



Coding and Artificial Intelligence (AI) learning in teachers' perspective

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ABSTRACT

Technological advancements have brought about changes to the curriculum, particularly the integration of coding and Artificial Intelligence (AI) into learning. This study aims to explore teachers' perspectives on coding and AI learning policies in the Kurikulum Merdeka, focusing on the factors that influence the adoption and acceptance of technology. The research was conducted using a qualitative approach, using in-depth interviews with six teachers from elementary, junior high, high school, and vocational school levels in Bandung City. The analysis framework utilizes the Unified Theory of Acceptance and Use of Technology (UTAUT) theory, which encompasses four key constructs: performance expectancy, effort expectancy, social influence, and facilitating conditions. The results indicate that teachers have positive expectations regarding the benefits of learning coding and AI. However, challenges persist in terms of infrastructure readiness, training, and institutional support. Perceived ease of use and social influence varied depending on the level and type of school. The research conclusion reveals that, although teachers in Bandung City generally exhibit a positive attitude towards coding and AI learning in the Kurikulum Merdeka, the level of implementation readiness remains unequal across educational units, necessitating contextual and adaptive policies.

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ABSTRAK

Perkembangan teknologi telah membawa perubahan pada kurikulum, khususnya masuknya koding dan Kecerdasan Artifisial (KA) dalam pembelajaran. Penelitian ini bertujuan untuk menggali perspektif guru terhadap kebijakan pembelajaran Koding dan KA dalam Kurikulum Merdeka, dengan fokus pada faktor-faktor yang mempengaruhi adopsi dan penerimaan teknologi. Penelitian dilakukan dengan pendekatan kualitatif menggunakan metode wawancara mendalam kepada enam guru dari jenjang SD, SMP, SMA, dan SMK di Kota Bandung. Kerangka analisis menggunakan teori Unified Theory of Acceptance and Use of Technology (UTAUT), mencakup empat konstruk: performance expectancy, effort expectancy, social influence, dan facilitating conditions. Hasil penelitian menunjukkan bahwa guru memiliki ekspektasi positif terhadap manfaat pembelajaran Koding dan KA, namun masih terdapat tantangan dalam hal kesiapan infrastruktur, pelatihan, dan dukungan institusional. Persepsi kemudahan penggunaan dan pengaruh sosial bervariasi tergantung pada jenjang dan jenis sekolah. Kesimpulan penelitian menunjukkan bahwa meskipun guru di Kota Bandung secara umum menunjukkan sikap positif terhadap pembelajaran koding dan KA dalam Kurikulum Merdeka, tingkat kesiapan implementasi masih timpang antar satuan pendidikan sehingga diperlukan kebijakan yang kontekstual dan adaptif.

Kata Kunci: kecerdasan artifisial; koding; perspektif guru; UTAUT

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INTRODUCTION

The rapid development of technology, especially in coding and Artificial Intelligence (AI), has had a significant impact on global and national education. Over the past few years, coding and Artificial Intelligence (AI) have become an integral part of the curriculum in many countries, including China, South Korea, Australia, Singapore, and India, in response to the need to prepare learners for the digital age, full of innovation and challenges. This technology is influencing the way we teach and learn, allowing for the creation of more interactive, project-based, and problem-solving-oriented learning methods that are applicable (Fajriati *et al.*, 2024). Coding, as a fundamental skill in the digital world, is important to teach from an early age, as it provides a foundation for understanding the logic and algorithms used in daily life and the industrial world (Lee, 2020). Meanwhile, trains have the potential to change how we interact with technology through their applications across various fields, including education (Adiman *et al.*, 2024).

In Indonesia, Kurikulum Merdeka provides space for learning innovations involving technology, including coding and teaching Artificial Intelligence (AI). It aims to prepare future generations with skills relevant to the demands of the 21st century, including the ability to think critically, creatively, and adaptively to the changing times (Sapitri, 2022). Therefore, it is important to examine how implementing this policy can accelerate the transformation of education in response to social and technological changes. Social dynamics and technological developments have profoundly impacted how we design educational curricula. Social changes, such as globalization and the digital revolution, have prompted the need to reform the curriculum to include 21st-century skills, including technical and social skills that meet the demands of the modern world. Technology, especially in the form of coding and Artificial Intelligence (AI), is an important element in the curriculum that prepares students to face future dynamics and challenges (Ayanwale *et al.*, 2022; Yim, 2024).

The curriculum must be adaptable to these social changes by creating space for learners to develop skills that connect them to the broader world. The social changes triggered by globalization demand that the education system prepare learners with skills that can increase their competitiveness in the global market. In addition, a curriculum that is responsive to technological developments provides students with the opportunity to innovate and create through mastery of digital technology (Yadav *et al.*, 2016). Therefore, the education curriculum in Indonesia needs to continue to make adjustments and adopt technology-based learning to prepare future generations to face increasingly complex challenges.

The Government of Indonesia, through the Academic Manuscript on coding and AI learning in Primary and Secondary education, has established a strategic policy to integrate coding and Artificial Intelligence (AI) learning into Kurikulum Merdeka starting from the 2025/2026 school year. This policy aims to prepare students to face the challenges of the 21st century, marked by digital transformation and rapid technological advancements. The integration of coding and Artificial Intelligence (AI) in the curriculum is designed to equip learners with digital literacy, computational thinking, problem-solving, creativity, and an ethical understanding of technology, which are essential in modern life and the world of work. The application of this subject is optional and will start from the 5th grade of Elementary School (SD) and Junior High School (SMP) to the Senior High School/Vocational (SMA/SMK) level,

with time allocation varying according to the level of education. Through this policy, it is hoped that students will not only master conceptual knowledge but also develop practical skills that can be applied in real-world contexts, enabling them to adapt and contribute to the era of globalization and digitalization.

In implementing coding and Artificial Intelligence (AI) learning policies in the Kurikulum Merdeka, teachers face significant challenges and obstacles. One of the main obstacles is the limited resources, both in the form of technological infrastructure and appropriate teaching materials to support coding and Artificial Intelligence (AI) learning in schools (Kartiasih *et al.*, 2023). In addition, inadequate teacher training to master the concepts and techniques of teaching coding and Artificial Intelligence (AI) is a major obstacle. Many teachers feel they are not ready to teach the material due to limited knowledge and skills in technology. The influence of social perceptions of technology also affects teachers' attitudes towards these policies; some teachers may feel concerned about the significant changes in teaching methods needed to integrate technology into daily learning (Dzattdini *et al.*, 2025).

In addition, the fear that technology could replace their role in the classroom is also an inhibiting factor in the acceptance of this policy, even though technology can be a tool that enriches the learning experience. However, until now, there is minimal research that explicitly and in-depth explores how teachers' perspectives on this new policy are, especially in the context of their psychological, pedagogical, and technological readiness to implement coding and Artificial Intelligence (AI) learning at various levels of primary and secondary education in Indonesia. The novelty of this research is the empirical mapping of teachers' perceptions holistically using the theoretical framework of the Unified Theory of Acceptance and Use of Technology (UTAUT), which has not been widely applied to coding learning policies and training in Kurikulum Merdeka.

The teacher's perspective is critical in understanding and evaluating the implementation of education policies, especially those related to coding and Artificial Intelligence (AI) learning. Teachers are most directly involved in the teaching and learning process, so their attitudes and perceptions of this policy will significantly affect its implementation in the classroom (Galindo-Domínguez *et al.*, 2024). Social factors play a significant role in the acceptance and implementation of curriculum changes among students, teachers, and the community. Teachers with a strong understanding of the benefits of technology in education will be more open to change and better able to overcome challenges that arise (Ayanwale *et al.*, 2022; Sanusi *et al.*, 2024). Therefore, it is important to listen to and understand teachers' perspectives when designing and implementing education policies, especially those related to technology, to ensure that such changes are acceptable and implemented effectively at the practical level (Fahdia & Lestari, 2025; Mualimin *et al.*, 2025).

Teachers' perspectives can provide important insights into how these policies can be adapted to real conditions on the ground, especially in the face of existing obstacles and challenges. On the other hand, an assessment of teachers' views on coding and Artificial Intelligence (AI) learning can provide valuable insights into the practical challenges they face, such as training limitations, resource constraints, and their readiness to teach evolving technologies (Purnama *et al.*, 2025) rapidly. In addition, the teacher's perspective reveals how these new technologies and curriculum are being accepted at the school level and how teachers are adapting their teaching methods to accommodate these changes. The involvement of

teachers in curriculum evaluation can make it easier to adapt coding and Artificial Intelligence (AI) learning policies to real needs in the field and facilitate the achievement of better educational goals. This can strengthen the implementation of a curriculum that is more inclusive and relevant to technological developments (Lukman & Nurhayati, 2024).

Research on teachers' perspectives on coding and Artificial Intelligence (AI) learning policies is fundamental, as teachers are the primary actors directly involved in classroom learning (Ayanwale *et al.*, 2022). Their perspectives can reflect the extent to which these policies are understood, accepted, and implemented effectively on the ground. Some studies show that teachers often feel ill-equipped to teach coding and Artificial Intelligence (AI), either due to limited training or a lack of supporting resources (Adawiyah & Rindaningsih, 2024; Aljemely, 2024; Purnama *et al.*, 2025). This situation underscores the importance of further research to understand the challenges teachers face and how these policies can be tailored to their needs, as well as to identify the best ways to engage them in implementing technology-based curricula. This research is significant because, in addition to offering a qualitative approach that focuses on teachers' interpretation of new policies, it systematically uses the UTAUT framework to identify factors influencing technology adoption in the context of Indonesian education, which is in a period of policy transition.

The general purpose of this research is to explore teachers' perspectives on coding and Artificial Intelligence (AI) learning policies in Kurikulum Merdeka, with special attention to factors that affect the use and acceptance of technology across primary to upper secondary education levels. Meanwhile, the specific purpose of this research is to identify teachers' expectations for the benefits of coding learning and Artificial Intelligence (AI) (*performance expectancy*), understand the level of ease felt by teachers in adopting this technology (*effort expectancy*), explore the social influence of the surrounding environment in encouraging the use of technology (*social influence*), and assess the availability of technical and institutional support in the implementation of the policy (*facilitating conditions*). The results of this research are expected to provide practical and theoretical contributions to policymakers and other education stakeholders.

LITERATURE REVIEW

Coding and Artificial Intelligence (AI) Learning in Primary and Secondary Education in Kurikulum Merdeka

Coding learning at the primary and secondary education levels refers to the introduction and mastery of computational thinking concepts, programming, and algorithmic logic tailored to students' developmental stage (Kong *et al.*, 2018). Meanwhile, training in primary and secondary education includes an understanding of the basic principles of machine intelligence, data processing, and the application of ethics in the use of intelligent technology, delivered through a contextual, practical approach (Nguyen *et al.*, 2023). The Academic Manuscript of Coding and Artificial Intelligence (AI) Learning 2025/2026 emphasizes that the scope of coding and Artificial Intelligence (AI) learning in elementary schools includes the introduction of simple patterns and instruction, while at the intermediate level, it is focused on developing projects based on digital solutions and solving real problems using KA technology. This learning is not only focused on technical skills, but also on strengthening

soft skills such as collaboration, creativity, and critical digital literacy. The scope of coding and Artificial Intelligence (AI) learning ranges from conceptual understanding to applied practices oriented to 21st-century competencies.

Learning coding and Artificial Intelligence (AI) in Kurikulum Merdeka has strategic urgency in preparing students to face the digital and automation era, as well as equipping them with the high-level thinking skills needed in a knowledge-based society (Suharyo *et al.*, 2024). Learning to code in school-age children has a significant impact on logical thinking, problem-solving, and decision-making skills (Lye & Koh, 2014). In addition, integrating training into the primary and secondary curricula provides an opportunity to introduce the ethical and social principles of technology from an early age (Zafari *et al.*, 2022). Kurikulum Merdeka, based on competencies and learning differentiation, provides space for the development of coding and Artificial Intelligence (AI) materials tailored to the local context and students' needs. In this context, Piaget's constructivist theory and Siemens' approach to connectivism serve as relevant epistemological foundations, as coding and Artificial Intelligence (AI) learning demand students' active interaction with a digital learning environment and meaning-making through hands-on experience. This study adopts the theory of connectivity as the main framework for the research, arguing that knowledge is built through information networks and technological interactions, in line with the characteristics of train learning.

In the context of technology-based curriculum planning, a modern curriculum must instill an understanding of technology in a social context so that students can become participatory citizens in a digitalized society. The success of technology-based curricula depends heavily on teachers' readiness to adopt a constructivist approach, which emphasizes hands-on, contextual, and student-centered learning. A good curriculum not only adopts technology but must also align with the school's social and cultural values that support transformative learning. Therefore, to integrate coding and Artificial Intelligence (AI), it is important to pay attention not only to the technical aspects of learning but also to curriculum design that is responsive to social conditions and teacher readiness. This idea aligns with the principles of Kurikulum Merdeka, which emphasize flexibility, meaningful context, and differentiation of learning to strengthen the profile of Pancasila students (Azalia *et al.*, 2023).

The Government of Indonesia, through the "*Academic Manuscript of Coding Learning and Artificial Intelligence in the Primary and Secondary Education Curriculum for the 2025/2026 Academic Year*," has set a strategic policy direction for integrating these two fields. This policy states that coding and Artificial Intelligence (AI) learning are no longer an addition but an essential part of strengthening the profile of Pancasila students and transforming national digital learning. The Academic Manuscript states that starting in 2025, all primary and secondary education units are expected to implement coding and Artificial Intelligence (AI) learning as part of the Informatics subject and/or the Pancasila student profile strengthening project. The government also emphasized the importance of teacher capacity development, the provision of software and hardware, and flexibility in the development of school curriculum to suit their respective readiness and context (Dewi & Dewi, 2024). This policy aligns with the global trend of integrating technology literacy and training into the education system from an early age. This research is conducted in the context of the ongoing national policy. It focuses on the readiness of educational units to implement the policy, including human resources, infrastructure, and school culture.

Acceptance Theory and Teachers' Perspectives on Educational Technology Innovation

Understanding teachers' perspectives on implementing technology-based learning policies, such as coding and Artificial Intelligence (AI), can be analyzed using a theoretical framework of technology acceptance. One of the comprehensive theories in explaining the factors that influence technology adoption is *the Unified Theory of Acceptance and Use of Technology* (UTAUT). UTAUT is a widely used theoretical model for understanding the acceptance and use of technology, including in educational contexts. UTAUT explained that an individual's intention to use a technology is greatly influenced by four primary constructs, namely: 1) *performance expectancy*, which is the extent to which individuals believe that the use of technology will help improve their performance; 2) *effort expectancy*, which is the extent to which the technology is considered easy to use; 3) *social influence*, i.e., the extent to which an individual feels that important people around him or her think that he or she should use the technology; and 4) *facilitating conditions*, i.e. the extent to which the individual believes that there is adequate technical infrastructure and organizational support to use the technology. These four constructs are highly relevant in the context of education, especially for analyzing how teachers respond to innovative policies such as coding and Artificial Intelligence (AI) learning under Kurikulum Merdeka (Venkatesh et al., 2012).

Performance expectancy *indicators* include teachers' perceptions that the use of coding and Artificial Intelligence (AI) can improve learning effectiveness or student learning outcomes. The *effort expectancy indicator* includes the extent to which teachers feel able to use coding or Artificial Intelligence (AI) devices and applications easily. *Social influence*, the indicators include the influence of school principals, peers, and national education policies on teachers' decisions to adopt technology (Dwivedi et al., 2019). Meanwhile, *enabling conditions will be evident* in the availability of training, technical support, hardware and software, and digital infrastructure in schools. Focusing on these indicators will help explain the main problems in the study: the extent to which teachers accept, are ready, and support the implementation of coding and Artificial Intelligence (AI) learning policies, as well as the factors that inhibit or drive them. This UTAUT theory also complements the *Technology Acceptance Model* (TAM), which focuses on two primary constructs: *perceived usefulness* and *perceived ease of use*. Although TAM has been widely used, UTAUT is considered superior because it encompasses the social dimension and organizational support conditions, making it more suitable for complex educational contexts (Dwivedi et al., 2019). In addition, the concept of *Teacher Readiness for Technology Integration* holds that the success of technology integration is not determined solely by teachers' acceptance, but also by their readiness in digital competence, pedagogy, and professional attitudes to change (Valtonen et al., 2015).

From a humanistic education perspective, Rogers' approach reminds us of the importance of considering human needs, experiences, and values in the technology-based learning process, ensuring that innovation remains on the side of students as the main subject of learning. This study aims to holistically understand how teachers interpret coding and Artificial Intelligence (AI) learning policies, as well as the factors that affect their attitudes, readiness, and acceptance within the framework of Kurikulum Merdeka. In the context of education, several studies, including those conducted by experts, support the view that UTAUT is

effective in analyzing the factors that influence teachers' technology adoption, including in the context of digital innovations such as coding learning and artificial intelligence (Dwivedi *et al.*, 2019). Therefore, in this research, UTAUT serves as a theoretical framework to explore teachers' perceptions of the implementation of new technologies in the school environment. In this context, this study identifies and explores various indicators that reflect the four UTAUT constructs.

Related Research

The way teachers view coding and Artificial Intelligence (AI) learning at the primary and secondary education levels is determined mainly by technological readiness, pedagogical understanding, and systemic support from schools and the government. Prospective teachers in Indonesia have a moderate level of technological knowledge and show a passion for exploring AI-based tools through training, collaboration, and self-learning (Hastomo *et al.*, 2024). However, while teachers are aware of the potential of AI in improving the quality of learning, they are also expressing concern about negative impacts such as students' dependence on technology and declining social interaction in learning (Pratiwi *et al.*, 2025). Another study that compared the perspectives of education students from Indonesia, the Philippines, and Japan emphasized that the use of AI in Indonesia is still constrained by infrastructure and training limitations, even though culturally, teachers have an open attitude to change (Muthohar *et al.*, 2025). Meanwhile, perceptions of teachers and other stakeholders greatly influence the success of AI implementation, with parental support and student understanding also crucial factors (Akbar *et al.*, 2025). In this research framework, these theories strengthen the position of researchers in exploring how teacher perception is an important factor in the readiness of the implementation of coding and Artificial Intelligence (AI) learning, as emphasized in the Academic Manuscript of Coding and Artificial Intelligence (AI) Learning that teacher training, access to resources, and positive perception are the main pillars of the success of digital innovation in schools.

Institutional and Policy Support

Institutional support is a key factor in the successful implementation of coding and Artificial Intelligence (AI) learning in primary and secondary schools. The government and education agencies have a strategic role in drafting regulations, providing infrastructure, and developing appropriate curriculum and training. The active involvement of schools and principals in digital policy-making drives systemic technology adoption. Additionally, collaborations between schools and communities, such as local educational technology (*EdTech*) organizations, can expand access to coding and Artificial Intelligence (AI) learning resources (Inayah *et al.*, 2024). Meanwhile, without local needs-based policies, digital programs often fail to be implemented sustainably. In this research framework, these theories provide a foundation for analyzing the readiness of Indonesian educational institutions to support coding and Artificial Intelligence (AI) programs, as outlined in the Academic Manuscript on Coding and Artificial Intelligence (AI) learning 2025, which emphasizes the importance of policy orchestration by the central education unit.

Some developed countries, such as Australia and South Korea, have integrated coding and Artificial Intelligence (AI) learning in their basic education systems with comprehensive and systematic policy support. In Australia, the *Digital Project Technologies in Focus* (DTiF) policy, since 2017, has been designed to encourage collaboration between schools and across schools, supported by curriculum officers to help them apply Digital Technologies in learning. In South Korea, train integration is part of the national strategy for digital talent development, with a focus on teacher education and the development of adaptive teaching materials (Lee & Jeong, 2023). The success of digital programs in South Korea is heavily influenced by cross-sectoral support between government, industry, and higher education institutions (Kim & Kwon, 2023). However, the success of digital policies is not only determined by the availability of the curriculum, but also by the readiness of school culture and teachers' trust in technology (Scherer *et al.*, 2019). Within the framework of this research, Indonesia's approach to coding and Artificial Intelligence (AI) learning is positioned to learn from successful international practices while still adapting them to the local context, as directed in the Academic Manuscript on Coding and Artificial Intelligence (AI) Learning.

METHODS

This research adopts a qualitative approach. This approach is a scientific method that aims to gain a deep understanding of a phenomenon in the social environment, naturally, with an emphasis on direct, intense interaction between the researcher and the object of study. The selection of a qualitative approach in this study is based on the aim of exploring in depth the teacher's perspective on coding and Artificial Intelligence (AI) learning policies in the Kurikulum Merdeka, which cannot be adequately explained through numbers or quantitative data alone. This approach allows researchers to capture teachers' meanings, understandings, and subjective experiences in responding to these policies, including expectations, barriers, and contextual factors that affect the acceptance of educational technology. With this approach, it is hoped that a holistic understanding of teachers' attitudes and readiness for integrating coding and Artificial Intelligence (AI) technology into learning will be obtained.

This research was carried out in Bandung using the purposive sampling technique, with specific criteria. The interview technique is semi-structured, allowing the researcher to elicit flexible, context-specific responses while still focusing on the indicators derived from the UTAUT theory. The interview process was carried out with six informants, including two public elementary school teachers and one private elementary, junior high, high school, and vocational school teacher, each targeted by the policy. This interview aims to dissect teachers' thoughts on coding and Artificial Intelligence (AI) learning policies. The interviews in this study were conducted using a semi-structured approach: they were flexible but still followed the guidelines for the prepared questions. The data analysis process follows the Miles and Huberman model, which includes the following stages: 1) data collection; 2) data reduction; 3) data presentation; and 4) concluding. To ensure data validity, this study used source triangulation.

RESULTS AND DISCUSSION

Technology-based learning, such as coding and Artificial Intelligence (AI), in the context of Kurikulum Merdeka is understood as an educational innovation that aims to prepare students to face the challenges of the 21st century. This innovation requires not only changes in curriculum content but also in how teachers interpret, accept, and apply it in learning practices. The findings of this study show that teachers' perspectives on the Koding and KA learning policies in the city of Bandung vary widely, depending on educational background, school conditions, and available support. The results of this study can be mapped into four main categories, as shown in the following **Table 1**.

Table 1. Teachers' Perspectives on Coding and Artificial Intelligence (AI) Learning

| Category | Education level | Teacher's Perspective |
|-------------------------------|------------------------|---|
| <i>Performance Expectancy</i> | Elementary School | Public & Private: Can improve students' digital literacy from an early age and train logical thinking and creativity. |
| | Junior High School | Very relevant and able to shape students' algorithmic mindset at the junior high school level. |
| | Senior High School | As an important provision for career development and readiness to face the digital era and the industrial revolution. |
| | Vocational High School | It is not new, as most of it has already been implemented, so this policy strengthens existing programs. |
| <i>Effort Expectancy</i> | Elementary School | Public: Teachers face significant challenges in implementing coding and Artificial Intelligence (AI) learning. This is due to limitations in infrastructure, such as computers and internet networks, as well as the low technical competence of teachers who generally come from a background in general classroom teaching, not informatics. Teachers are also not used to using coding applications or software, so they need intensive training. In addition, administrative burdens, such as preparing teaching tools (RPPs, modules), are additional obstacles. Private: These challenges are relatively minor because of adequate facilities, school policy support, and teachers who have received basic coding and Artificial Intelligence (AI) learning, as evidenced by the fact that before the policy related to coding and Artificial Intelligence (AI) learning, private elementary school students in grades 4 and 5 had already carried out the learning. |
| | Junior High School | At the beginning of implementation, there are obstacles in understanding the structure of coding and Artificial Intelligence (AI) materials, especially if there is no systematic module or guide. However, most teachers feel that this challenge can be overcome if training and teaching tools are available. Another supporting factor is that students are accustomed to using computers, making the process of introducing coding concepts relatively straightforward. |
| | Senior High School | Teachers are more ready to implement coding and Artificial Intelligence (AI), mainly because students already have basic digital skills and a more mature understanding of logic. Teachers state that if teaching tools such as curricula and modules are clearly and completely available, the teaching process is not overly |

| Category | Education level | Teacher's Perspective |
|--------------------------------|------------------------|--|
| | | complicated. However, some teachers still suggest technical assistance to minimize implementation errors and increase learning effectiveness. |
| | Vocational High School | It is common because the technology-based learning approach has been in place before this policy emerged. |
| <i>Social Influence</i> | Elementary School | Public: The school environment is not yet entirely encouraging, still relying on the initiative of the principal and teachers. Private: Strong support from the school management and the school community (including the students' parents) boosted teachers' confidence in implementing coding and Artificial Intelligence (AI) learning. |
| | Junior High School | The demands of the office and school environments encourage the adoption of technology, though not all colleagues support it. |
| | Senior High School | The school environment encourages the adoption of technology because there is a digitalization target and strong social pressure from the technology teacher community. |
| | Vocational High School | The support from management and the vocational community is firm, even though the initiative was already underway before the official policy was published. |
| <i>Facilitating Conditions</i> | Elementary School | Public: Infrastructure is still limited. Computers/laptops are in short supply, and the internet is unstable. Teacher training is also still minimal. Private: Adequate facilities, computer labs available, smooth internet access. The school also provides training for teachers. |
| | Junior High School | Infrastructure facilities are quite adequate, although not evenly distributed. There is a school IT team that can assist teachers in technical implementation. |
| | Senior High School | Facilities are available but limited, and teacher competencies are improved. Institutional support is starting to take shape, especially in technology-oriented schools. |
| | Vocational High School | The support is firm, both in terms of infrastructure and teacher competence. Technology-based learning is part of school culture. |

Source: Author Documentation 2025

Based on **Table 1**, teachers across educational levels offer diverse yet generally positive views on coding and Artificial Intelligence (AI) learning. In terms of *performance expectancy*, elementary school teachers believe that this learning can improve students' digital literacy and develop their logic and creativity from an early age. Junior high school teachers view it as highly relevant and practical for shaping students' algorithmic mindset. At the high school level, learning coding and Artificial Intelligence (AI) is considered important for career preparation and for readiness in the digital era. Meanwhile, vocational school teachers said this is not new, as most vocational schools have already implemented it, so this policy strengthens the programs already available. In terms of *effort expectancy*, public elementary school teachers face significant challenges due to students' technical limitations, infrastructure constraints, and the generally classroom-based nature of teachers' competence. On the other hand, in private elementary schools, implementation is more

straightforward because the facilities are adequate and teachers already have the competence to teach coding and Artificial Intelligence (AI). Junior high school teachers stated that obstacles occur only in the early stages and that, with clear modules, implementation is relatively easy. High school teachers believe that coding and Artificial Intelligence (AI) learning are relatively easy to teach as long as there are supporting devices and curricula, given that students already have a digital foundation. Vocational school teachers said that this approach had been prevalent before the existence of an official policy.

From a social influence perspective, public elementary school teachers reported that the school environment has not fully supported implementation, with implementation largely dependent on individual initiatives. On the contrary, private elementary schools received strong support from the management and the school community. In junior high school, pressure comes from the office and the environment, although not all teachers are supportive. High school shows that there is quite intense social pressure from the technology teacher community because of the digitalization target. Vocational schools have full support from management and the vocational community, and even initiatives have emerged before policies are issued. Finally, in terms of facilitating conditions, public elementary schools still face limited infrastructure, such as computers and internet access, as well as a lack of teacher training, in contrast to private elementary schools, which have adequate facilities and teacher training. At the junior high school level, infrastructure is reasonably available, with a school IT team that assists with technical implementation. High schools had limited but sufficient facilities, and institutional support began to take shape. In vocational schools, support is firm across both infrastructure and teacher competence, as technology-based learning has become part of the school culture.

Discussion

In general, teachers at all levels of education convey positive expectations for the benefits of coding and Artificial Intelligence (AI) learning (*performance expectancy*) (Venkatesh *et al.*, 2012). Elementary school teachers, both in public and private schools, believe that this learning can improve digital literacy and students' logical thinking skills from an early age. Junior high school teachers emphasized the importance of learning coding to develop an algorithmic mindset and cultivate digital skills. High school and vocational school teachers stated that mastery of coding and Artificial Intelligence (AI) is a strategic skill for students' future, especially in the world of work and universities. These findings confirm previous research emphasizing the importance of introducing *computational thinking* and algorithmic logic in primary and secondary education (Kong *et al.*, 2018). In addition, the OECD and the Ministry of Education emphasized that technology learning, such as training, supports critical digital literacy and creativity, two key competencies of the 21st century. This hope also aligns with the views of several experts, who stated that the curriculum must instill an understanding of technology in a social context so that students can actively participate in an increasingly digitized society (Lye & Koh, 2014). The implication is that positive expectations of teachers provide a strong initial foundation for policy implementation when supported by an adequate support system.

However, the ease of implementing this policy (*effort expectancy*) varies significantly across school levels and types (Venkatesh *et al.*, 2012). Public elementary school teachers face

major obstacles due to students' limited digital device skills and limited training and operational guidance. On the other hand, private elementary school teachers are better prepared because their internal facilities and training support them. Junior and senior high school teachers stated that their students were relatively familiar with technology, and training learning became easier with the modules and support from the school's ICT team. Vocational school teachers said that train learning had been routinely carried out before the national policy was enforced. These findings reinforce the notion that teachers' pedagogical and digital readiness significantly affects the effectiveness of learning technology use (Valtonen *et al.*, 2015). Furthermore, the success of technology-based curriculum is highly dependent on teachers' readiness to adopt a constructivist approach, namely by prioritizing direct and contextual experiences in learning. The connectivity approach is also relevant, as technology-based learning requires teachers and students to explore digital knowledge networks independently.

The social *influence aspect* shows that encouragement from the social environment plays an important role in shaping teacher motivation (Venkatesh *et al.*, 2012). Public elementary school teachers reported receiving no explicit support from school leaders or peers. In contrast, private elementary school teachers reported strong support from the principal and students' parents. Junior and senior high school teachers acknowledge the encouragement of the teacher community and the education office. In contrast, in vocational schools, social influence is powerful because it is embedded in the institution's culture. These findings corroborate UTAUT's theory that social pressure has an important role in driving significant technological acceptance (Dwivedi *et al.*, 2019). The school's social environment and values also influence the direction of the curriculum and the teacher's attitude towards change. In the context of KA learning, *social influence* comes not only from school leaders but also from official policies, teacher forums, and parents' expectations. Therefore, it is important to strengthen a collaborative culture and transformational leadership in schools, as emphasized in the humanistic approach. The category of *facilitating conditions* is an important determinant in the implementation of coding and Artificial Intelligence (AI) learning (Venkatesh *et al.*, 2012).

Public elementary school teachers face limited devices, unstable internet connections, and a lack of systematic training. On the other hand, private schools already have enough computer labs and access to training. At the junior high and high school levels, the condition of the facilities is considered quite adequate, especially with technical assistance from the school IT team. In vocational schools, institutional support and infrastructure have even taken root. This condition underscores the importance of responsive, locally needs-based policy orchestration. These findings are consistent with the view that structural factors, such as resources and institutional support, should be designed to empower teachers to address the needs of today's curriculum. Further, these results are reinforced by research that underscores the importance of principal involvement and collaboration with the local EdTech community to ensure the sustainability of learning technology implementation (Inayah *et al.*, 2024). Furthermore, this discussion emphasizes that coding and Artificial Intelligence (AI) learning in Indonesia cannot be implemented uniformly. A differential approach is needed based on the educational unit's readiness and the students' socio-economic background. This is also confirmed by several studies that criticize the failure of digital program implementation that is not grounded in local needs, compared with South Korea and

Australia, which have implemented artificial intelligence holistically in primary education through support from various sectors (Kim & Kwon, 2023; Lee & Jeong, 2023).

Indonesia still needs to build a foundation of infrastructure and teacher training more widely and evenly. Referring to the international approach and adapting it to the local context as suggested by the Ministry of Education, coding and Artificial Intelligence (AI) policies in Indonesia have the opportunity to become a national strategy in producing a generation of digital learners who are adaptive and globally competitive. This discussion comprehensively addresses the general and specific research objectives. It emphasizes that the four UTAUT constructs interact to shape teachers' readiness and acceptance of coding and Artificial Intelligence (AI) learning policies. These findings also show that the scope of the research, which includes teachers from elementary, junior high, and high school/vocational school in the city of Bandung, reflects complex and diverse actual conditions. These results enrich theoretical understanding of the acceptance of technological innovation in education and provide a practical basis for developing teacher-training strategies, strengthening differential policies, and providing sustainable and equitable educational infrastructure.

CONCLUSION

This study revealed that teachers from various levels of education showed a positive attitude towards coding and Artificial Intelligence (AI) learning policies in the Kurikulum Merdeka. This reflects their belief in the contribution of learning to improving digital skills, logical thinking, and students' readiness to face future technological challenges. However, the readiness for implementing this policy remains highly diverse, especially at the public elementary level, which faces challenges with device availability and technological competence. On the other hand, private schools and junior high schools tend to be better prepared because they have access to facilities and training. The findings confirm that social support from the education community plays a central role in driving the adoption of these policies. In addition, implementation readiness is highly dependent on the availability of facilities, training, and technical assistance. Inequality between schools underscores the importance of a policy approach that is more context-specific and adaptable to the conditions of each educational unit. The follow-up study suggests that the government and the education office design a continuous training program based on teachers' technology needs and levels of mastery, especially in public elementary schools. The preparation of coding and Artificial Intelligence (AI) learning curricula and modules also needs to be carried out systematically and inclusively. Schools are expected to build a collaborative ecosystem with transformative leadership to support innovation. On the other hand, efforts to equitably distribute educational infrastructure are urgent to ensure justice in digital transformation at all levels of education.

AUTHOR'S NOTE

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