver, and evaluate learning effectively in accordance with curriculum objectives (Fitriyanti, 2024). In the context of the digital era, an AI curriculum is certainly needed to create a more personal, adaptive, and innovative learning experience (Hakim, 2021).

Indonesia is one of the countries with the largest population in the world (Kemhanbalitbang, 2024), predicted to be a golden country in 2045 according to the World Bank (Holmemo, 2020). Of course, we are preparing ourselves to face global challenges, including in the field of education (Hermawan, 2018). Preparing superior and competitive human resources is a top priority (Nagel, 2020). However, significant challenges remain, particularly related to low literacy rates. According to the Program

for International Student Assessment (PISA), Indonesia still ranks 69th out of 81 countries, ranking below Malaysia, Thailand, and Singapore in terms of reading literacy (Kemendikbudristek, 2023). This demonstrates the need for serious efforts to improve the quality of education, including through strengthening teachers' pedagogical competencies and developing curricula that are relevant to the needs of the times, such as AI-based curricula.

Previous research has shown that AI can act as a smart tutor, learning tool, and curriculum development guide, supporting both students and teachers. However, the improvement in teachers' pedagogical competence remains low (0.23), despite AI's great potential (Mastarita Nova Wulanda, Muslimahayati, 2025). The purpose of this study is to investigate teachers' strategies and roles in implementing the AI curriculum through pedagogical competencies to improve the quality of education. This research is significant because it can contribute to educational development, improve teacher competency, and support the vision of Golden Indonesia 2045 through superior human resources.

METHOD

This study uses a library research method to analyze the relationship between pedagogical competence and the AI curriculum in supporting the vision of Golden Indonesia 2045 (Sulaiman, 2022) Data is collected from various secondary sources, including books, scientific journals, conference proceedings, education policy documents, as well as academic databases such as Google Scholar, Garuda and others indexed by OJS, Sinta or even Scopus (Assingkily, 2021; Supriyadi, 2017).

The research process begins with data collection through literature research related to pedagogical teacher skills and the implementation of AI in education. In addition, the data is analyzed in a procedure using content analysis (content analysis). (1) Identifying the main topics, (2) classifying the results of the classification of pedagogical and AI aspects, and (3) classifying interpretations to understand the relationship between the two fields. The results of the analysis are then synthesized to develop strategic recommendations regarding the role of teachers in optimizing AI-based curriculum. This approach is expected to make research and practical contributions to the development of adaptive education in the digital era.

FINDINGS AND DISCUSSION

Definition and Scope of Pedagogical Competence

The term "pedagogy" comes from two ancient Greek words: "paedos," meaning "child," and "agogos," meaning "to lead," "to guide," or "to lead." Pedagogy is the field of study of how to educate children and the goals of education, educational tools, educational methods, students, educators, etc (Uce, 2021). Therefore, in education, it is considered as a process or activity that aims to change human behavior, and humanize humans. Pedagogic is a theory that discusses the problem, and what is the best way and the best way of education so that students can become intelligent, creative and innovative children and achieve their educational goals (Muzayanah, 2017).

In terms of No. 19 of 2005 in relation to the 2005 National Education Standards, the scope of educational skills listed in Article 28, paragraph 3 states that educational skills are the ability to manage student learning, which includes (1) understanding students, (2) designing and implementing learning, (3) evaluating learning outcomes, (4) developing students to actualize their various potentials. Meanwhile, Akhmad Sudrajat, pedagogical competence is the ability to manage student learning which includes; (1) understanding insight, (2) understanding students, (3) developing curriculum/syllabus, (4) designing learning, (5) utilizing learning technology, (6) evaluating learning processes and outcomes, and (7) developing students to actualize their various potentials.

Educational skills. The concept of education aims to acquire knowledge and teaching skills. According to the Ministry of National Education's educational skills (2007), teachers cover several core competencies including: (1) Mastering the characteristics of students from physical, moral, spiritual, social, cultural, emotional, and intellectual aspects, (2) Mastering learning theories and principles of educational learning, (3) Developing curricula related to the subjects taught, (4) Organizing educational learning, (5) Utilizing information and communication technology for learning purposes, (6) Facilitating the development of students' potential to actualize their various potentials, (7) Communicating effectively, empathetically, and politely with students, (8) Carrying out assessments and evaluations of learning

processes and outcomes, (9) Utilizing the results of assessments and evaluations for learning purposes, and (10) Carrying out reflective actions to improve the quality of learning.

Based on the understanding of teaching skills above, it can be said that professional teachers have the following skills: Basics of Lessons, Master Teachers, Learning from Students, Learning Motivation Theory, Knowledge of Community Environment, Preparation of Learning Curriculum, Learning Preparation for Educational Plans, and Controlling Knowledge of Learning Evaluation (Utiarahman, 2020).

Artificial Intelligence Curriculum Concept

AI-based curriculum is a term referring to curriculum development that utilizes artificial intelligence to create a more personalized, responsive, and adaptive learning environment for students. This idea aims to optimize the learning process by using data analysis to understand students' unique needs, making the learning experience more relevant and effective (Mulyadi, et.al., 2022). The plan to launch the AI curriculum originated from Prabowo Subianto's Asta Cita (eight missions), specifically the points on strengthening human resources, science, and technology (*Asta Cita: Delapan Misi Menuju Indonesia Emas 2045*, n.d.). This vision was then reinforced by Vice President Gibran's statement at an education policy evaluation meeting, which emphasized the importance of teaching coding from elementary school so that Indonesian students are able to compete globally towards Golden Indonesia 2045 (Jatnika, 2024). As an effort to prepare superior and competitive human resources, Indonesia's low human resource status is evidenced by its 69th ranking out of 81 countries, below Malaysia, Thailand, and Singapore in terms of reading literacy (Kemendikbudristek, 2023).

Before the official launch of the AI curriculum, the Ministry of Education, Culture, Research, and Technology had already integrated AI into the Bangkit 2024 Batch 2 Program. This program, which includes three learning paths (Cloud, Android, and Machine Learning), is enriched with materials on basic AI, applied machine learning, and generative AI. According to Putri Alam (Director of Public Policy at Google Indonesia), this step is in line with efforts to build AI-savvy digital human resources as the foundation for an independent and inclusive Indonesia in 2045 (Kemendikbudristek, 2024). Thus, the AI curriculum is not only a response to future technological needs, but also a concrete manifestation of the vision of human resource development within the framework of Asta Cita and Indonesia Emas 2045.

The scope of AI curriculum encompasses several important aspects. First, Personalized Learning. AI enables a learning approach tailored to students' learning styles and interests. By analyzing student progress data and preferences, AI can recommend appropriate materials. Second, Problem-Based Learning. This curriculum often includes simulations and learning scenarios relevant to real-life challenges, encouraging students to think critically and find solutions. Third, In-Depth Learning Evaluation. The use of AI in evaluation allows for the collection of more accurate data on student interaction with the subject matter, helping teachers provide specific feedback. Fourth, Dynamic Curriculum. AI-based curriculum can be updated regularly to reflect the latest developments in education and technology, ensuring that the material taught remains relevant. Fifth, Access to Lifelong Learning.

AI technology supports the concept of lifelong learning, where students can continue to access learning resources at any time, thus facilitating the continuous development of knowledge and skills. Sixth, Implementation Challenges. Despite its great potential, implementing AI-based curriculum also faces challenges such as the need for adequate technological infrastructure, training for educators, and issues of data privacy and security (Hakim, 2021). Thus, an AI-based curriculum focuses not only on technology, but also on how it can improve the overall quality of education, creating a more immersive and relevant learning experience for each student.

The Importance of Pedagogy in Achieving the Golden Indonesia 2045 Program

The common thread of Golden Indonesia 2045 with critical pedagogy refers to the concept of integration between the vision of Golden Indonesia 2045 and the critical pedagogical approach in the world of education. Critical pedagogy is a learning approach that emphasizes critical understanding, reflection, problem solving, and action aimed at creating social awareness and social transformation. According to Herlambang, critical pedagogy is able to produce individuals with character, who are futuristic, and idealistic. In line with Herlambang, according to Giroux, critical pedagogy is an educational

culture that produces individuals who have the ability to think critically, have broad insight, are reflective, have the ability to judge morally with balance, and have social responsibility in their actions (Yulianti et al., 2022). It is concluded that critical pedagogy aims to enable an individual to have the ability to think critically, futuristically, with noble character, and be able to compete globally.

Critical pedagogy, on the other hand, emphasizes the importance of education that not only teaches knowledge and skills but also develops critical awareness and the ability to think critically about existing social, political, and economic realities. This approach encourages students to become agents of change who can understand and address the various social challenges facing the nation. Similarly, character education is not solely focused on cognitive abilities, but must be able to be internalized through real-life experiences (Sennen, 2017).

In the effort to realize Golden Indonesia 2045, developing superior and competitive human resources (HR) is a fundamental aspect. One of the main strategies being promoted is the implementation of an artificial intelligence (AI)-based curriculum to improve the quality of education in Indonesia. However, the success of the AI curriculum implementation depends not only on technology but also on the readiness of teachers to manage learning with an appropriate pedagogical approach. Pedagogical competence plays a central role in ensuring that the use of AI in education is not merely a technical tool but is truly capable of improving the quality of learning and developing students' character (Khotimah & Ula, 2023). The following are things that need to be considered in the AI-based learning process:

1. AI as a Tool, Teachers as Learning Facilitators

Although AI has the ability to automate many aspects of learning, such as material development, personalized learning, and data-driven assessment, the role of teachers remains irreplaceable. Teachers with strong pedagogical competencies are able to utilize AI as a learning aid without losing the essential human interaction necessary for the educational process. In this context, the right pedagogical approach will ensure that AI is not simply used to replace the role of teachers, but rather as a tool that supports the learning process to be more effective, inclusive, and responsive to students' needs. The teacher's role as a facilitator remains essential in guiding students to understand concepts, develop critical thinking skills, and shape character and social values that AI cannot teach alone (*Penerapan AI Dalam Pembelajaran: Masa Depan*, n.d.).

2. Pedagogical Competence to Face the Challenges of the Digital Divide

One of the main challenges in implementing an AI curriculum is the gap in infrastructure and digital literacy. Data shows that teachers' pedagogical competence is still low (0.23), (Sennen, 2017), indicating that many teachers are not yet ready to optimally integrate AI into learning. Without adequate pedagogical competence, the use of AI in education can widen the gap in access and quality of education between regions with adequate infrastructure and those that are still lagging behind.

Therefore, teachers' pedagogical competencies must include skills in adapting AI technology to students' conditions and needs. Teachers must be able to: (a) Develop inclusive learning strategies, so that AI can be utilized by all students without exception. (b) Develop AI-based learning methods that maintain aspects of social interaction and character values. (c) Address ethical and privacy challenges in the use of AI in education, by ensuring that student data is used safely and responsibly.

3. Critical Pedagogy to Develop a Competitive Generation

The implementation of an AI curriculum in education aims not only to improve students' technical skills in understanding technology, but also to shape a generation with critical, creative, and solution-oriented thinking. In this regard, a critical pedagogical approach is crucial because it helps students understand how technology works, why it is developed, and its impact on society and their future.

Critical pedagogy is not merely a process of knowledge transfer, but also a process of reflection and awareness-building toward social reality. This is particularly relevant in the AI era, where students need not only to understand technology but also to have ethical awareness in its use. Therefore, a critical pedagogical approach should be an integral part of the AI curriculum to: (a) Encourage students to think independently and reflectively about the role of AI in their lives. (b) Develop problem-solving skills and creativity in facing future technological challenges. (c) Instill moral and ethical values in the use of AI, so that students become not only technology users but also responsible innovators.

4. Strategies for the Success of AI-based Curriculum

Incorporating artificial intelligence (AI) into the school curriculum is now a strategic step to improve the quality of learning in Indonesia. Achieving a successful AI-based curriculum requires a structured and collaborative strategy that begins with improving teacher competency. Teachers, who are at the forefront of education, must receive intensive training on the basic concepts of AI, how AI tools can be used in learning, and how to incorporate this technology into everyday learning. Teachers can enhance their digital and pedagogical skills by participating in workshops, online courses, and certification programs. This allows them to prepare their students for the digital era. The development of AI-based learning content and platforms is also crucial. AI-powered intelligent tutoring systems, virtual simulations, and interactive learning materials can enhance student understanding and make the learning process more engaging. Adaptive learning platforms allow materials to be tailored to the needs and abilities of each student, making learning more effective and individualized (Hakim, 2021).

The availability of infrastructure and supporting tools is crucial for the success of an AI curriculum. All devices and platforms used must be relevant, accessible, and aligned with the curriculum's needs; schools must also provide hardware such as tablets, computers, and robotics. The next, equally important step is to collaborate with industry and technology institutions. Schools can gain access to the latest technology, teaching materials, and AI mentors through these collaborations. This collaboration also helps develop AI solutions that meet local needs and the national curriculum (Hakim, 2025).

AI can be used in assessment and evaluation processes to automate assessments, provide rapid and objective feedback, and comprehensively analyze learning outcomes. The resulting data helps teachers identify areas for improvement and offer more targeted interventions. Clear policies and guidelines need to be established for the use of AI, particularly regarding ethics, privacy, and data security. The rights of students and teachers must be protected, and transparency in data management must be a top priority. To enhance students' critical thinking, creativity, and collaboration skills, project-based and problem-based learning should also be implemented. With the help of AI, students can work in teams to solve real-world problems and find innovative solutions.

Finally, ongoing monitoring and evaluation are crucial to ensure the successful integration of AI into the curriculum. Feedback from teachers, students, and parents should be used to adapt the curriculum to remain relevant and relevant (Tristianto et al., 2025). Thus, an AI-based curriculum will be a strong foundation for preparing the younger generation to face future challenges if combined with a mature strategy, cross-sector collaboration, and a commitment to improving the quality of education.

CONCLUSION

This study revealed three main findings. First, the successful implementation of an AI-based curriculum is highly dependent on teachers' pedagogical competence in integrating technology with a humane learning approach. Second, there are serious challenges in the form of low teacher competency improvement (score 0.23) and a gap in digital infrastructure between regions. Third, the AI curriculum has great potential to create a more personalized and innovative learning system when supported by an appropriate pedagogical approach. Based on these findings, the study recommends four strategic steps. First, the implementation of intensive training programs for teachers focused on mastering educational technology through collaboration between the government, universities, and industry. Second, accelerating the distribution of digital infrastructure along with the development of ethical guidelines for the use of AI in the education sector. Third, the integration of a critical pedagogical approach with the development of a project-based learning model in the AI curriculum. Fourth, the formation of multi-sector partnerships involving all stakeholders to ensure sustainable implementation. These strategic steps are expected to strengthen the foundation of the Indonesian education system in preparing competitive and globally competitive human resources, while simultaneously realizing the vision of Golden Indonesia 2045.

REFERENCES

Assingkily, M. S. (2021). *Metode Penelitian Pendidikan: Panduan Menulis Artikel Ilmiah dan Tugas Akhir*. Yogyakarta: K-Media.

Asta Cita: Delapan Misi Menuju Indonesia Emas 2045. (n.d.). UNESA.COM.

Fitriyanti, F. (2024). Kompetensi Pedagogik Guru Pendidikan Agama Kristen dalam Penguatan Profil

Pancasila. *Proceeding National Conference of Christian Education and Theology*, *2*(1), 92–100. https://doi.org/10.46445/nccet.v2i1.861

Hakim, L. (2021). *Peranan Kecerdasan Buatan (Artificial Intelligence) dalam Pendidikan*. Kemdikbudristek.

Hermawan, R. (2018). Kebijakan-Kebijakan Pendidikan Pada Era Globalisasi. *Jurnal Pendidikan*, *1*(1), 1–18.

Holmemo, C. (2020). *Berinvestasi pada manusia: Perlindungan sosial untuk masa depan Indonesia*. Worldbank.

Indonesia, M. K. R. (2005). *Resume Permohonan Perkara. Perkara Nomor 025 / PUU-IV / 2006*.

Jateng, K. (2021). Selain Kompetensi Dasar, Guru PAI Harus Faham Kompetensi Spiritual. *Kemenag Jateng*.

Jatnika, Y. (2024). *Abdul Mu'ti : Mapel Coding dan AI Itu Pilihan, Hanya Bagi Sekolah Yang Siap*. Puslapdik Kemendikdasdikmen.

Kemendikbudristek. (2023). Literasi Membaca, Peringkat Indonesia di PISA 2022. *Laporan Pisa Kemendikbudristek*, 1–25.

Kemendikbudristek. (2024). *Program Bangkit 2024 Batch 2 Dimulai, Bekali Mahasiswa dengan Kompetensi AI*. Kemendikbudristek.

Kemendikdasmen. (2024). *Indikator dan Level Refleksi Kompetensi Guru*. Kemendikdasmen.

Kemhanbalitbang. (2024). *Jumlah Penduduk Yang Besar Merupakan Tantangan Bagi Negara Indonesia*. Kemhanbalitbang.

Khotimah, K., & Ula, D. M. (2023). Pendidikan Dan Pelatihan: Pengembangan Sumber Daya Manusia Menuju Indonesia Emas 2045. *Trivikrama: Jurnal Ilmu Sosial*, *01*(11), 40–50.

Lukmanul Hakim, D. (2025). *Wajah Baru Pendidikan di Era Digital* (Issue Januari 2025). Lembaga Pendidikan dan Pelatihan Sindotech.

Mastarita Nova Wulanda, Muslimahayati, T. A. (2025). Pelatihan Penggunaan Teknologi Artificial Intelligence Untuk Meningkatkan Kemampuan Pedagogik Guru. *Jurnal Pengabdian Pendidikan Masyarakat (JPPM)*, *3*(2), 108–118.

Mulyadi, Muhammad Ilyas, Kafrawi, Abdul Syahid, F. Y. L. (2022). Pendidikan, Kurikulum Berbasis Kecerdasan Buatan: Menyongsong Revolusi Pendidikan. *Jurnal Literasiologi Volume*, *11*, 103–112.

Muzayanah, F. L. M. (2017). *Kompetensi Pedagogik*. 1–17.

Nagel, P. J. F. (2020). Peningkatan SDM Indonesia yang Berdaya Saing melalui Pendidikan di Era Transformasi Digital dan Teknologi yang Berkelanjutan. *Prosiding Seminar Nasional Sains Dan Teknologi Terapan*, *1*(1), 31–38.

Paluja, H. D., Hente, A., & Ayuningtiyas, F. (2023). Kompetensi Profesional Guru Paud Dalam Peningkatkan Kualitas Belajar Anak Usia Dini di Kelompok Bermain Tunas Bangsa. *ECEIJ (Early Childhood Education Indonesian Journal)*, *6*(1), 1–13.

Penerapan AI dalam Pembelajaran: Masa Depan. (n.d.). AICI UMG.

Sennen, E. (2017). Problematika Kompetensi dan Profesionalisme Guru. *Prosiding Seminar Nasional HDPGSDI Wilayah IV Tahun 2017*, 16–21.

Sulaiman, J. M. (2022). Peran Guru dalam Membentuk Karakter Peserta didik Era Pandemi. *Kompetensi*, *7*(1), 39–47. https://doi.org/10.47655/kompetensi.v7i1.64

Sumartini, N. W. E. (2021). Memanfaatkan Digitalisasi Pendidikan dalam Pengembangan Potensi Siswa. *Prosiding Webinar Nasional IAHN-TP Palangka Raya, No. 3*, *1*, 135.

Supriyadi, S. (2017). Community of Practitioners: Solusi Alternatif Berbagi Pengetahuan antar Pustakawan. *Lentera Pustaka: Jurnal Kajian Ilmu Perpustakaan, Informasi Dan Kearsipan*, *2*(2), 83. https://doi.org/10.14710/lenpust.v2i2.13476

Tristianto, M. R., Nugraha, A. S., & Ramdani, A. (2025). *Pengaruh Artificial Intelligence (AI) dalam Evaluasi Pembelajaran Bahasa Indonesia pada Kalangan Mahasiswa*. *3*.

Uce, L. (2021). Urgensi Pembekalan Pedagogik Kepada Orang Tua. *Bunayya : Jurnal Pendidikan Anak*, *7*(1), 54. https://doi.org/10.22373/bunayya.v7i1.9289

Utiarahman, T. B. (2020). Meningkatkan Kompetensi Pedagogik Guru Melalui Pelatihan Berjenjang. *Aksara: Jurnal Ilmu Pendidikan Nonformal*, *5*(3), 215. https://doi.org/10.37905/aksara.5.3.215-222.2019

Yulianti, Winda Cahya Wati, & Adiyono. (2022). Analisis Standar Hasil Evaluasi Melalui Proses Belajar. *SOKO GURU: Jurnal Ilmu Pendidikan*, *2*(2), 170–176. https://doi.org/10.55606/sokoguru.v2i2.815