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Transforming the Role of PGSD/PGMI Lecturers in Preparing Teacher Candidates Who Are Adaptive to Technological Disruption

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Abstract
The rapid advancement of digital technology has significantly transformed the landscape of education, demanding a fundamental shift in the roles of educators, particularly in teacher education programs. This study aims to analyze the transformation of lecturers' roles in PGSD/PGMI in preparing prospective teachers who are adaptive to technological disruption. The research employs a qualitative approach with a descriptive case study design to explore in depth the practices, challenges, and strategies implemented by lecturers in integrating technology into the learning process. Data were collected through in-depth interviews, observations, and documentation, and analyzed using an interactive model involving data reduction, data display, and conclusion drawing. The findings reveal that lecturers have undergone a significant role transformation from knowledge transmitters to facilitators, learning designers, and innovators. This transformation is reflected in the implementation of student-centered learning approaches, integration of digital technologies, and the emphasis on developing digital literacy and 21st-century skills among pre-service teachers. However, the study also identifies several challenges, including disparities in digital competence, limited technological infrastructure, and resistance to pedagogical change. The study concludes that the transformation of lecturers' roles is essential in producing adaptive, innovative, and technologically competent teachers. Therefore, continuous professional development, institutional support, and strategic policy implementation are required to optimize the quality of teacher education in the era of technological disruption.
Keywords: *Lecturers' Role Transformation, Technological Disruption, Digital Literacy.*

INTRODUCTION

The rapid development of digital technology has brought fundamental changes in various aspects of life, including in the world of education. The era of technological disruption marked by the emergence of artificial intelligence, big data, and digital-based learning demands a paradigm transformation in the education process (Karlau & Rukua, 2023). Educational institutions are no longer enough to focus only on knowledge transfer, but must also be able to equip students with 21st century skills such as critical, creative, collaborative, and communicative thinking. In this context, the role of teachers has become increasingly complex and strategic, so the process of preparing prospective teachers needs to be adjusted to the demands of the times (Zaimarni et al., 2025).

The Elementary School Teacher Education (PGSD) and Madrasah Ibtidaiyah Teacher Education (PGMI) study programs as a printing institution for prospective teachers have a great responsibility in producing educators who are professional and adaptive to change (Nuraeni, 2025). However, the challenges faced today are no longer conventional. Technological disruption has changed the way of learning, learning resources, and interaction between teachers and students. Therefore, prospective teachers are not only required to master pedagogic and professional competencies, but also digital literacy, the ability to utilize learning technology, and readiness to face the dynamics of rapid change (Noorissiyam, n.d.).

In this situation, PGSD/PGMI lecturers play a key role as agents of transformation in the educational process of prospective teachers. Lecturers no longer only function as material presenters, but as facilitators, innovators, and inspirers who are able to integrate technology in learning (Karlau & Rukua, 2023). The transformation of the role of lecturers is very important to create an adaptive, flexible, and technology-based learning environment. Lecturers are required to be able to design innovative learning strategies, utilize digital platforms, and instill an adaptive mindset in students as future teacher candidates (Irfan Ilmy, 2022).

However, the reality on the ground shows that not all lecturers are fully prepared for this change. There are still gaps in technology mastery, resistance to innovation, and limitations in integrating technology into the learning process effectively. This certainly has an impact on the quality of graduates produced, especially in facing educational challenges in the digital era (Elmanisar et al., 2024).

Based on this background, the transformation of the role of PGSD/PGMI lecturers is an inevitable necessity. This effort is not only related to improving technological competence, but also a paradigm shift in the learning process. Therefore, this study aims to analyze how the role of PGSD/PGMI lecturers in preparing prospective teachers who are adaptive to technological disruptions is transformed, as well as strategies that can be carried out to improve the quality of teacher education in the digital era. Thus, it is hoped that the results of this study can contribute to the development of teacher education that

is relevant to the demands of the times and able to produce educators who are superior, innovative, and ready to face the future.

METHOD

This study uses a qualitative approach with a descriptive-analytical type of research. This approach was chosen to deeply understand the transformation of the role of PGSD/PGMI lecturers in preparing prospective teachers who are adaptive to technological disruptions, both from conceptual aspects and implementive practices in the field. Through a qualitative approach, researchers can explore the phenomenon holistically and gain a comprehensive understanding of the dynamics of changing the role of lecturers in the context of digital education (Aveling et al., 2015).

The type of research used is a case study (*Case Study*), which is focused on PGSD and/or PGMI study programs at certain universities. The case study allows researchers to explore in depth the learning practices, strategies of lecturers, and the challenges faced in integrating technology in the educational process of prospective teachers. This research can also be enriched with a literature study approach to strengthen the theoretical foundation related to technological disruption and educational transformation (Ishtiaq, 2019).

The data sources in this study consist of primary data and secondary data. Primary data was obtained through *in-depth interviews* with PGSD/PGMI lecturers, students, and other related parties such as study program managers. In addition, participatory observation is carried out to see firsthand the learning process that takes place, especially in the use of technology. Meanwhile, secondary data is obtained from academic documents, such as Semester Learning Plans (RPS), institutional policies, and relevant scientific literature.

The data collection techniques used include: (1) semi-structured interviews to explore the experiences and views of informants; (2) observation to observe technology-based learning practices; and (3) documentation to review written data that support the research. This technique is used triangulatively to increase the validity and validity of the data (Njie & Asimiran, 2014).

Data analysis was carried out using an interactive analysis model which included three stages, namely data reduction, data presentation, and conclusion drawn. Data reduction is carried out by sorting and simplifying relevant information, then presented in the form of a descriptive narrative, and then conclusions are drawn based on the patterns, themes, and relationships between the data found.

To ensure the validity of the data, this study uses source triangulation techniques and triangulation methods. In addition, a credibility test was also carried out through member checks, namely confirming the results of interviews with informants, as well as increasing the researcher's diligence in the data collection process.

With this research method, it is hoped that an in-depth and systematic picture can be obtained of the transformation of the role of PGSD/PGMI lecturers in facing technological disruption and their contribution in producing adaptive and competent teacher candidates in the digital era.

RESULTS AND DISCUSSION

1. The Role of Lecturers in the Digital Transformation of Higher Education

The role of university lecturers (lecturers) has undergone a profound metamorphosis as higher education transitions from traditional pedagogical models to digitally integrated landscapes. In the contemporary era, often defined by the Fourth Industrial Revolution, lecturers are no longer just "sages on stage" or the main disseminators of static information; rather, they have become knowledge facilitators, architects of digital learning environments, and mentors in navigating vast information networks. This transformation is driven by the convergence of physical, digital, and biological technologies, which demand radical changes in the way educators interact with students and curriculum (Purnama, 2025).

In traditional academic frameworks, lecturers hold a monopoly on specialized knowledge. However, as noted in*The Digital University: A Manifesto*, the democratization of information through the internet has shifted the main responsibility of lecturers towards curation and critical synthesis. Modern lecturers must design learning experiences that encourage students to evaluate the credibility of digital sources, a skill often referred to as digital literacy or "metaliteration". This shift is supported by the "Community of Inquiry" framework, which emphasizes the importance of social, teaching, and cognitive presence in online and blended learning environments (Suyasa et al., 2025).

One of the main pillars of the role of lecturers in digital transformation is the mastery of Learning Management Systems (LMS) such as Moodle, Canvas, or Google Classroom. These platforms are not just a repository for PDF documents, but are dynamic spaces for asynchronous interactions. Effective digital transformation requires lecturers to leverage these tools to provide timely feedback and encourage global collaboration. According to *Teaching in a Digital Age*, the selection of the right media and technology is a core professional requirement for modern lecturers, which requires a deep understanding of the "SECTIONS" model (Student, Ease of use, Cost, Teaching function, Interaction, Organizational issues, Network, and Security).

Digital transformation has popularized "Blended Learning" and the "Flipped Classroom" model. In this scenario, the lecturer's role involves recording previous learning content often using multimedia principles to reduce cognitive load while face-to-face time or synchronous digital time is allocated for high-level discussions and problem-solving. This requires a deep understanding of learning design. As discussed in*Rethinking University Teaching*, lecturers must now act as "educational designers" who create a cycle of iterative learning that bridges the gap between theory and digital practice (Sya'roni et al., 2025).

2. Lecturer as Learning Management System (LMS) Architect

The concept of a Learning Management System (LMS) has evolved from a mere repository of files to a sophisticated digital ecosystem that facilitates the administration, documentation, tracking, reporting, and delivery of educational courses. At its core, an LMS serves as an infrastructure that delivers and manages

learning content, identifies and assesses individual and organizational learning goals, tracks progress in achieving those goals, and collects and presents data to oversee an organization's overall learning process. In the context of modern pedagogy, LMS is no longer just a tool, but a fundamental environment in which the "architecture" of learning is built, which requires educators, especially professors and teachers, to move from traditional lecturers to digital architects (Andrea et al., 2024).

When a teacher or professor takes on the role of an "Architect" in an LMS, they are involved in Instructional Design (ID). This process involves the systematic development of instructional specifications using learning and instructional theories to ensure the quality of teaching. In contrast to traditional classroom environments where spontaneous interaction can compensate for structural gaps, digital environments require a predefined blueprint. Educators must design students' "user experience" (UX), ensuring that navigation is intuitive, cognitive load is managed, and pedagogical goals are aligned with digital activities (Mubarok & Aimah, 2025).

Architectural frameworks often follow established models such as ADDIE (Analysis, Design, Development, Implementation, and Evaluation). In the "Analysis" phase, educator-architects determine the needs of students such as in the elementary school environment and technological limitations. In the "Design" and "Development" phases, educators select appropriate media, structure modules, and create assessment rubrics that will organize automatic or semi-automated feedback cycles in the system.

The effectiveness of an LMS is rooted in the application of educational psychology. Most modern systems are designed to support Social Constructivism, a theory popularized by Lev Vygotsky, who states that knowledge is built through social interaction. Therefore, an LMS architect must integrate tools such as discussion forums, peer review workshops, and collaborative wikis to facilitate the construction of this "social" knowledge in a virtual space.

In addition, Cognitive Load Theory, developed by John Sweller, is essential in LMS architecture. This theory states that because working memory has limited capacity, learning materials should be designed to reduce unnecessary cognitive load. An educator-architect applies this in a way that (Maghfiroh, 2025):

a. Content Breakdown: Break down long lectures into 5-10 minute "microlearning" segments.
b. Scaffolding: Provides temporary support structures that are gradually eliminated as the student's mastery of the material increases.
c. Multimedia Integration: Using the "Principle of Proximity," which states that people learn better when appropriate words and images are presented close together rather than far apart on screen.

From a technical standpoint, the LMS architecture must adhere to certain standards to ensure content is movable and data can be traced. The most prominent standard is SCORM (*Sharable Content Object Reference Model*). SCORM allows a variety of interactive tools to "communicate" with the LMS, ensuring that if a student

completes a module on an external tool, grades will be automatically recorded in the LMS's gradebook.

Another new standard is the x API (Experience API), which allows tracking of learning experiences that occur outside of the LMS, such as mobile learning, simulations, or experiential learning. Architect-educators must understand this technical ability to build systems that are not "closed environments" but open ecosystems capable of integrating various educational technologies (EdTech) (Mirhabun Nadir et al., 2025).

In the context of elementary education or elementary school, the LMS architecture must differ significantly from the higher education model. As noted in the latest development proposal, the focus shifted towards "User-Friendly Interface" and "Parental Integration". For younger students, the LMS should use more visual cues and gamification elements to maintain engagement. The "architect" here had to design a portal that allowed parents to monitor progress and communicate directly with teachers, creating a model of "triangle" interaction between teachers, students, and guardians (Dazia & Wardatushobariah, 2024).

One of the most powerful features of a well-designed LMS is the ability to leverage Learning Analytics. It involves measuring, collecting, analyzing, and reporting data about learners and their contexts. By analyzing the "big data" generated within the LMS, educator-architects can identify "at-risk" students before they fail the assessment. For example, if the data shows that a student has not logged in for five days or spent a very long time reading certain material, the system can trigger an automatic intervention or alert the teacher to provide manual support.

Mathematical modeling of student progress often uses probability density functions to predict outcomes. For example, the probability of a student's mastery of a concept can be modeled based on their previous interactions. X:

$$\mathrm{P}(MASTeRy!\,X) = \frac{1}{1 + e^{-}(B_0 + B_1 X)}$$

Where B0 and B_1 are parameters obtained from historical data in the LMS.

3. The Impact of Industry 4.0 and AI and Professional Development and Institutional Support

The Fourth Industrial Revolution, or Industry 4.0, represents a fundamental shift in the way goods are produced and services are delivered, characterized by a blend of technologies that blur the boundaries between the physical, digital, and biological realms. At its core, Industry 4.0 is driven by the integration of cyber-physical systems, the Internet of Things (IoT), and cloud computing, creating a "smart factory" where machines are equipped with wireless connectivity and sensors. In contrast to the previous industrial revolutions the first was driven by steam, the second by electricity and mass production, and the third by electronics and information technology, this fourth revolution was characterized by its speed, scope, and systemic impact. Artificial Intelligence (AI) acts as the cognitive engine of this transformation,

allowing machines to perform tasks that would normally require human intelligence, such as visual perception, voice recognition, and decision-making (Sirozi, 2025).

The integration of AI into the professional world has profound implications for the workforce, which demands a radical rethinking of professional development. As automation handles routine cognitive and manual tasks, the value of human labor is shifting toward high-level problem-solving, creativity, and emotional intelligence. Professional development in the era of Industry 4.0 is no longer a periodic event, but a continuous process in the form of "lifelong learning." Employees must engage in upskilling (learning new skills for the same job) and upskilling (learning new skills for different jobs) to stay relevant. Corporate educational institutions and training programs are increasingly focusing on "T-shaped" skills, in-depth expertise in specific disciplines combined with a broad ability to collaborate across functional fields (Ma'shum Thoyib, 2025).

Institutional support plays a critical role in navigating this transition. Governments and organizations are tasked with creating frameworks that reduce the "digital divide" and ensure equitable access to new technologies. In Indonesia, for example, the roadmap "Building Indonesia 4.0" outlines a national strategy to revitalize the manufacturing sector through digital adoption, targeting five key industries: food and beverages, textiles, electronics, automotive, and chemicals. Institutional support also includes the establishment of regulatory standards for AI ethics and data privacy, ensuring that the implementation of autonomous systems does not disrupt human rights or social stability.

The economic impact of AI is often modeled through production functions where AI acts as a new factor of production. Consider Cobb-Douglas' production functions simplified and modified for the digital age.

$$Y = A.K^{a}L^{b}ASAYA^{y}$$

Where Y is the total production, A is the total productivity factor, K is capital, L is labor, and ASAYA represents the contribution of artificial intelligence and automated systems. As γ spending increases, the traditional relationship between capital and labor is disrupted, necessitating institutional interventions such as the Universal Basic Income (UBI) or tax incentives for human-centered roles to maintain economic balance.

In addition, the synergy between AI and professional development is facilitated by AI-based personalized learning platforms. The system uses machine learning algorithms to analyze learners' progress and adjust the curriculum in real-time, optimizing the "Proximal Development Zone". This technological assistance enables institutions to scale up high-quality education to millions of people, although this requires significant investment in digital infrastructure. Ultimately, the success of Industry 4.0 depends not only on the sophistication of the algorithm, but also on the resilience and adaptability of the human professionals who work with the algorithm.

CONCLUSION

This study concludes that the transformation of lecturers' roles in PGSD/PGMI is a critical and inevitable response to technological disruption in education. Lecturers are no longer positioned merely as knowledge transmitters, but have evolved into facilitators, learning designers, and agents of innovation who play a central role in shaping adaptive and future-ready teachers. This shift reflects a broader transition from conventional, teacher-centered approaches to more dynamic, student-centered and technology-enhanced learning environments.

The findings demonstrate that the integration of digital technologies and the strengthening of 21st-century competencies such as critical thinking, creativity, collaboration, and communication have become essential components in preparing prospective teachers. Through these transformations, pre-service teachers are better equipped with digital literacy and pedagogical adaptability, enabling them to respond effectively to the complexities of modern educational contexts.

However, the study also identifies several challenges, including disparities in digital competence among lecturers, limited technological infrastructure, and resistance to pedagogical change. These constraints indicate that the transformation process is not yet fully optimal and requires continuous improvement.

Therefore, sustained efforts are necessary to support this transformation, including ongoing professional development for lecturers, institutional commitment to providing adequate technological resources, and the establishment of supportive policy frameworks. Ultimately, the success of this transformation will determine the extent to which PGSD/PGMI programs can produce competent, adaptive, and innovative teachers who are capable of navigating and leading education in the era of technological disruption.

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