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Teacher's Professional Agency in Pedagogical Decision-Making on the Digital Transformation of Education

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ABSTRACT

This article aims to analyze how teachers' professional agency is expressed in pedagogical decision-making during educational digital transformation and to identify the factors that support or constrain such agency. The study employs a narrative literature review with thematic synthesis of 20 journal articles published between 2021 and 2026. Ten articles were selected as primary sources because they directly address teacher agency, professional judgment, or technology adaptation, while ten additional articles provide supporting perspectives on digital competence, technology integration, and generative artificial intelligence. The synthesis indicates that teachers' agency extends beyond the ability to operate digital tools. It involves professional judgment in selecting, adapting, combining, or rejecting technologies based on learning objectives, students' needs, school contexts, and ethical considerations. This agency is shaped not only by teachers' individual capacities but also by institutional conditions, including infrastructure, available time, leadership support, and opportunities for professional collaboration. The article proposes a conceptual synthesis that connects professional judgment, adaptive action, contextual conditions, and reflective evaluation. This perspective highlights the importance of understanding digital transformation as a pedagogical process rather than merely the adoption of technological tools. The findings suggest that teacher professional development should integrate digital skills with pedagogical reasoning, digital ethics, and professional autonomy. The review also emphasizes the need for transparent documentation of literature searches and source-selection procedures to strengthen methodological traceability and support future replication. Overall, the synthesis provides a conceptual basis for understanding how teachers exercise professional agency in making responsible and context-sensitive pedagogical decisions in digitally mediated educational environments. The review also situates teacher agency within the social context of schools, particularly professional relationships, institutional support, and differences in digital access that may shape teachers' and students' opportunities to participate in learning.

Keywords: teacher agency, pedagogical decision-making, digital transformation, educational technology, generative artificial intelligence

INTRODUCTION

Digital transformation is changing the way teachers design learning, present materials, provide feedback, assess learning outcomes, and interact with learners. Learning platforms, digital learning resources, collaborative applications, and generative artificial intelligence open up opportunities to expand access and tailor learning activities. However, the availability of technology does not automatically improve the quality of learning. The impact depends on teachers' decisions about when, for what, and how technology is used in specific contexts. Akram et al. (2022) show that technology integration is influenced by teachers' perceptions as well as supporting and inhibiting conditions in the learning environment.

In this context, the professional agency of teachers is an important concept. Agency refers to the capacity of teachers to act objectively, use professional judgment, and negotiate opportunities and obstacles shaped by the school's experience, policies, resources, and culture. Agency does not stand apart from the work environment. Pantić et al. (2022) place teacher agency in social and epistemic relationships that affect the likelihood of teachers making changes. Thus, teacher agency also has a social dimension: pedagogical choices are not only shaped by individual abilities, but also by relationships with peers, leaders, students, families, and the norms and policies that apply in schools. This perspective is in line with the discussion of agency in social and epistemic networks.

Agency also needs to be distinguished from digital competence. Digital competence relates to knowledge and skills in using technology, whereas agency appears in decisions about the use of such knowledge for pedagogical purposes. Siddiq et al. (2024) examine the concept of a digital agency and help explain that the ability to operate in a digital environment is not the same as the ability to determine the right course of action in that environment.

This distinction is important because teachers who are skilled in using apps do not necessarily have the space to choose the most appropriate strategy. Rigid policies, device limitations, unstable internet connections, or tight planning time can reduce pedagogical choices. Revuelta-Domínguez et al. (2022) emphasize that reviewing digital teaching competencies is one of the important foundations, but these competencies need to be supported by conditions that allow teachers to implement them meaningfully.

The technology integration literature also shows that the application of ICT cannot be understood as the process of incorporating devices into the classroom alone. Msafiri et al. (2023) review the integration of ICT in secondary education and highlight the importance of considering the conditions of implementation and sustainability of technology use. Therefore, the agency's discussion needs to connect individual teachers' decisions with school resources and governance.

In addition to the issue of the availability of facilities, digital transformation also requires teachers to consider the suitability of technology with the learning process to be achieved. Each device has different characteristics and limitations, so its use needs to be adjusted to the material, learning activities, and needs of students. Effective technology to convey information is not necessarily the best choice for building discussions or developing critical thinking skills. In such situations, teachers need to compare various alternatives before determining the strategy to be used. This process shows that pedagogical decisions are not just technical actions, but part of the teacher's professional responsibility in maintaining the quality of learning.

In the development of educational technology, teachers often have to adapt the available devices to suit learning needs. Bradbury et al. (2026) discuss teachers as actors who adopt and adapt educational technology, so that teachers are not only recipients of innovations determined from the outside. This idea is relevant to assess pedagogical decisions as an active, contextual, and reflective process.

The presence of generative artificial intelligence expands the opportunities and responsibilities of teachers. AI can help generate materials, compile examples, or support feedback, but the results need to be examined in terms of accuracy, bias, privacy, and suitability for learners' development. Qian (2025) maps the pedagogical application of generative AI in higher education, while its application at the school level still requires considerations appropriate to the age, goals, and context of the students.

Technological developments also make the boundaries between ease of use and pedagogical responsibility even more important to be considered. Teachers can get help in preparing materials or providing a variety of activities, but the results produced by technology do not always match the learning needs. Teachers still need to check the accuracy of information, consider the level of understanding of students, and ensure that the use of

technology does not reduce students' opportunities to think and interact actively. Therefore, the ability to make decisions independently and responsibly is an important part of teachers' professionalism. Professional agencies provide a perspective to understand how teachers use their judgment when faced with various choices and limitations in the digital environment.

The Indonesian context is important to pay attention to because school conditions and access to technology are diverse. Discuss pedagogical adaptation of teachers in technology-assisted teaching. Williyan et al. (2025) examine EFL teacher agency when integrating ICT in writing learning. Both studies provide a basis for understanding that technology adaptation is related to professional decisions, not just the availability of tools.

Although digital competence and technology integration have been widely discussed in the educational literature, they need to be understood in conjunction with the decision-making process that teachers make. The ability to use technology explains one of the resources that teachers have, while professional agency helps explain how those resources are applied, adapted, or even not used in certain situations. This distinction is important because learning practices take place in the context of schools that have diverse needs, resources, and policies. By placing pedagogical decisions as the focus of the study, the relationship between teachers' individual capacities and institutional conditions can be discussed more comprehensively. The perspective also provides a basis for formulating implications for professional development and management of educational digital transformation.

From a social perspective, differences in resources and opportunities to participate need to be read as part of the context of decision-making. When access to devices, connections, or learning supports differs between learners, teachers need to weigh not only the effectiveness of the tools, but also who can use them and who is at risk of being left behind.

Based on these descriptions, this article answers three questions: (1) how teachers' professional agency is embodied in pedagogical decision-making on digital transformation; (2) what factors support or limit such agencies; and (3) what are the implications for teacher professional development and educational technology governance. The aim of the article is to synthesize relevant literature and propose a conceptual framework linking professional assessment, adaptive action, contextual conditions, and reflective evaluation.

METHODS

This article uses a review of narrative literature with thematic synthesis to compare concepts, focuses, and research findings on teacher agency and pedagogical decision-making in a digital environment. The scope of the publication is limited to 2021–2026. Google Scholar is designated as a search source, while Publish or Perish can be used to help retrieve and export search result metadata. Relevant keywords include "teacher agency", "teacher professional agency", "pedagogical decision-making", "digital agency", "digital technology integration", "teacher judgement", "generative AI in education", as well as Indonesian equivalents such as "teacher agency", "pedagogical decision", and "digital transformation of education". The inclusion criteria include journal articles within that year range that discuss teacher agency, pedagogical decisions or reasoning, technology adaptation, digital competencies, or the use of AI in education and have searchable bibliographic metadata and DOIs. Sources that only discuss technical aspects with no clear connection to pedagogical practice are not prioritized. The corpus in this draft consists of 20 candidate articles divided into 10 primary sources and 10 supporting sources based on their proximity to the focus of the study. The analysis is carried out by grouping the content of the article into the themes of professional assessment, technology adaptation, supporting and limiting factors, and ethics and pedagogical relationships in the use of AI. To meet the reporting standards, authors need to complete actual records regarding search dates, keyword combinations, number of records, deduplication, and

exclusion reasons based on Google Scholar/Publish or Perish real results. This draft does not claim undocumented search results.

RESULT AND DISCUSSION

Mapping of primary sources

Ten main sources were chosen because they directly address the teacher's agency, professional assessment, technological adaptation, or the conditions that shape the teacher's actions. Table 1 presents the focus and contribution of each source as the basis for the synthesis. The summary needs to be matched with the full text of each article before the manuscript is submitted to the journal.

Table 1. The Contribution of Each Source as the Basis of Synthesis

No.	Main source	Focus of the study	Contribution to synthesis
1	(Pathiranage & Karunaratne, 2023)	Teachers' agencies in the use of technology before and after COVID-19	Linking changes in digital practices to opportunities and limitations of teacher actions.
2	(Siddiq et al., 2024)	Conceptualization of digital agencies	Differentiate digital agencies from operational competencies.
3	(Pantić et al., 2022)	Teacher agency in social and epistemic networks	Showing the influence of professional relations and school structure.
4	(Bradbury et al., 2026)	Adoption and adaptation of EdTech by teachers	Placing teachers as active actors who adapt technology.
5	(Lizamuddin et al., 2025)	Pedagogical adaptation in technology-assisted teaching	Highlight reflective decisions and practice contexts.
6	(Williyan et al., 2025)	Deliberative agency in ICT integration for writing teaching	Describe the teacher's considerations when choosing and using ICT.
7	(Lestari et al., 2026)	Prospective teachers' agency in technology integration during practicum	Connecting actions to school experiences and conditions.
8	(Wulandari & Wirza, 2026)	Adaptation of learning resources by English teachers	Emphasizing adapting learning resources to the context of the classroom.
9	(Asri et al., 2026)	Teacher agency and human relations in an automated ecosystem	Highlight the relational dimension in the use of automated systems.
10	(Eedelouei, 2026)	Language teacher assessment and decision on generative AI	Supports a direct focus on professional judgment.

Agency as a professional assessment

Professional agency is expressed when teachers make reasoned choices about whether, when, and how a technology should be used for a particular learning purpose. This involves

assessing the relationship between the tool's functions, learning objectives, students' needs, and the conditions of the classroom. Pathiranage and Karunaratne (2023), in a systematic review of technology-related teacher agency before and after COVID-19, show that teachers' room for action is shaped by contextual opportunities and constraints. Siddiq et al. (2024), through a conceptual systematic review, further distinguish digital agency from digital competence: the ability to use technology does not by itself explain how a person decides to act in a digital environment. Read together, these reviews suggest that professional agency concerns the judgement through which teachers turn available competence into context-sensitive pedagogical action.

Empirical studies help clarify that this judgement is not formed by teachers in isolation. Pantić et al. (2022), studying teacher agency for educational change in two Swedish schools, connect teachers' capacity to act with their social and epistemic networks. Bradbury et al. (2026), in a study of teachers adopting and adapting an educational technology platform in primary schools, show more directly how teachers' choices are shaped by the platform, curriculum expectations, and local practice. The studies therefore converge on the importance of context, although they examine different aspects: Pantić et al. (2022) foreground professional relationships and change, whereas Bradbury et al. (2026) examine the practical adaptation of a particular EdTech platform.

On this basis, the decision process can be interpreted as a sequence of professional questions rather than a routine choice of an application: What learning need is being addressed? Which features of the tool serve that need? Can the activity be adjusted for students' abilities and access? Would combining digital and face-to-face activities be more appropriate? If the tool introduces barriers or does not contribute to the learning objective, is it better to limit or reject its use? The four possible actions—selecting, modifying, combining, and declining a tool—are the present article's synthesis of the reviewed literature, not a classification attributed to one individual study.

Adaptation of technology to purpose and context

Meaningful use of technology requires a process of adaptation. Teachers can choose specific features, change the order of activities, adjust assignments, or combine digital and offline activities. Adaptation does not necessarily mean using more technology; decisions to limit or not use certain tools may also reflect responsible pedagogical considerations.

Evidence from language-teaching studies shows that adaptation takes different forms and is not simply an increase in the amount of technology used. Lizamuddin et al. (2025) examine teachers' pedagogical adaptation in technology-mediated language teaching, while Williyan et al. (2025) focus on deliberative agency in ICT-supported writing instruction. Both studies place teachers' pedagogical considerations at the centre of technology integration, but their emphases differ: the former concerns adaptation across technology-mediated language teaching, whereas the latter foregrounds deliberation, reflection, and professional judgement in writing instruction. This comparison indicates that adaptation needs to be understood in relation to the particular learning activity, not as a uniform practice.

The studies by Lestari et al. (2026) and Wulandari and Wirza (2026) add evidence about how adaptation varies across teachers and settings. Lestari et al. (2026) examine five EFL preservice teachers during a teaching practicum and report differences in the alignment between technology use and learning objectives, alongside constraints related to devices and connectivity. Wulandari and Wirza (2026), in a qualitative case study of three secondary-school English teachers, identify different ways of selecting, supplementing, modifying, and selectively replacing learning resources. The two studies share an emphasis on context-sensitive decisions, but differ in their focus: Lestari et al. (2026) consider technology integration during practicum, while Wulandari and Wirza (2026) examine adaptation of learning

resources. Their findings show why a single prescribed pattern of technology use cannot represent all pedagogical situations.

Taken together, the reviewed studies support four analytical forms of adaptation: selecting tools that match the learning objective; modifying activities or materials to fit students' needs; combining digital resources with offline interaction; and limiting or declining technology when its constraints outweigh its pedagogical value. These categories are the synthesis developed in this article. They are supported by the different forms of adaptation reported by Bradbury et al. (2026), Lestari et al. (2026), and Wulandari and Wirza (2026), but should not be read as a taxonomy proposed by any one of those studies.

Supporting and limiting factors of agency

The reviewed literature indicates that teachers' decisions are shaped by interacting individual, institutional, and social conditions. At the individual level, pedagogical knowledge, digital competence, experience, beliefs, and confidence influence the options teachers can consider. At the institutional level, access to devices, internet reliability, planning time, technical support, leadership, and opportunities for collaboration affect whether teachers can put those considerations into practice. Akram et al. (2022) and Bui (2022), both reviewing technology integration in language-teaching contexts, identify the relevance of teacher perceptions, resources, and professional support. Msafiri et al. (2023), reviewing ICT integration in secondary education, similarly highlight the importance of professional development, pedagogical and technological knowledge, and the conditions needed to sustain implementation.

These reviews are consistent in showing that positive attitudes or technical capability do not remove structural barriers. However, their scopes differ: Akram et al. (2022) focus on teachers' perceptions and reported barriers in Pakistan, Bui (2022) examines English teachers' integration of digital technologies, and Msafiri et al. (2023) consider ICT integration across secondary education. Pathiranage and Karunaratne (2023) add a further qualification by showing that technology-related agency is affected by contextual conditions, while their review is weighted toward higher-education settings. Therefore, these sources support a cautious conclusion: competence and willingness can enable action, but the actual choices available to teachers depend on the institutional and educational context.

The social consequences of these conditions are also important. Unequal access to devices, connectivity, or learning support can affect students' opportunities to participate, communicate, and demonstrate their understanding. Pantić et al. (2022) show that teacher agency for educational change is connected to professional and epistemic relationships. Although their study does not examine digital access directly, it helps explain why collaboration and professional networks matter when teachers respond to unequal or changing learning conditions. In this article's synthesis, teachers' decisions should therefore be assessed not only by instructional efficiency but also by whether students can participate meaningfully.

Bui (2022) and Akram et al. (2022) provide supporting evidence about teachers' experiences and barriers to technology integration, but neither review should be treated as direct evidence of every stage of professional agency. Their contribution is to identify conditions—such as confidence, resources, training, and institutional support—that can enable or constrain classroom technology use. This distinction matters because the existence of a barrier does not by itself reveal the precise decision a teacher makes; that mechanism is more directly illuminated by studies of teacher adaptation and deliberation, including Bradbury et al. (2026), Williyan et al. (2025), and Lestari et al. (2026).

Responsibility for the quality of digital transformation therefore cannot be placed solely on individual teachers. When schools expect innovation without providing infrastructure, time,

training, or technical support, teachers may have limited capacity to translate professional judgement into practice. The literature reviewed here suggests that leadership support and professional collaboration are not peripheral conditions; they help determine whether teachers can test, discuss, evaluate, and refine pedagogical decisions.

Agency in the use of generative artificial intelligence

Generative AI introduces a specific set of professional decisions because its outputs may be useful while also containing inaccuracies, bias, or material that is unsuitable for a particular group of learners. Eedelouei (2026), through a systematic review of 14 empirical studies on language teachers' judgements and decisions about generative AI, places teachers' professional evaluation at the centre of adoption. Cincioğlu et al. (2026), in a systematic review of empirical studies on teachers' use of generative AI in K–12 education, map applications such as lesson planning, material development, assessment, and feedback. Both reviews address teachers and GenAI, but Eedelouei (2026) focuses on factors shaping language teachers' judgements, whereas Cincioğlu et al. (2026) map a broader range of teacher uses in school education.

The need for professional intervention is also evident in research on AI-based instruction more broadly. Lee (2026), reviewing 29 studies in K–12 education, describes teacher intervention through processes of monitoring, interpreting, and acting on information generated by AI-supported systems. This is relevant to the present discussion, but AI-based instruction should not be treated as synonymous with generative AI: the former may include adaptive systems and intelligent tutoring tools, while the latter generates new text or other content. The distinction prevents findings about one type of system from being generalized to all AI applications.

(Asri et al., 2026)

Asri et al. (2026), in a qualitative case study involving 10 teachers in three senior high schools in Makassar, report that teachers responded to students' growing engagement with generative AI by making pedagogical adjustments intended to restore authentic interaction, trust, and human connection. This study provides context-specific empirical evidence for the relational dimension of teacher agency. Wang et al. (2025) synthesize empirical studies of GenAI in pedagogical practice and discuss its potential to support feedback and learning materials alongside concerns about reliability and academic integrity. Marzano (2025) reviews GenAI in K–12 teaching and learning and highlights the need for teacher development and attention to ethical issues. These sources reinforce the importance of human judgement, although they examine different questions: Asri et al. (2026) focus on teacher–student relations in Indonesian secondary schools, while Wang et al. and Marzano provide broader reviews of pedagogical applications and challenges.

The educational level also needs to be considered when comparing findings. Qian (2025) focuses on pedagogical applications of GenAI in higher education, whereas Cincioğlu et al. (2026) and Marzano (2025) address K–12 education. Qian's (2025) findings can therefore provide a useful comparison about pedagogical opportunities and risks, but should not be presented as direct evidence of school teachers' practice. Across these sources, the common point is that GenAI may support aspects of teaching, while decisions about accuracy, suitability, student development, privacy, and academic integrity remain matters for professional judgement.

Taken together, the literature suggests that teachers' agency in using GenAI is expressed not through acceptance or rejection alone, but through verification, selective use, adaptation, and the decision to withhold a tool when its outputs or data practices are unsuitable. The present synthesis distinguishes three connected considerations: the pedagogical value of the output, the reliability and ethical implications of its use, and the effect on students' learning and participation. This interpretation is consistent with the decision-making focus of Eedelouei

(2026) and the school-level applications and constraints discussed by Cincioğlu et al. (2026) and Marzano (2025).

CONCLUSION

Teachers' professional agency is an important element in the digital transformation of education because it influences the way technology is selected, interpreted, adapted, and evaluated based on learning objectives. Agency is not the same as technical skills. Teachers need to have the ability to provide pedagogical reasons for the decisions taken and the professional space to apply them responsibly.

Agencies are supported by digital competencies, experience, professional identity, supportive leadership, infrastructure, time, and a culture of collaboration. In contrast, limited access, technical support, training, and autonomy can limit teachers' ability to translate professional considerations into practice. In the use of generative AI, agencies also include information verification, data protection, ethical considerations, and the maintenance of human relationships in learning.

This article proposes a framework that links professional consideration, adaptive action, contextual conditions, and reflective evaluation. The practical implications are that schools and policymakers need to strengthen professional development based on pedagogical reasoning, provide responsible decision-making space, and ensure adequate support. Before the article is submitted, authors need to verify all sources and complete search documentation so that the study method can be traced and replicated.

Taking into account the social dimension, responsible digital transformation also needs to pay attention to the equal distribution of opportunities for participation and the quality of relationships in learning. Support for teacher agencies is not enough in the form of tools and training, but also needs to create a school environment that allows collaboration, understands the diversity of learners' conditions, and responds to barriers to access proportionately.

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