

TRANSFORMATION OF EARLY CHILDHOOD EDUCATION TEACHERS COMPETENCIES IN THE DIGITAL ERA: A LITERATURE STUDY ON TRAINING NEEDS IN 2025

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Abstract:

This Early Childhood Education (PAUD) faces the challenge of transformation in the digital era, particularly in enhancing teachers' competencies to integrate technology and relevant pedagogy. This literature study examines the technological and pedagogical skills required by PAUD teachers in 2025, focusing on training needs that support effective learning. Data were collected from scientific articles, books, and educational reports from 2015 to 2024 and analyzed qualitatively to identify trends and gaps. The results indicate that PAUD teachers must master basic technology (educational applications, online platforms) and adaptive pedagogical skills (digital play-based learning, online formative assessment). However, current training remains limited to technical aspects without in-depth pedagogical exploration. This study highlights the need for holistic training that combines technology and innovative teaching strategies, offering recommendations for the future professional development of PAUD teachers.

Keywords: Competency, PAUD, Digital Era, Teachers

INTRODUCTION

Madrasah Early Childhood Education (PAUD) plays a crucial role in shaping the holistic developmental foundation of children. According to Law No. 20 of 2003 on the National Education System, education aims to develop children's potential to become knowledgeable and independent individuals. However, new challenges arise in the rapidly evolving digital era, especially for PAUD teachers who must adapt to changing times. Technological advancements have transformed the global educational landscape. Today's young children grow up as "digital natives," accustomed to devices like tablets and smartphones from an early age. This demands that PAUD teachers serve as traditional learning facilitators and agents of digital transformation in the classroom. Technology offers significant opportunities, such as interactive educational apps and online learning platforms, but it also introduces new complexities in teaching.

PAUD teachers are expected to possess dual competencies: technological and pedagogical. Technological skills include using digital tools, while pedagogy involves teaching strategies tailored to the characteristics of young children. Susanto (2011) emphasizes that children aged 3-6 learn optimally through play, so pedagogical approaches must remain engaging even when technology-based. However, reality shows that many teachers

struggle to integrate these two aspects. Data from the Ministry of Education and Culture (Kemendikbud) in 2022 reveal that only a tiny percentage of PAUD teachers in Indonesia are trained to use essential technology in learning. This is concerning, given UNESCO's (2023) projection that by 2025, over 60% of global educational activities will involve digital technology. This disparity signals an urgent need for teacher competency transformation.

Previous studies have underscored the importance of teacher training. For instance, Sari and Setiawan (2021) found that technology training boosts PAUD teachers' confidence in using educational applications. However, their study focused primarily on technical aspects without exploring how pedagogy can be adapted in a digital context, indicating a research gap that needs addressing.

The transformation of PAUD teachers' competencies is about mastering tools and understanding how to use them to support child development. Prensky (2010) argues that teachers must become "digital immigrants" who adapt to remain relevant in the digital era. The challenge is that many PAUD teachers still rely on conventional methods like storybooks and songs, neglecting technology's potential. Literature also suggests that PAUD teacher training in Indonesia is often sporadic and unstructured. Research by Hidayat (2020) reveals that technology training for PAUD teachers in rural areas

This literature study only covers basic device introduction without delving into teaching strategies. However, by 2025, teachers are expected to design technology-based, interactive, and age-appropriate learning experiences. Global trends reinforce this training need. The OECD (2023) report notes that advanced countries like Finland have integrated technology and pedagogy in PAUD teacher training, resulting in more effective learning. In contrast, Indonesia's approach remains fragmented. This research gap is a primary reason for conducting this literature study.

Pedagogical approaches in PAUD must remain child-centered, even with technology. Vygotsky (1978) highlights the importance of social interaction in early childhood learning, which can now be extended through digital platforms. However, without proper training, teachers risk using technology mechanically, devoid of educational value. A prominent research gap is the lack of holistic training studies that balance technology and pedagogy. Nugroho et al. (2022) examined the use of learning applications in PAUD but did not address how teachers are trained to adapt digital content to play-based methods. Given the projection that 2025 will increasingly rely on technology, this gap is relevant.

PAUD teacher training must also consider local contexts. Technology access in remote areas in Indonesia remains limited, necessitating flexible

and inclusive training. Widodo (2023) shows that urban teachers adopt technology more efficiently than their rural counterparts. This research gap underscores the need for contextual training strategies. The digital era also brings ethical challenges, such as excessive screen exposure for children. The American Academy of Pediatrics (2022) recommends screen time limits for young children, meaning teachers must be trained to balance technology with physical activities. However, local literature rarely addresses teacher training on this issue.

This study aims to fill these gaps by reviewing the literature on the technological and pedagogical skills PAUD teachers need by 2025. Its focus is on training needs that support competency transformation. We hope to provide a comprehensive overview of trends and recommendations through a literature study approach. The study benefits not only teachers but also policymakers. Teachers gain insights into relevant training, while educational institutions can design more targeted programs. Amid accelerating digitalization, transforming PAUD teachers' competencies is an urgent necessity.

METHODOLOGY

This study employs a literature review approach using qualitative methods (Sugiyono, 2019). Data were collected from academic sources such as scientific journals, books, and official reports published between 2015 and 2024 to capture current trends and projections for 2025. Inclusion criteria encompassed publications discussing PAUD teacher competencies, educational technology, and professional training.

DISCUSSION

Theoretical Foundation of Teacher Competency Transformation

PAUD teacher competencies in the digital era extend beyond conventional teaching abilities, requiring a blend of technology and pedagogy that complement each other. Technology involves skills in using digital tools like educational applications or online platforms, while pedagogy is the art of teaching tailored to the developmental stages of young children. Integrating these two is key to keeping learning relevant amid rapid changes. Mishra and Koehler, in their TPACK framework proposed in 2006, assert that teachers must harmoniously combine technology, pedagogy, and content. In the PAUD context, this might mean using educational apps to teach basic concepts like colors or shapes in a playful manner. This framework is not just theoretical but a tangible foundation for the competency transformation teachers need today. By 2025, TPACK will become increasingly vital as technology becomes inseparable from education. PAUD teachers must adapt this theory to young children's unique needs, such as direct interaction and physical exploration, which must not be lost despite technology's presence.

Technology Trends in PAUD by 2025

Educational technology is advancing rapidly, and projections for 2025 reflect this trend. UNESCO in its 2023 report estimates that educational activities worldwide will involve gamification-based technology learning designed like games to capture children's attention. This trend will not bypass PAUD, where children will increasingly encounter interactive learning approaches. Tools like tablets, digital story apps, and online platforms will become commonplace in PAUD classrooms. These technologies offer visual and auditory simulations that can captivate children, making them more enthusiastic about learning. However, their success depends on teachers understanding how to use them appropriately, not merely handing devices to children without guidance. The impact of technology on early childhood learning cannot be ignored—studies show it boosts engagement, but if uncontrolled, it may disrupt social development. This is why teacher training is critical to ensure technology is used wisely.

Technological Skills Needed

To face the digital era, PAUD teachers must possess concrete basic technological skills. They need to know how to operate software like Kahoot for fun quizzes or Google Classroom for organizing class activities. Research by Sari and Setiawan (2021) proves that teachers mastering basic technology gain more confidence in teaching. However, these skills extend beyond tool usage—teachers must also manage digital content. Aspects like digital safety and ethics, often overlooked, are crucial. Teachers must understand how to protect children's data and ensure they are not exposed to inappropriate content—a growing necessity as technology advances. Unfortunately, current training rarely addresses these aspects in depth.

Pedagogical Skills in the Digital Era

PAUD must not stray from the fundamental principle that young children learn best through play. Susanto (2011) asserts that exploration and enjoyment are the heart of children's learning. In the digital era, this means teachers must skillfully integrate technology into play-based activities, such as creating interactive quizzes that feel like games. The challenge lies in adapting traditional methods to the digital world without losing their essence. For example, oral storytelling can now be delivered via digital story apps, but teachers must maintain interaction to prevent children from becoming passive observers. Creativity is essential here, and training is key to unlocking it.

Moreover, modern pedagogy includes technology-based formative assessment. Teachers can use applications to track children's learning progress, such as letter recognition, but they must be trained to use these tools effectively.

Training Gaps

Currently, PAUD teacher training in Indonesia is far from ideal. Hidayat (2020) found that many programs focus solely on device usage rather than teaching with those devices, hindering competency transformation. There is also a stark regional disparity—urban teachers tend to be better trained due to greater technology access, while rural training is often minimal and limited. Widodo (2023) highlights this disparity as a major obstacle. Furthermore, existing training approaches are rarely holistic—technology and pedagogy are often taught separately, though they must be integrated. This gap leaves many teachers struggling to apply what they learn in real classrooms.

The Importance of Holistic Training

Holistic training is the answer to PAUD teachers' needs in the digital era. This approach integrates technology and pedagogy into a cohesive package, ensuring teachers are fully prepared for challenges. Finland offers a real example—there, PAUD teachers are trained with digital simulations combining both aspects, resulting in more creative and effective learning. The outcomes are evident in their education quality. Indonesia urgently needs a similar approach to catch up. Without holistic training, competency transformation will lag, and teachers will struggle to keep pace with global developments. Training must be designed so teachers not only know how to “use” technology but also how to “integrate” it with age-appropriate play-based methods.

Challenges in Teacher Training

PAUD teacher training faces significant hurdles. Uneven technology access is a major issue—teachers in remote areas often lack devices to practice with, rendering training less effective. Additionally, the typical 1-2 day training duration is too short to deeply transform competencies. Teachers need more time to fully grasp and apply what they learn. Another issue is facilitators—many trainers lack a full understanding of PAUD's specific needs in the digital era, lowering training quality and leaving teachers without adequate guidance.

Global Trends and Lessons for Indonesia

Globally, PAUD teacher training has adopted advanced approaches. In countries like Finland, virtual reality is used to train teachers in classroom simulations, preparing them for real situations and boosting readiness and confidence. In Canada, long-term mentoring is part of training, with teachers supported post-formal sessions. These models could inspire Indonesia, though adaptations to local contexts—such as using simple technologies like mobile phones for rural teachers—are necessary. Flexibility will be key to success.

Impact of Technology on Young Children

Technology brings tangible benefits to young children. Interactive apps, for example, can enhance motivation and support early literacy in an enjoyable way. However, risks must be managed. The American Academy of Pediatrics (2022) warns that excessive screen time can disrupt children's social and emotional development. Teachers play a vital role in mitigating these risks, requiring training to balance screen time with physical activities like outdoor play. Unfortunately, training on managing technology's negative impacts remains scarce in Indonesia.

Future Training Strategies

Future PAUD teacher training must be tailored to real needs. Since teachers have varying initial competency levels, customized training is more effective. A flexible approach—combining online and offline sessions—can reach more teachers, especially in remote areas. Project-based training is a smart solution, encouraging teachers to design their own digital activities, like interactive quizzes or digital stories, fostering creativity and engagement. This approach has proven successful in several studies.

Implications for PAUD Teachers

Competency transformation has a real, positive impact on PAUD teachers. Well-trained teachers gain confidence in using technology, ultimately improving classroom quality. They become more adaptable, able to handle both in-person and online settings, and more innovative in designing learning experiences. However, neglecting training poses a significant risk—unprepared teachers will fall behind, and the children they teach will miss out on optimal learning opportunities. This threat must not be underestimated.

Recommendations

Training should be designed with sufficient duration—ideally a minimum of 6 months with ongoing sessions—far more effective than short-term programs. Teachers need time to practice what they learn. Training modules must be integrated, covering technology and pedagogy in a balanced whole, ensuring teachers are not just technology users but smart

educators. Post-training mentoring is another critical step—teachers need guidance when applying knowledge in the classroom for maximum results. Without mentoring, training efforts will be wasted.

Transforming PAUD teachers' competencies is an unavoidable necessity in the digital era. Without this change, early childhood education will lag far behind global developments. Holistic, contextual, and sustained training is the key to meeting these challenges. Teachers must be equipped not only with tools but also with a new mindset about teaching. This study provides an initial guide to realizing this—a small but significant step toward improving PAUD quality in the future. With these elements, the hope for better early childhood education is not just a dream but an achievable goal.

CONCLUSION

This literature study concludes that PAUD teachers in 2025 require technological skills (using digital tools) and pedagogical skills (digital play-based learning) to support early childhood education in the digital era. Current training remains limited to technical aspects and lacks comprehensiveness, necessitating a holistic approach that integrates both. Considering Indonesia's local context, recommendations include sustained training, integrated modules, and mentoring. This competency transformation will ensure PAUD teachers are ready to face digital challenges while preserving the joyful and meaningful essence of early childhood learning.

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