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TEACHERS' ADAPTATION STRATEGIES TO CHANGES IN EDUCATIONAL TECHNOLOGY: A PROFESSIONAL ETHICS PERSPECTIVE

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Abstract:

The rapid digital transformation in education has significantly reshaped teaching and learning technologies, requiring teachers, as the frontline actors in education, to adapt effectively and responsively. However, adapting to technological advancements extends beyond acquiring technical competencies; it also requires adherence to the ethical principles of the teaching profession. This article aims to analyze teachers' adaptation strategies to changes in educational technology from the perspective of professional ethics. The study employs a qualitative descriptive library research approach by examining relevant scholarly literature. The findings indicate that ethically grounded teacher adaptation strategies encompass four key dimensions: (1) strengthening digital competencies while upholding professional standards; (2) utilizing technology as a pedagogical tool rather than a substitute for the teacher's humanistic role; (3) safeguarding the integrity and confidentiality of students' data; and (4) fostering ethical collaboration within the digital educational ecosystem. This article concludes that professional ethics constitute the fundamental foundation for responding to technological change, enabling teachers to maintain professionalism, humanistic values, and integrity in the digital era.

Keywords:
teacher adaptation; educational technology; professional ethics; digital transformation; teacher professionalism.

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INTRODUCTION

The rapid advancement of information and communication technology (ICT) has fundamentally transformed almost every aspect of human life, including education. The emergence of digital technologies such as cloud computing, big data, artificial intelligence (AI), learning analytics, and online learning platforms has reshaped the educational landscape, changing not only how knowledge is delivered but also how learning is designed, managed, and evaluated. Education is no longer confined to physical classrooms; instead, it has evolved into a technology-enhanced ecosystem that supports personalized, collaborative, and lifelong learning. Consequently, educational institutions across the world are redefining their pedagogical approaches to meet the demands of an increasingly digital society (Belawati, 2019).

The rapid digitalization of education has significantly transformed teachers' professional roles. Traditionally, teachers were viewed primarily as transmitters of knowledge, responsible for delivering instructional content to students. However, the integration of digital technologies into teaching and learning has expanded these responsibilities considerably. Contemporary teachers are expected to serve as facilitators of learning, instructional designers, learning mentors, digital content developers, and managers of technology-enhanced learning environments capable of promoting student-centered learning and collaborative knowledge construction (Oyewo & Oyewo, 2025). These changing expectations require teachers not only to acquire advanced technological competencies but also to redesign their pedagogical practices in response to continuously evolving educational innovations.

The COVID-19 pandemic further accelerated this transformation by forcing educational institutions worldwide to shift from conventional face-to-face instruction to online and hybrid learning within an exceptionally short period. As a result, teachers were required to rapidly master various digital technologies, including video conferencing platforms, Learning Management Systems (LMS), cloud-based collaboration tools, digital assessment systems, learning analytics, and, more recently, AI-powered educational applications (MAKHZOUM, 2025). Although these technologies have enhanced learning flexibility, accessibility, and instructional efficiency, they have simultaneously introduced new challenges associated with digital competence, pedagogical adaptation, and professional responsibility.

Theoretically, teachers' adaptation to technological change can be understood through several complementary perspectives. (Buabeng & Amo-Darko, 2025) argues that successful educational reform depends largely on teachers' willingness and capacity to embrace continuous change while maintaining effective instructional practices. Similarly, (Abdul Waheed & Panneerselvam, 2025) Diffusion of Innovation Theory explains that the adoption of educational innovations is influenced by teachers' perceptions of usefulness, compatibility, complexity, and organizational support. In addition, the Technological Pedagogical Content Knowledge (TPACK) framework proposed by Koehler and Mishra (2009) emphasizes that effective technology integration requires the intersection of technological knowledge, pedagogical knowledge, and content knowledge. These theoretical perspectives suggest that teachers' adaptation involves far more than acquiring technical skills; it requires continuous professional learning, pedagogical transformation, and reflective decision-making.

Beyond technological competence, ethical competence has emerged as an equally important dimension of teacher professionalism. Professional ethics provide the moral foundation that guides teachers' decisions, behaviors, and responsibilities toward students, colleagues, parents, educational institutions, and society. According to Campbell (2003), ethical teaching is not limited to compliance with professional regulations but involves moral judgment, care, justice, integrity, and responsibility in every educational decision. As digital technologies increasingly mediate teaching and learning processes, ethical considerations become substantially more complex. Teachers are now expected to make responsible decisions regarding the use of AI-generated learning materials, automated assessment systems, digital surveillance technologies, intellectual property,

algorithmic bias, and the protection of students' personal data (Holmes, 2026).

Recent advances in artificial intelligence have intensified these ethical concerns. AI-powered educational technologies provide unprecedented opportunities for personalized learning, adaptive assessment, automated feedback, and learning analytics. However, these innovations also generate significant ethical dilemmas concerning transparency, fairness, privacy, accountability, and academic integrity. The increasing use of generative AI tools such as ChatGPT has further challenged conventional understandings of authorship, originality, and assessment validity, requiring teachers to exercise careful professional judgment in determining how such technologies should be integrated into educational practice (Munaye et al., 2025). Consequently, digital competence alone is no longer sufficient; teachers must also possess ethical competence that enables them to balance technological innovation with educational values and human dignity.

Numerous studies have examined teachers' digital competence and technology integration in educational settings. (Quast et al., 2025), through the DigCompEdu framework, highlights digital competence as a key component of teachers' professional development. (Mekheimer, 2025) emphasize the importance of integrating technological, pedagogical, and content knowledge to achieve meaningful technology-enhanced learning. Recent studies have also investigated teachers' readiness to adopt AI and digital technologies, demonstrating positive impacts on instructional effectiveness and student engagement (Bergdahl et al., 2025). Nevertheless, most existing studies primarily focus on technological readiness, digital literacy, or pedagogical innovation, while relatively limited attention has been devoted to examining teachers' adaptation strategies from the perspective of professional ethics. Ethical issues are often discussed separately from technological adaptation rather than being integrated into a comprehensive framework for teacher professionalism.

This limitation reveals an important research gap. Although previous literature has acknowledged the necessity of digital competence, insufficient attention has been given to understanding how professional ethics can guide teachers in responding to rapidly evolving educational technologies. As AI and digital platforms continue to reshape educational practice, ethical competence should no longer be viewed as a complementary attribute but rather as an essential component of teachers' professional adaptation. Integrating ethical principles with technological competence is therefore critical for ensuring that educational innovation remains human-centered, equitable, and professionally accountable.

Accordingly, this study seeks to bridge this gap by examining teachers' adaptation strategies to changes in educational technology through the lens of professional ethics. Unlike previous studies that predominantly emphasize technical competence or technology acceptance, this article integrates theories of digital transformation, teacher adaptation, and professional ethics into a unified conceptual framework. Specifically, this study aims to: (1) identify the ethical challenges encountered by teachers during the adaptation to educational technology; and (2) formulate ethically grounded adaptation strategies that enable teachers to maintain professionalism, integrity, and humanistic values while effectively integrating digital technologies into teaching and learning.

METHOD

This study employed a qualitative descriptive library research approach (Fahriah et al., 2026). This method was selected because the primary objective of the study was to examine, analyze, and synthesize existing theoretical perspectives and empirical findings concerning teachers' adaptation to educational technology from the perspective of professional ethics.

The data sources consisted of scholarly journal articles indexed in national databases (SINTA) and international databases (Scopus and Google Scholar), educational textbooks, professional codes of ethics issued by the Indonesian Teachers Association (PGRI), and policy documents published by the Ministry of Education, Culture, Research, and Technology of the Republic of Indonesia. Data were collected through systematic digital searches in Google

Scholar, DOAJ, and SINTA using the following keywords: *teacher adaptation*, *educational technology*, *teacher professional ethics*, *digital transformation in education*, and *teachers' digital competence*.

The literature inclusion criteria were as follows: (1) publications issued between 2018 and 2024; (2) studies relevant to educational technology adaptation and teacher professional ethics; and (3) studies employing scientifically rigorous and credible research methodologies. The collected data were analyzed using content analysis to identify recurring patterns, major themes, and adaptation strategies reflecting ethical dimensions. To enhance the trustworthiness of the findings, source triangulation was employed to ensure the consistency and validity of the analyzed literature.

RESULTS AND DISCUSSION

The literature review indicates that teachers' adaptation to educational technology is not merely a technical issue but also an ethical one (Osorio Vanegas et al., 2025). Across the reviewed studies, four major ethical challenges and five principal adaptation strategies consistently emerged. These findings suggest that successful educational digital transformation depends on teachers' ability to balance technological competence with professional ethics. In other words, the effectiveness of digital innovation in education is closely linked to the extent to which teachers are able to preserve ethical standards while embracing new instructional possibilities.

1. Ethical Challenges Faced by Teachers in Responding to Changes in Educational Technology

The literature review shows that teachers encounter four main ethical challenges in adapting to educational technology. These challenges are interconnected and often reinforce one another, making ethical adaptation a complex and ongoing process rather than a one-time adjustment (Enăchescu, 2025).

a. Digital Competence Challenges

A number of teachers have not yet developed adequate competence in using Learning Management Systems (LMS), artificial intelligence (AI), and digital assessment tools (Fatmasari, 2026). This gap in digital competence can create uncertainty in instructional practice and may lead to behaviors that are inconsistent with professional standards. For example, some teachers may use digital materials without proper citation, fail to verify the originality of students' work, or become overly dependent on technological assistance in ways that weaken their pedagogical judgment. In such cases, the problem is not only a lack of technical skill but also a risk to professional integrity, since digital incompetence may inadvertently result in unethical or careless practices.

b. Privacy and Data Confidentiality Challenges

The use of digital platforms in learning requires both teachers and students to share various forms of personal data, including names, contact information, academic records, images, and behavioral traces (Yap et al., 2025). This condition creates significant challenges related to privacy protection and data security. Several studies indicate that teachers' understanding of the privacy policies of digital platforms varies considerably, which may increase the risk of violating students' data confidentiality. In many cases, teachers may use applications without fully understanding how data are stored, processed, or shared with third parties. As a result, the ethical responsibility to protect students' personal information becomes increasingly important in digital learning environments.

c. Academic Integrity and Authenticity Challenges

Easy access to digital information has increased the risk of plagiarism, unauthorized copying, and various forms of academic dishonesty. Teachers are expected to ensure the authenticity of students' work while also serving as role models in the responsible use of information sources (Feliza, 2025). However, the abundance of online content and the availability of generative AI tools have made it more difficult to distinguish between original student work and externally assisted output. This challenge requires teachers to develop not only assessment strategies that

promote honesty and originality but also ethical awareness regarding the responsible use of digital resources in academic settings.

d. Humanistic Relationship Challenges

The excessive dominance of technology may reduce the intensity of social and emotional interaction between teachers and students (Ashfaq et al., 2025). When communication becomes overly mediated by digital platforms, the relational dimension of teaching may weaken, and students may experience learning as impersonal or transactional. This condition can affect the teacher's role as a mentor, motivator, and character educator, which has traditionally been an essential part of the educational process. The literature suggests that while technology can enhance access and efficiency, it cannot fully replace the empathy, attentiveness, and moral presence that define human-centered teaching. Therefore, maintaining meaningful interpersonal relationships remains a critical ethical concern in digital education.

2. Teacher Adaptation Strategies Based on Professional Ethics

Based on the synthesis of the literature, five main strategies were identified that teachers can adopt in responding to changes in educational technology. These strategies reflect the need for a balanced approach in which technological innovation is guided by ethical responsibility and professional judgment (Bashiir, 2025) .

a. Strengthening professional digital competence on an ongoing basis.

Teachers need continuous opportunities to improve their digital literacy and technological skills through training, workshops, peer learning, and reflective practice. However, digital competence should not be understood merely as the ability to operate devices or applications. It should also include the capacity to evaluate the pedagogical appropriateness, ethical implications, and limitations of digital tools. Ongoing professional development enables teachers to remain adaptive while maintaining a critical and responsible stance toward technology.

b. Using technology as a learning aid, not as a substitute for the teacher's role.

Technology should be positioned as a supportive instrument that enriches teaching and learning, rather than as a replacement for the teacher's pedagogical, emotional, and moral functions. Teachers remain central in designing learning experiences, fostering dialogue, and nurturing students' character. By treating technology as an aid rather than a substitute, educators can preserve the human dimension of education while still benefiting from digital innovation.

c. Maintaining the integrity, privacy, and security of students' data.

Teachers must develop a strong awareness of data ethics when using digital platforms. This includes understanding privacy policies, limiting unnecessary data collection, securing access to student information, and using only trusted platforms that comply with ethical and legal standards. Protecting students' data is not only a technical responsibility but also a moral obligation that reflects respect for students' rights and dignity.

d. Building ethical collaboration within the digital education ecosystem.

Adaptation to educational technology should be supported by collaboration among teachers, school leaders, parents, students, and technology providers. Ethical collaboration involves shared responsibility, transparent communication, and mutual respect in the use of digital tools. When all stakeholders understand their roles and responsibilities, the educational ecosystem becomes more supportive of both innovation and ethical practice.

e. Integrating digital ethics education into the learning process.

Teachers should not only apply ethical principles in their own practice but also teach students how to behave responsibly in digital environments. This includes lessons on digital citizenship, academic honesty, respectful online communication, and responsible information use. By integrating digital ethics into everyday learning, teachers help students develop the moral awareness needed to

navigate technology responsibly in both academic and social contexts.

Collectively, these five strategies demonstrate that technological adaptation requires not only technical mastery but also a strong foundation in professional ethics. Teachers who are able to combine digital competence with ethical sensitivity are better positioned to respond to the demands of educational transformation in a way that is both effective and principled. These findings provide the basis for the subsequent discussion of their implications for teacher professionalism in the digital era.

DISCUSSION

The findings of this study indicate that the transformation of educational technology presents increasingly complex ethical challenges for the teaching profession (Widodo, 2025). These findings suggest that successful technological adaptation is determined not only by technical proficiency but also by teachers' ability to uphold the ethical values of the profession amid digital change.

The digital competence challenges identified in this study are consistent with view that teacher professionalism requires continuous competence development. Limited mastery of technology may lead teachers to make ethically questionable decisions, such as using learning resources without clear attribution or becoming overly dependent on technology (Adipat, 2025). Therefore, the enhancement of digital competence should be understood as both a moral and professional responsibility.

The findings related to privacy and data security also show that teachers now face new responsibilities as managers of students' digital information. This condition reflects an expansion in the meaning of teacher professional ethics, which previously focused primarily on pedagogical relationships but now also encompasses the protection of students' digital rights. These findings support (Widodo, 2025) research, which emphasizes the importance of digital privacy literacy for educators.

In addition, the challenge of academic integrity demonstrates that technological progress creates a paradox in education. On the one hand, technology facilitates access to learning resources; on the other hand, it increases the potential for plagiarism and academic dishonesty. Therefore, teachers do not only serve as supervisors but also as ethical role models in the use of information and technology. This finding reinforces argument that academic integrity is a fundamental foundation of teacher professionalism in the digital era.

With regard to humanistic relationships, the findings show that technology has not been able to replace the teacher's human function in guiding, motivating, and shaping students' character. This is consistent with iew that education is essentially a human interaction process that cannot be fully replaced by digital systems or artificial intelligence.

The adaptation strategies identified in this study demonstrate that professional ethics functions as a normative framework for the use of educational technology. Strengthening digital competence, protecting privacy, fostering professional collaboration, and integrating digital ethics are concrete manifestations of the teacher code of ethics in the context of twenty-first-century learning. Thus, teachers are not only expected to be competent technology users but also ethical decision-makers capable of positioning technology as a means to achieve humanistic educational goals.

1. Implications for Professional Development and Policy

This study offers several important implications. First, teacher professional development programs need to integrate digital competence and digital ethics in a balanced manner. Second, the teacher professional code of ethics should be updated periodically to respond to technological developments, including the use of generative AI, digital data management, and intellectual property issues. Third, educational institutions need to build a digital ethics culture involving teachers, students, parents, and other stakeholders.

Overall, the findings of this study confirm that effective adaptation to educational technology cannot be separated from the strengthening of teachers' professional ethics. The stronger teachers' ethical understanding, the more wisely they will select, use, and evaluate technology for the benefit of students.

CONCLUSIONS

The transformation of educational technology in the digital era requires teachers to adapt quickly, accurately, and sustainably. However, adaptation that is not grounded in a strong professional ethic can give rise to a range of serious problems, from violations of students' data privacy and the degradation of the humanistic quality of teacher-student interaction to academic misconduct that undermines the integrity of education.

This article concludes that appropriate and ethical teacher adaptation strategies should encompass five interrelated dimensions: (1) the continuous strengthening of professional digital competence with a service-oriented orientation and ethical awareness; (2) the use of technology as a tool that enriches learning rather than as a substitute for the teacher's humanistic role; (3) an active commitment to maintaining the integrity, privacy, and security of students' data; (4) ethical collaboration within the digital ecosystem with colleagues, parents, and the educational community; and (5) the integration of digital ethics values into the learning process as part of students' character formation.

By consistently implementing these five adaptation strategies, teachers will not only be able to keep pace with the dynamically evolving flow of technological change but also remain steadfast in upholding the noble values of the teaching profession. Professional ethics, therefore, should not be seen as an obstacle to adaptation, but rather as a compass that determines the direction of adaptation so that it remains dignified and meaningful.

For future research, empirical studies across various school levels are recommended to test the effectiveness of the ethical adaptation strategies formulated in this article. Survey-based research or case studies will provide a more concrete picture of the challenges and successes of implementing professional ethics in the adaptation of educational technology in practice.

AUTHOR CONTRIBUTION

Fajar Hidayat contributed fully to all stages of the research, including conceptualization and research design, data collection and analysis, interpretation of the research findings, manuscript drafting, substantive revision of the article, and final approval of the manuscript to be published.

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