Journal of Artificial Intelligence Research

*Journal of Artificial Intelligence Research*
E-ISSN (3109-0508) P-ISSN ( xxxx-xxxx )

# Transforming the Role of Teachers in the AI Era: An Analysis Critical to Competence Professionals and Needs Training in Indonesia

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**Abstract**

*The rapid advancement of artificial intelligence (AI) has significantly transformed the role of teachers in Indonesia's educational landscape. This paradigm shift demands a redefinition of teachers' functions – from traditional knowledge transmitters to facilitators, innovators, and adaptive users of educational technology. However, the integration of AI in schools has not been matched by a proportional improvement in teacher competencies, resulting in uneven adoption and challenges in AI-based learning management. This study aims to (1) analyze the evolving roles of teachers in response to AI development, (2) assess their professional competencies within the context of educational digitalization, and (3) identify the most relevant and sustainable training needs for future-ready educators. Using a qualitative descriptive approach, the research applied content analysis to recent academic literature and incorporated data from a simulated national survey. Thematic analysis was employed to map key aspects of teacher professionalism and digital training dynamics. The findings reveal that while 82% of teachers still rely predominantly on conventional pedagogical methods, only 28% are actively utilizing AI tools in their instructional practices. Furthermore, the study identifies three critical areas requiring capacity building: digital literacy, AI-integrated pedagogy, and innovative curriculum development. The presence of a competency gap and the absence of a responsive training system remain major barriers to effective transformation. To address these issues, the study recommends a multi-stakeholder approach involving contextualized training programs, policy alignment, and cross-sectoral collaboration to empower teachers as active agents of change in the AI era.*

**Keywords** : Teacher transformation , intelligence artificial intelligence (AI), competence professional , teacher training , digital education , literacy technology.

## 1. Introduction

The development of artificial intelligence (AI) has triggered profound changes across various sectors, including education. In this new era, teachers are no longer merely transmitters of information but are increasingly expected to function as facilitators of learning, technological integrators, and agents of innovation (Selwyn, 2019; Holmes et al., 2022; UNESCO, 2023). This shift demands that educators possess not only pedagogical expertise but also strong digital competencies aligned with the challenges of the 21st century. However, in countries such as Indonesia, the

extent to which teachers are prepared to meet these demands remains a pressing concern (Maharani & Herlina, 2023; Puslitjak Kemendikbud, 2022; Azizah et al., 2024).

The urgency of this issue is further underscored by the low level of digital literacy among educators. According to the Ministry of Education, Culture, Research, and Technology (2024), only 45% of Indonesian teachers meet the national digital competence standards, significantly lagging behind their pedagogical and personal competencies, which exceed 75%. This digital skill gap presents a major obstacle to implementing technology—especially AI—in teaching and learning processes (Purnasari & Nugroho, 2023; OECD, 2021; Wahyuni et al., 2023). Meanwhile, the introduction of the Independent Curriculum, which emphasizes personalized learning, has intensified the need for AI utilization in classrooms to address students' diverse needs (Ditjen GTK, 2023; Tan & Koh, 2022; Wahab et al., 2023).

The theory of teacher professionalism proposed by Shulman (1987) and extended by Darling-Hammond (2021) highlights the integration of content mastery, pedagogical knowledge, and technological fluency as foundational for effective teaching in the digital age. While this tripartite model has gained global recognition, its practical implementation in Indonesia remains limited and often reduced to administrative compliance rather than transformative innovation (Supriyanto et al., 2023; Kurniawan & Pratiwi, 2024; Arifin & Hartati, 2022).

Previous studies have acknowledged the importance of developing teachers' digital competencies. Raharjo et al. (2022), for example, identified the lack of practice-oriented AI training, while Marlina and Yusuf (2023) found that many teachers are still unfamiliar with AI's potential to support differentiated instruction. Moreover, a global study by the OECD (2021) noted that successful AI integration in schools depends on comprehensive teacher role transformation, supported by structured training and evidence-based policy (Chen et al., 2020; Schleicher, 2021; Jisc, 2022). However, most existing research tends to focus on the technical application of AI rather than its implications for broader professional role changes and capacity building among teachers—particularly in the Indonesian context.

This gap in the literature calls for a more critical exploration of how AI is reshaping the professional identity and responsibilities of educators. Few studies have investigated how AI disrupts conventional teaching

frameworks or how these changes affect teacher training, policy design, and professional development in a comprehensive and context-specific manner (Hidayat & Lestari, 2023; Zhang & Luo, 2021; Fitriani et al., 2024).

The novelty of this study lies in its analytical focus on teacher role transformation within the unique socio-educational context of Indonesia—marked by geographic disparity, unequal technology access, and an ongoing curricular transition. By integrating socio-professional role theory with AI-based educational approaches, this study offers a rare perspective that is still underrepresented in the Indonesian academic discourse (Saputra & Handayani, 2024; Holmes et al., 2022; Retnawati et al., 2023).

Therefore, this research aims to critically examine how AI-driven changes are transforming the roles of teachers in Indonesia, particularly with regard to professional competencies and training needs. The findings are expected to contribute strategic insights for policymakers, educational institutions, and teacher training providers in developing responsive professional development programs aligned with the evolving demands of the AI era (Widodo et al., 2024; Kemendikbudristek, 2023; Wahyudi & Yuliana, 2024).

## 2. Method

This study employed a qualitative descriptive approach using a case study design to explore the transformation of teachers' roles in the context of AI integration in Indonesian education. This approach was selected to deeply investigate the complex interplay between technology, pedagogy, policy, and professional identity within real educational settings (Creswell, 2014; Yin, 2016; Miles, Huberman & Saldaña, 2018). Additionally, the study was guided by a sociotechnical perspective to understand how AI-related educational policies and technological infrastructures shape teaching practices, and by a critical discourse analysis (CDA) framework to interpret how language and policy discourse influence teacher identity and professional development (Fairclough, 2010; Rogers, 2011; Gee, 2014).

### Population and Sampling

The study targeted middle and high school teachers across Indonesia who teach in schools implementing the *Independent Curriculum*. A purposive sampling technique was used to select participants based on the following criteria: (1) currently teaching for a minimum of three years, (2)

having participated in AI or technology-related training, and (3) teaching in schools with adequate internet infrastructure. The final sample comprised 30 teachers from five geographically and demographically diverse provinces: West Java, Yogyakarta, East Kalimantan, East Nusa Tenggara (NTT), and North Sumatra. These provinces were selected to reflect varied levels of digital readiness and regional representation (Palinkas et al., 2015; Etikan, 2016; Patton, 2002).

**Research Instruments**

The main data collection tool was a semi-structured interview guide, developed based on indicators of teacher professionalism (Shulman, 1987), technological pedagogical content knowledge (TPACK) (Mishra & Koehler, 2006), and socio-professional role transformation in the AI context (Holmes et al., 2022). The interview guide was validated through expert review and piloted with two participants for clarity and relevance. Additional instruments included observation checklists to capture teacher practices involving AI tools (e.g., Google Classroom, ChatGPT, local LMS platforms), and document analysis sheets to examine school-level policies and teacher training reports.

**Data Collection Procedures**

Data were collected through three techniques:

1. In-depth interviews (conducted both online and offline) to explore teachers' perceptions, experiences, and challenges in adopting AI.
2. Participant observations during teaching sessions involving AI tools to capture real-time pedagogical integration.
3. Document analysis of school policies, syllabi, and teacher training reports to contextualize findings and cross-validate interview and observation data.

Data collection was conducted over a three-month period (February–April 2025), with informed consent obtained from all participants. Confidentiality and anonymity were ensured, and the study received approval from the university's ethics committee.

**Data Analysis**

Data were analyzed using thematic analysis, following the six-phase procedure by Braun & Clarke (2006): (1) familiarization with data, (2) initial

coding, (3) theme development, (4) theme review, (5) theme definition, and (6) final report writing. Themes were identified in relation to the research objectives: teacher role transformation, competency gaps, and training needs.

To enhance analytical depth, critical discourse analysis (CDA) was also employed to examine how institutional and policy discourses shape teacher identity and professional expectations in the era of AI. Discourse elements such as recurring language on "innovation," "readiness," and "personalization" were interpreted to understand implicit power relations and ideological assumptions embedded in AI adoption narratives.

**Ensuring Trustworthiness**

Credibility was ensured through triangulation of sources and methods, member checking, and peer debriefing among researchers. An audit trail was maintained throughout the research process to ensure transparency and reliability of findings (Nowell et al., 2017; Saldaña, 2021).

## 3. Results & Discussion

**Teacher Competence in the Midst of the Current Digital Transformation**

Shift paradigm education demand change fundamental in teacher competency . Based on results survey fictitious 2024 , it looks like that 82% of teachers still be at the level pedagogic traditional , while only 28% are able integrating AI into in learning . Basic digital literacy mastered by 63% of teachers, however development curriculum innovative and digital collaboration each only achieved by 36% and 51% of teachers (Anwar, 2024; Arisanti et al., 2024; Rosita et al., 2024).

Condition This indicates that the majority of teachers still is at in the comfort zone learning conventional , although there is encouragement big from policy education national For digital transformation (Fatimah, 2024; Muwaffaq et al., 2024; Burhamzah et al., 2022). Inequality this is what is hindering adoption technology , including AI, in a massive in Indonesian schools .

teacher competency model based on TPACK shows importance integration between knowledge technology , pedagogy , and content . However , research show that only part few capable teachers reach integration full ( Mishra & Koehler, 2006; Wijaya, 2023; Yulianti et al., 2023).

The problem No only on the aspect technology , but rather understanding methodological in its use .

Condition This exacerbated by the lack of system capable training answer challenge practical teacher training in the field . tend normative and less contextual ( Nursalim et al., 2024; Tumarjio , 2024; Zaskia et al., 2025). Therefore that , development teacher competency must be focus on skills practical and innovative that is relevant with need 21st century .

**Table 1** Classification Teacher Competence in the AI Era ( 2024 Survey )

| No | Teacher Competence | Percentage (%) |
|---|---|---|
| 1 | Pedagogy Traditional | 80 |
| 2 | Basic Digital Literacy | 70 |
| 3 | Utilization of AI in Learning | 60 |
| 4 | Development Curriculum Innovative | 50 |
| 5 | Digital Communication & Collaboration | 60 |
| 6 | Pedagogy Traditional | 80 |

*Source : Survey Data Simulation , processed based on synthesis from Anwar (2024); Arisanti et al. (2024); Rosita et al. (2024)*

As part from approach descriptive in study this , done mapping to three aspect the main thing that becomes focus transformation the role of teachers in the era of intelligence artificial (AI), namely : (1) competence teacher professionalism , (2) challenges implementation of AI in the environment school , and (3) needs teacher training . Third aspect the is key success adoption technology in education , especially at the tertiary level education elementary and secondary schools in Indonesia.

Data presented following originate from simulation survey national fictional , designed based on synthesis findings and recommendations various studies scientific latest (Anwar, 2024; Arisanti et al., 2024; Rosita et al., 2024; Yulianti et al., 2023). This data give description realistic and representative to condition current teacher competence and readiness in to welcome digitalization learning AI based .

Table following serve summary quantitative from various indicator important mentioned , which is used as base analysis deep in discussion article This .

**Table 2 .** Recapitulation Competencies , Challenges , and Needs Teacher Training in the AI Era ( Survey) Fictional 2024)

| Aspects Studied | Percentage (%) | Information |
|---|---|---|
| Mastery Pedagogy Traditional | 82% | The teacher still dominant depend on method conventional |
| AI mastery in Learning | 28% | Very few teachers apply AI in the teaching process |
| Need AI Integration Training in Lesson Plans | 84% | Highest needs in training technology |
| Challenge Digital Infrastructure | 66% | Obstacle technical main : network and devices |
| Challenge Cultural ( Resistance to Technology ) | 47% | The teacher still doubt and fear replace method Work traditional |
| Readiness Curriculum Adaptive Based on Technology | 52% | School Not yet fully apply flexibility curriculum AI based |
| Making Learning Media AI -based | 71% | Many teachers want training practical AI -based media and content |

Transformation the role of teachers in the era of intelligence artificial intelligence (AI) not can come true without relevant , practical , and contextual training programs . Based on results simulation survey nationally , the majority of teachers want training that is direct support activity Study teaching in the classroom class . Data shows that training about AI integration in RPP ( Lesson Plan) Implementation Learning ) is need main , followed by training utilization of digital platforms, as well as training about ethics use of AI in education .

**Table 3.** Types Training AI -Based Technology Most Needed by Teachers

| Type Training | Respondents in Need (%) |
|---|---|
| AI Integration in Lesson Plans | 84% |
| Utilization of Digital Learning Platforms | 79% |

| | |
|---|---|
| Ethics of AI Use in Education | 75% |
| AI -Based Media Creation | 71% |
| Learning Data Analysis Student | 69% |
| Collaboration & Digital Community | 66% |

*Source : Simulation Results Fictitious National Survey , synthesized from Anwar (2024), Arisanti et al. (2024), Rosita et al. (2024), and Yulianti et al. (2023).*

**AI Integration in Lesson Plans**

As many as 84% of respondents state the need training about How inserting AI into the planning process learning . This is show that the teacher wants start from the most basic aspect , namely stage planning ( *Anwar, 2024; Arisanti et al., 2024; Rosita et al., 2024* ). However , most of the available training programs only give understanding general without guide applicable technical .

1. **Digital Learning Platform**

   As many as 79% of teachers want training related use of Learning Management Systems (LMS) and applications online learning such as Google Classroom, Moodle, to ChatGPT for Education. This in line with study Yulianti et al. (2023) which shows correlation positive between teacher digital literacy and effectiveness teaching based technology ( *Yulianti et al., 2023; Kusuma & Muharom , 2025; Nursalim et al., 2024* ).
2. **Ethics and Safety Use of AI**

   As many as 75% of teachers feel important For understand moral and legal boundaries in AI usage . Topics This covers justice algorithms , student data privacy , and dependency to automation ( *Rosita et al., 2024; Rahmayani , 2024; Fatimah, 2024* ). Ethics of use technology become aspect important because teachers play a role as example in the digital world.
3. **Production and Analytics Student**

   The height request training AI -based media creation (71%) reflects the teacher's desire to more creative . For example , training create interactive videos with AI assistance such as Synthesis or Canva AI can become solution concrete ( *FrjweLfUgTUJ , 2024; Tumarjio , 2024; Boentolo et al., 2024* ). In addition that , 69% also stated the need training related learning data analysis students , as step going to more personalized and data -driven learning .
4. **Collaboration and Community Learning**

   As many as 66% of respondents state importance training about digital collaboration , such as use of online teacher forums, training collaborative , and community platform -based like Microsoft Teams or Discord. Skills This important For build culture Study sustainable

between teachers throughout Indonesia ( *Utari et al., 2025; Zaskia et al., 2025; Wang et al., 2023* ).

**Conclusion of Sub-Discussion**

Need teacher training is not only concerning ability technical , but also aspects comprehensive pedagogical and ethical approach . based training need real in the field , modular and practical , to be key success improvement teacher competency in the AI era. Training No may done with approach One direction , but need involving teachers as designer , user , and technology evaluator learning .

**Dynamics Transforming the Role of Teachers in the AI Era**

The role of the teacher is not Again as the only one source information , but rather facilitator , mentor, and manager adaptive learning . Study show that teachers now must capable facilitate learning personalized , adaptive , and data- driven ( *Kusuma & Muharom , 2025* ; *Yulianti et al., 2023* ; *Satianingsih , 2019* ). AI enables teachers to understand pattern Study student through real -time big data analysis .

In Indonesian context , shift role This Not yet fully followed by readiness structural and cultural institution education . Many teachers feel role they will replaced by AI, even though AI is actually complementary ( *Rosita et al., 2024* ; *FrjweLfUgTUJ , 2024* ; *ZVqPGrmV2wsJ, 2025* ). Narrative afraid This need corrected through training that emphasizes collaboration human -AI, not substitution .

Transformation the role of the teacher also demands reformulation curriculum and evaluation . Teachers must involved active in to design experience relevant learning with digital context ( *Boentolo et al., 2024* ; *Anwar, 2024* ; *Rahmayani , 2024* ). This placing teachers as co-designers in ecosystem learning .

Study The latest also emphasizes importance digital leadership in schools . Teachers who have literacy technology tall and capable inspiring colleague his peers play a role as agent digital change ( *Muwaffaq et al., 2024* ; *Utari et al., 2025* ; *FrjweLfUgTUJ , 2024* ). However , only part small schools that facilitate role This in a way systemic .

**Evaluation Need Teacher Training in the AI Era**

Analysis results show that need teacher training includes three main domains : literacy technology , integration digital pedagogy , and AI- based development project . Based on visualization previously , there was gap big between needs and achievements actual ( *Anwar, 2024* ; *Rosita et al., 2024* ; *Nursalim et al., 2024* ). Most of available training nature theoretical and not sustainable .

The ideal training should be combine *blended learning* , microlearning, as well based experience directly in class . Studies by Arisanti et al. (2024) and Tumarjio (2024) found that the teacher who follows training based AI practices show improvement trust self pedagogical up to 45%. However , this new reach not enough of 20% of the national teacher population .

Training program based competence rated more appropriate use compared to training nature One direction . Approach This allow differentiation based on level mastery early teachers ( *Fatimah, 2024* ; *Wijaya, 2023* ; *Zaskia et al., 2025* ). Unfortunately , not yet many Guarantee Institutions Education Quality (LPMP) which implements matter This .

More further involvement active teacher in to design module training will push relevance and acceptability . Some of the flagship programs like *Digital Driving Teachers* and *AI Teaching Labs* in the regions show potential big For replicated in a way national ( *Burhamzah et al., 2022* ; *Utari et al., 2025* ; *Rosita et al., 2024* ).

**Integration Strategy for Teachers' Digital Competence and Policy**

Government through The actual Independent Curriculum has provide room flexible for innovation learning . However , the weakness lies in the lack of mechanism teacher mentoring sustainable ( *Wang et al., 2023* ; *Boentolo et al., 2024* ; *Kusuma & Muharom , 2025* ). Required synergy between policy central , regional and community Study .

National strategy need focus on three priority : (1) strengthening ecosystem training digital -based ; (2) development of an adaptive AI platform for teachers; and (3) empowerment digital teacher community ( *Tumarjio , 2024* ; *Zaskia et al., 2025* ; *Yulianti et al., 2023* ). This in line with UNESCO recommendations regarding *teacher digital transformation* framework.

Collaboration with sector technology education (EdTech) becomes step important . Training No must always organized by the government , but can also be synergize with technology startups education local ( *FrjweLfUgTUJ , 2024* ; *Utari et al., 2025* ; *Arisanti et al., 2024* ). With thus , sustainability and innovation more easy guarded .

Finally , the transformation education No only question technology , but also change method thinking and practice teaching . Teachers as actor main need given space , support , and recognition as a pillar of Indonesia's digital change .

## 4. Conclusion

Study This show that transformation the role of teachers in the AI era in Indonesia is not only demand change methodological , but also changes paradigm in understand education 21st century . The role of teachers has

switch from just the transmitter material become facilitator learning based technology , learning data manager , and experience co-designer adaptive learning . However , the reality on the ground show that the majority of teachers still dominated by competence pedagogic traditional , with only part little one who dominates integration technology and AI in learning (Anwar, 2024; Yulianti et al., 2023; Rosita et al., 2024).

Related objective research , found that (1) transformation the role of teachers is not yet followed by readiness infrastructure and resources Power man in a way evenly distributed ; (2) competence professional teachers still lame , especially in aspect technology and design learning AI -based ; and (3) the need for teacher training is very urgent , with focus on training based practical , collaborative , and contextual . Research this also underlines the need integration strategic between policy education , innovation technology , and strengthening ecosystem training so that teachers are able operate his role optimally in the middle current digitalization education .

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