



Learning paradigms in professional training: mapping pedagogical and andragogical extensions

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ABSTRACT

Professional training is undergoing a significant transformation driven by digitalization and the demand for lifelong learning. This study presents an integrated mapping of learning paradigms by analyzing Scopus-indexed literature (2010–2025) using bibliometric techniques. The findings reveal a closely interconnected conceptual structure in which pedagogy, andragogy, workplace learning, and experiential learning form a core. Rather than remaining fragmented, these paradigms are increasingly synthesized within a unified, practice-oriented framework. Thematic analysis identified two dominant clusters: work-based lifelong learning and reflective-experiential practice. Temporal visualizations demonstrate an evolutionary shift from traditional, curriculum-based formal education to flexible, technology-based models, such as e-learning and virtual reality. Furthermore, density analysis confirms the stability of foundational theories while highlighting emerging research interest in sustainability and professional identity. The results suggest that professional learning evolves through recontextualization, integrating established theoretical foundations with digital innovations, rather than replacing them. This study offers a cohesive conceptual roadmap for designing an adaptive curriculum that can effectively bridge the gap between formal education and professional practice.

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ABSTRAK

Pelatihan profesional tengah mengalami transformasi signifikan yang didorong oleh digitalisasi dan tuntutan akan pembelajaran seumur hidup. Penelitian ini menyajikan pemetaan terintegrasi paradigma pembelajaran dengan menganalisis literatur terindeks Scopus (2010–2025) menggunakan teknik bibliometrik. Temuan penelitian mengungkapkan struktur konseptual yang saling terhubung erat, di mana pedagogi, andragogi, pembelajaran di tempat kerja (*workplace learning*), dan pembelajaran eksperiensial membentuk inti yang saling terhubung. Alih-alih tetap terfragmentasi, paradigma-paradigma tersebut semakin disintesis dalam kerangka kerja terpadu yang berorientasi pada praktik. Analisis tematik mengidentifikasi dua kluster dominan: pembelajaran seumur hidup berbasis kerja dan praktik reflektif-eksperiensial. Visualisasi temporal menunjukkan pergeseran evolusioner dari pendidikan formal tradisional berbasis kurikulum menuju model fleksibel berbasis teknologi, seperti e-learning dan realitas virtual (*virtual reality*). Lebih lanjut, analisis densitas mengonfirmasi stabilitas teori-teori dasar sekaligus menyoroti munculnya minat penelitian pada aspek keberlanjutan dan identitas profesional. Hasil penelitian menunjukkan bahwa pembelajaran profesional berkembang melalui rekontekstualisasi yang mengintegrasikan landasan teoritis yang mapan dengan inovasi digital, alih-alih menggantikannya. Studi ini menawarkan peta jalan konseptual yang kohesif untuk merancang kurikulum adaptif yang secara efektif dapat menjembatani kesenjangan antara pendidikan formal dan praktik profesional.

Kata Kunci: pembelajaran berbasis pengalaman; pembelajaran di tempat kerja; pembelajaran orang dewasa; pelatihan profesional

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INTRODUCTION

The nature of professional work has undergone a profound transformation in recent decades due to rapid digitalization, automation, and organizational restructuring, which have significantly altered skill demands and emphasized adaptability, continuous learning, and responsiveness to complex work situations. In this context, Pramudia, in his book entitled "*Pendidikan Sepanjang Hayat di Era Digital: Membangun Kompetensi dan Literasi di Tengah Transformasi Teknologi*" explains that professional competence is no longer viewed as a static outcome of formal education but as a dynamic capability developed through sustained engagement with work practices across the lifespan. Consequently, professional training has become a strategic mechanism for workforce reskilling and upskilling. However, contemporary research indicates that learning in professional contexts extends beyond formal training programs and is increasingly embedded in everyday work practices, social interactions, and problem-solving processes (Dillard et al., 2024; Perusso et al., 2022).

Informal and non-formal learning often exerts a substantial influence on competence development, highlighting the importance of workplace experiences as continuous sources of professional growth (Assakayeva et al., 2025). These shifts have intensified scholarly attention to the learning paradigms underpinning professional training. Widyasari, in her book entitled "*Dilema Guru: Antara Kompetensi dan Tuntunan Kurikulum*" explains that traditional pedagogical approaches, characterized by structured curricula and instructor-centered instruction, remain influential but are increasingly critiqued for their limited capacity to address the autonomy, contextual judgment, and problem-oriented learning required in professional contexts. In response, andragogy has been widely adopted to emphasize self-directed learning, prior experience, and real-world relevance (Pingo et al., 2024). At the same time, recent scholarship highlights that the pedagogy–andragogy distinction alone is insufficient to capture the complexity of learning in rapidly changing and knowledge-intensive environments (Hutson, 2025; Yoo & Choi, 2026).

Accordingly, post-2020 research has expanded toward experiential learning, workplace learning, and technology-enhanced learning as complementary paradigms. Experiential learning supports the integration of theory and practice through iterative cycles of experience and reflection (Zamiri & Esmaeili, 2024). Formal training can be designed to stimulate experiential and informal learning processes, thereby strengthening learning transfer (Kittel & Seufert, 2023). Workplace learning further re-conceptualizes learning as embedded in professional practice, shaped by collaboration and problem-solving in real work environments, with organizational and individual factors influencing learning processes (Kauffeld et al., 2025). Simultaneously, digital technologies are transforming professional learning by enabling flexible, personalized, and scalable environments, while also reconfiguring learning paradigms rather than merely digitizing traditional models (Manopo & Riyana, 2025; Rado et al., 2025). Bibliometric evidence in related fields likewise reveals increasing emphasis on learner-centered approaches alongside persistent conceptual fragmentation (Jauhari et al., 2025).

Despite this growing body of research, the literature remains fragmented, as studies tend to examine pedagogical, andragogical, experiential, workplace, and technology-enhanced learning paradigms in isolation. This lack of integration undermines theoretical coherence and limits curriculum studies' ability to inform the design of effective professional training in rapidly evolving work contexts. At the institutional level, training effectiveness is increasingly linked to broader educational design, learning environments, and curriculum structures rather than instructional delivery alone, with competency-oriented curriculum approaches showing promise in aligning training with workplace demands (Bhat et al., 2022; Emilzoli & Priandani, 2024). To address this gap, bibliometric analysis provides a systematic approach to mapping research trends, intellectual structures, and thematic relationships across a fragmented body of literature.

It enables the identification of dominant paradigms, emerging directions, and conceptual linkages, particularly when integrated with systematic review approaches to strengthen synthesis (Marzi et al., 2025). Therefore, this study employs a bibliometric approach to analyze research on learning paradigms in professional training, focusing on the relationships among pedagogical, andragogical, experiential, workplace-based, and technology-enhanced perspectives. This study contributes by offering an integrated mapping of learning paradigms within a single analytical framework, demonstrating how they are interconnected, evolve, and are contextually applied across professional domains. Rather than replacing traditional frameworks, the findings highlight a process of paradigmatic extension, providing an evidence-based foundation for designing adaptive, competency-oriented professional training curricula in digitally mediated, practice-intensive environments.

LITERATURE REVIEW

Pedagogy has long served as a foundational framework in professional training, particularly in formal, institutionalized contexts, drawing on instructional design traditions that emphasize structured learning, instructor control, and systematic knowledge transmission (Abuhassna et al., 2023). From a theoretical perspective, pedagogy aligns closely with behaviorist and cognitivist learning theories, which prioritize observable outcomes and the structured sequencing of instruction. This approach remains relevant in professional certification and upskilling contexts, including online and blended environments (Stavermann, 2025). However, pedagogical models have been increasingly criticized for their limited flexibility in addressing the needs of adult professionals, as their emphasis on predetermined curricula may constrain adaptive problem-solving, contextual judgment, and self-directed learning in complex work environments (Dillard et al., 2024).

In response, andragogy reconceptualizes learners as self-directed individuals who bring prior experience and intrinsic motivation into the learning process (Amiruddinami & Baharuddin, 2023; Amiruddin et al., 2022; Hasanbasri et al., 2023). Widely recognized in adult education literature, andragogy emphasizes autonomy, readiness to learn, and the immediate relevance of knowledge. These principles enhance motivation, facilitate the transfer of learning to professional contexts, and support professionals in adapting to evolving work demands through self-directed learning (Greere, 2023). Recent developments further indicate that digital and AI-powered environments can reinforce andragogical principles by enabling personalized, adaptive, and learner-controlled learning experiences (Purwoko et al., 2025). Extending beyond pedagogical and andragogical perspectives, experiential learning conceptualizes learning as an iterative process grounded in experience, reflection, and application. This perspective aligns with constructivist learning theory, which emphasizes knowledge construction through active engagement with real-world contexts (Gannar et al., 2025).

It is particularly relevant in professional development, where authentic tasks mirror workplace challenges. Empirical evidence demonstrates that experiential strategies, such as simulations and case-based problem solving, support the integration of theory and practice while fostering adaptive and transferable competencies (Sisternans, 2020). Building on experiential foundations, workplace learning theory conceptualizes the workplace as a primary site of learning, where knowledge is constructed through participation in practice. This perspective aligns closely with socio-cultural learning theory, which views learning as embedded in social interaction and contextual activity, as well as with the concept of communities of practice, where learning occurs through participation in shared professional activities (Lindley et al., 2023). Learning is therefore continuous, situated, and context-dependent rather than confined to formal training settings. Evidence from work-integrated learning (WIL) demonstrates that such approaches effectively connect educational programs with industry practices and support the development of professional competencies.

Furthermore, validated instruments such as the Workplace Learning Inventory show that workplace learning outcomes can be systematically measured and linked to performance improvement (Grantham et al., 2024). The proliferation of digital technologies has further reshaped professional learning through technology-enhanced learning (TEL), which constructivist and networked learning perspectives inform. In particular, connectivism explains how learning occurs across digital networks and emphasizes the role of technology in shaping knowledge distribution and interaction (Alam, 2023). TEL enables flexible, interactive, and personalized learning experiences through online platforms, collaborative tools, and blended models. Research by Afriani in “*Inovasi Pembelajaran dan Pendidikan*” indicates that digital technologies support active learning, peer collaboration, and adaptive pacing, making them particularly effective for continuous professional development. Moreover, the integration of TEL with experiential and workplace learning reflects the emergence of interconnected learning ecosystems, where formal instruction, real-world practice, and digital mediation converge to support competence development in contemporary professional contexts.

METHODS

This study employed a bibliometric research design using a quantitative descriptive approach to systematically map the development of research on learning paradigms in professional training. Bibliometric analysis was selected because it enables the structured examination of publication patterns, intellectual structures, and thematic relationships across large bodies of scientific literature. In line with established bibliometric frameworks, this study integrates performance analysis and science mapping techniques to identify research trends, influential contributors, and conceptual structures within the field (Marzi et al., 2025). The bibliographic data analyzed in this study were retrieved exclusively from the Scopus database, which was selected due to its extensive multidisciplinary coverage, rigorous indexing standards, and provision of standardized metadata suitable for bibliometric analysis. Scopus is widely recognized as a reliable source for analyzing citation patterns, international research trends, and intellectual linkages in educational research.

The dataset consisted of bibliographic metadata, including author names, publication year, document type, source title, affiliations, country of origin, citation counts, and author keywords. Data collection followed a structured multi-stage procedure. First, a predefined search string was developed to capture two interconnected conceptual domains: learning paradigms and professional training contexts. The search was applied to the title, abstract, and author keyword fields to ensure both relevance and precision. Keywords representing learning paradigms included “*pedagogy*”, “*andragogy*”, “*experiential learning*”, “*workplace learning*”, “*adult learning*”, “*learner-centered learning*”, and “*heutagogy*”, while keywords representing professional contexts included “*professional training*”, “*vocational training*”, “*workplace training*”, “*workforce development*”, and “*professional learning*”. The inclusion of experiential and workplace learning terms was informed by contemporary literature that emphasizes the role of practice-based and experience-driven learning in professional competence development.

The search was limited to peer-reviewed journal articles and review papers published between 2010 and 2025 to capture recent developments in the field. The initial search yielded 640 documents, which were then screened using predefined inclusion and exclusion criteria to ensure data relevance and quality. Inclusion criteria required that publications explicitly address learning paradigms within professional or vocational contexts. Exclusion criteria removed studies focusing solely on primary or secondary education, as well as publications that addressed technical or managerial training outcomes without conceptual engagement with learning paradigms. Non-peer-reviewed documents, including book chapters, reports, and conference papers, were also excluded to maintain methodological rigor and consistency with bibliometric standards. After screening, the final dataset was retained for analysis.

Following data selection, bibliographic metadata were exported from Scopus in CSV format and processed for analysis. The analytical procedure consisted of several sequential stages. First, a descriptive (performance) analysis was conducted to examine annual publication trends, citation growth, and document type distribution, providing an overview of the field's development and consolidation. Second, source and authorship analyses were performed to identify the most productive journals, influential authors, and patterns of scholarly contribution based on publication output and citation metrics. Third, country-level analysis was undertaken to examine the geographical distribution of research and patterns of international collaboration, which are commonly used indicators in bibliometric studies of educational research. Similar analytical procedures have been employed in recent bibliometric studies on technology-enhanced learning and curriculum development, demonstrating the suitability of this approach for examining conceptual structures in learning-related research.

To further explore the field's intellectual structure, science-mapping techniques were applied using keyword co-occurrence analysis. This analysis aimed to identify major thematic clusters and relationships among key learning paradigms. Keyword co-occurrence analysis was conducted using VOSviewer, a specialized software tool for visualizing bibliometric networks and detecting thematic structures based on co-occurrence patterns. Author keywords were used as the primary unit of analysis, as they directly reflect researchers' conceptual emphases and thematic orientations (Christou, 2022). The analysis generated network, overlay, and density visualizations to examine both the structural relationships among themes and their temporal evolution. Microsoft Excel was used as a supplementary tool for data cleaning, organization, and descriptive statistical analysis. The integration of performance analysis and science mapping enabled a comprehensive examination of publication trends, intellectual structures, and thematic developments in research on learning paradigms in professional training. Through this systematic process, the study provides an evidence-based mapping of the field's evolution and emerging research directions.

RESULTS AND DISCUSSION

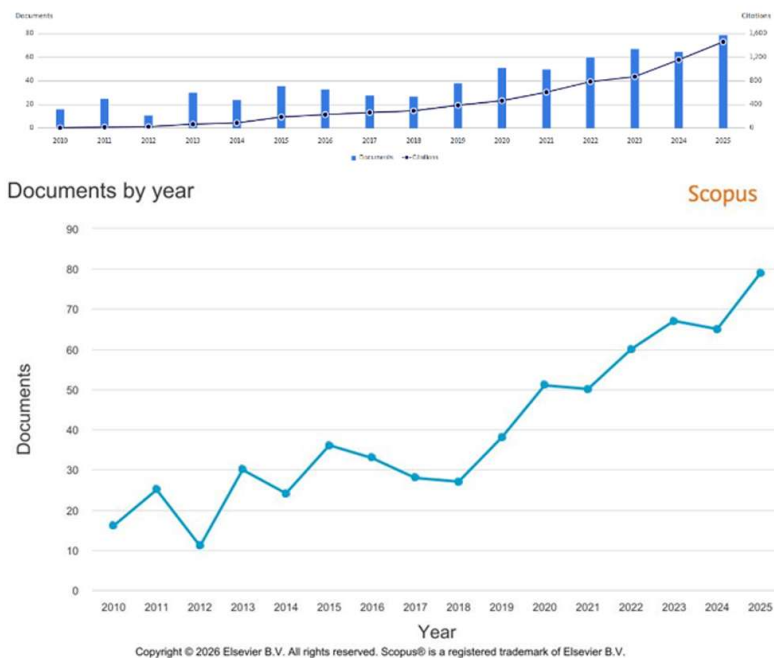


Figure 1. Longitudinal trends in publication output and citation impact on learning paradigms in professional training (2010–2025)
Sources: Research 2026

Figure 1 illustrates the longitudinal development of publication output and citation impact in research on learning paradigms in professional training from 2010 to 2025. The results show a gradual increase in publications, with a more pronounced acceleration after 2019. In contrast, citation counts exhibit a steeper and more consistent upward trajectory, particularly in recent years. This divergence between publication growth and citation accumulation is analytically significant. While research output expands incrementally, the sharper rise in citations suggests that recent studies are gaining stronger scholarly influence and are increasingly integrated into subsequent research. Such patterns are commonly associated with the consolidation of a research field, where knowledge production becomes more cumulative and interconnected (Vakkari et al., 2022). This pattern may further indicate a process of epistemic maturation, in which the field transitions from fragmented knowledge production to more theory-driven, conceptually coherent scholarship.

The disproportionate increase in citations suggests that recent studies are not only numerous but also more influential in shaping subsequent research. From a conceptual perspective, this trend reflects a shift in how professional learning is understood. Rather than being confined to formal instructional settings, recent research increasingly emphasizes integrating formal training, workplace learning, and experiential processes (Brandi, 2024). The accelerated citation growth after 2019 may also be linked to global developments such as digital transformation and the growing importance of lifelong learning, which have intensified scholarly attention to professional training. Similar dynamics have been identified in studies highlighting the increasing relevance of practice-based and technology-enhanced learning approaches (Kittel & Seufert, 2023). In addition, the post-2019 acceleration may reflect a shift toward more problem-driven research, in which scholarly work increasingly responds to real-world disruptions such as digitalization and changing workforce demands. This suggests that the field is not only expanding but also becoming more socially and professionally responsive.

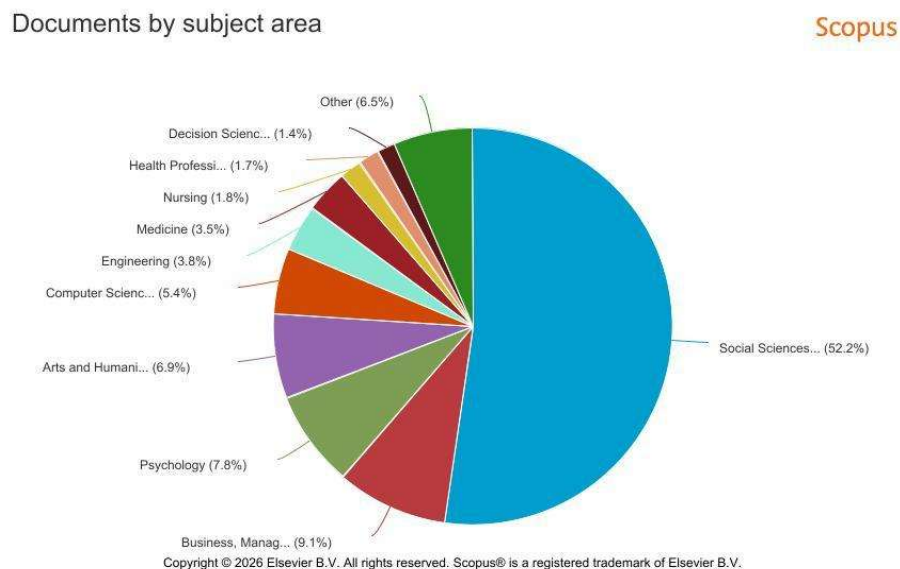


Figure 2. Disciplinary distribution of research on learning paradigms in professional training across subject areas
Sources: Research 2026

Figure 2 presents the disciplinary distribution of research on learning paradigms in professional training. The results indicate that social sciences account for the largest share of publications, followed by business and management, psychology, and arts and humanities, with additional contributions from applied fields such as computer science, engineering, and health-related disciplines. This distribution highlights the

shared research agenda, in which scholars increasingly operate within a common conceptual space rather than within isolated disciplinary ones. Several central nodes, including pedagogy, workplace learning, experiential learning, and professional training, occupy prominent positions within the network, reflecting their foundational role in structuring the field. The clustering of these keywords suggests the presence of multiple but interrelated thematic orientations.

One dominant cluster is centered on workplace learning, closely linked to concepts such as lifelong learning, professional competence, and continuing professional development. This configuration highlights the growing emphasis on learning as an ongoing, practice-based process embedded in professional contexts. A second major cluster revolves around experiential learning, connecting concepts such as reflection, simulation, and active learning, thereby emphasizing the role of experience in bridging theory and practice. Importantly, pedagogy and andragogy appear within overlapping areas of the network rather than forming distinct or opposing clusters. This co-occurrence indicates that contemporary research does not treat these paradigms as mutually exclusive but instead integrates them flexibly depending on learning context and professional needs. This finding aligns with previous research suggesting that hybrid and context-sensitive learning approaches are increasingly necessary in professional training environments (Kittel & Seufert, 2023).

At the same time, this overlap may indicate a blurring of theoretical boundaries, where distinctions between learning paradigms become less significant in practice. While this integration enhances flexibility, it also underscores the need for clearer theoretical articulation of when and how different paradigms are most effectively applied. Overall, the network structure demonstrates that research on learning paradigms in professional training is conceptually integrated and grounded in practice-oriented approaches. The strong interconnections among key themes suggest the emergence of a coherent knowledge structure in which multiple paradigms interact to support the development of professional competence (Brandi, 2024). This also suggests that future studies should move beyond identifying relationships between concepts to explain the mechanisms by which these paradigms interact in real professional learning environments.

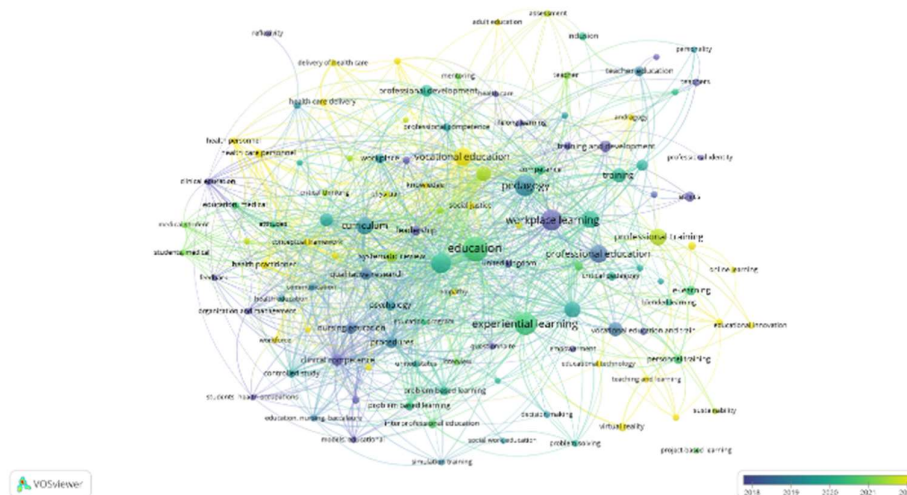


Figure 4. Overlay visualization of author keywords showing the temporal evolution of research on learning paradigms in professional training
Sources: Research 2026

Figure 4 presents an overlay visualization of author keywords, with colors indicating the average publication year for each concept. The results reveal a clear temporal differentiation between earlier and more recent research themes, indicating an evolutionary shift in learning paradigms within professional

themes reflects a high level of theoretical consolidation, where research consistently focuses on learning processes grounded in practice, experience, and social interaction. This finding reinforces the co-occurrence network's results, which demonstrated strong interconnections among these paradigms. It also aligns with previous research emphasizing the central role of integrative and practice-based learning approaches in professional competence development (Brandi, 2024).

This concentration of themes suggests a stable conceptual core that provides continuity and coherence within the field. At the same time, less dense regions of the map reveal emerging themes such as virtual reality, sustainability, project-based learning, and professional identity. Although these topics currently occupy peripheral positions, their presence indicates growing research interest and responsiveness to evolving professional and technological contexts. In particular, the emergence of digitally mediated learning environments reflects broader transformations associated with digitalization and innovation in professional training (Kittel & Seufert, 2023). These peripheral yet emerging themes may represent areas of high research potential, offering opportunities for future studies to expand the field's conceptual boundaries and explore new interdisciplinary connections.

The coexistence of highly dense core areas and less dense emerging themes suggests that both stability and innovation characterize the field. Established learning paradigms continue to provide a conceptual foundation, while newer themes signal potential directions for future research. This balance indicates that professional training research is developing as a dynamic and adaptive knowledge domain, capable of responding to changing demands in work and learning environments. Such a dual structure combining a stable core with innovative peripheries is characteristic of evolving scientific fields and reflects the field's capacity to sustain continuity while accommodating transformation.

CONCLUSION

This study successfully addresses the issue of theoretical fragmentation in professional training by providing an integrated mapping of learning paradigms. Based on a bibliometric analysis of literature from 2010 to 2025, the findings demonstrate that isolated approaches to pedagogy, andragogy, and experiential learning are no longer sufficient in a modern context. As a solution, this research proposes a synthesized framework that bridges formal instruction with workplace-based learning, offering a theoretical coherence that unites diverse paradigms into a singular, practice-oriented model. In alignment with the research objectives, the mapping identifies two primary thematic orientations that constitute a roadmap for professional development: workplace-based lifelong learning and experiential-reflective practice. The analysis further reveals an evolutionary shift from traditional, curriculum-driven formal education toward more flexible, technology-mediated models, including e-learning and virtual reality. These results confirm that the field evolves through re-contextualization, integrating established theoretical foundations with digital innovations rather than substituting them. The practical implications of this study provide strategic guidance for instructional designers to transition from rigid, conventional training models to more holistic and adaptive approaches. This integration ensures that professional training curricula remain academically robust while remaining responsive to industrial demands, sustainability, and the development of professional identity in the digital age. Ultimately, this research achieves its goal of synthesizing fragmented paradigms into a structured conceptual model, contributing significantly to the contemporary literature on professional education.

AUTHOR'S NOTE

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