Enhancing Teacher Professional Development through Post-Service and In-Service Training: A Survey

Abstract

This survey paper examines the multifaceted landscape of teacher professional development, emphasizing the critical roles of post-service and in-service training in enhancing educational quality and aligning with compulsory education standards. The analysis underscores the need for innovative, personalized professional development (PD) strategies that cater to the diverse needs of educators, particularly in adapting to evolving educational demands and integrating technology into teaching practices. Key findings highlight the importance of bridging the gap between pre-service and post-service training to improve teacher literacy and efficacy. The paper identifies significant research gaps, including the need for explicit facilitation of 21st-century skills and the professional development of educators teaching outside their content areas. The exploration of various models and approaches to post-service training, such as the integration of technology and collaborative learning environments, reveals both challenges and opportunities for enhancing teacher proficiency. In-service training methods, including the use of ICT and teacher-led initiatives, are analyzed for their potential to foster continuous professional growth. Quality assessment mechanisms are discussed as crucial tools for evaluating training program effectiveness and ensuring alignment with educational standards. The integration of traditional sports into physical education curricula is examined as a strategy to enrich educational experiences and promote cultural appreciation. The paper concludes by addressing challenges in teacher training, such as resource limitations and the ethical use of AI, while proposing future directions for research and practice to support the dynamic needs of educators and improve educational outcomes.

1 Introduction

1.1 Overview of Teacher Professional Development

Teacher professional development (PD) is essential for enhancing educational standards and improving teaching effectiveness across various contexts. It equips educators with the skills required to adapt to the evolving demands of modern classrooms, ensuring alignment with compulsory education standards. The shift from traditional classroom settings to online platforms, particularly during the COVID-19 pandemic, has underscored the necessity for flexible and adaptive PD strategies [1].

The significance of PD is highlighted by its ability to cultivate 21st-century skills among preservice teachers, an area that remains under-researched despite its importance in preparing educators for contemporary challenges [2]. Personalized PD approaches, which move beyond generic workshops, are crucial for addressing individual teachers' unique needs and fostering sustained professional growth [3].

Additionally, PD is vital for enhancing interaction skills among preservice teachers, especially in early childhood education and care (ECEC), where effective training approaches are often lacking compared to in-service training [4]. The professional development needs of English as a foreign
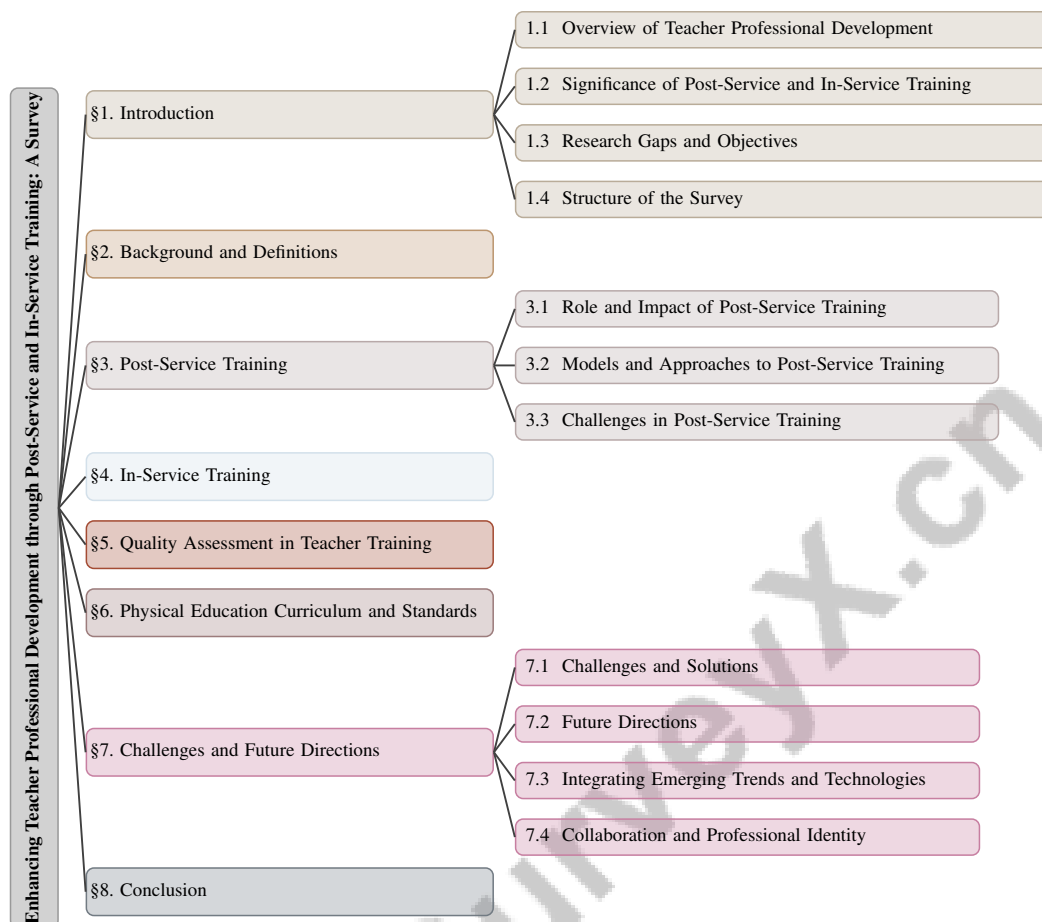
Figure 1: chapter structure

language (EFL) teachers in non-formal education settings further exemplify the necessity for tailored PD programs that cater to specific educational contexts [5].

Insights into teacher candidates' perceptions of training programs reveal gaps between pre-service and post-service stages, indicating areas for improvement in teacher professional literacy. Moreover, the incorporation of artificial intelligence (AI) in educational measurement and assessment offers new opportunities to enhance teaching and learning experiences, thereby enriching PD frameworks [6].

Programs like 'Streamline to Mastery' emphasize empowering teachers to design their own professional development opportunities, facilitating transformative changes in their roles and identities [7]. Thus, teacher professional development constitutes a dynamic and continuous process crucial for maintaining educational quality and aligning teaching practices with national and regional standards.

1.2 Significance of Post-Service and In-Service Training

Post-service and in-service training are vital components of teacher professional development, addressing the evolving demands of educational environments and enhancing teaching practices. Post-service training is essential for improving teacher performance and educational outcomes by providing opportunities for skill refinement and adaptation to new standards. This is particularly evident in creative drama-based active learning service training programs, which significantly impact teacher development [8]. In-service training serves as an ongoing development tool crucial for fostering teaching efficacy and organizational commitment, as demonstrated in studies involving special education teachers in Sichuan Province [9].

In rural areas, such as those in China, the challenges faced by physical education teachers highlight the need for targeted post-service and in-service programs that cater to local conditions and professional

development needs [10]. Similarly, the inadequate proficiency of chemistry teachers, particularly those with less than ten years of experience, underscores the necessity for effective collaboration and professional development initiatives [11]. In-service training programs must be designed to provide personalized feedback, enabling teachers to adapt their practices and engage students meaningfully [3].

The integration of STEM education into curricula presents unique challenges, especially for dual language learners, necessitating PD that equips educators with the skills to effectively incorporate these disciplines [12]. Evaluating teacher candidates' perspectives before and after training offers valuable insights into program effectiveness and areas for improvement [13]. Furthermore, the need to enhance in-service training programs for nurses reflects the broader applicability of these initiatives across various professional fields [14].

Teacher views on in-service training reveal its contribution to vocational development and address knowledge gaps regarding current training effectiveness [15]. The ongoing challenge of limited research and methodologies for enhancing interaction skills in pre-service training, which differ from those applicable to in-service training, emphasizes the importance of tailored PD approaches [4]. Both post-service and in-service training are essential for equipping educators to meet contemporary educational demands and contribute to global educational standards.

1.3 Research Gaps and Objectives

Despite extensive research on teacher professional development, critical gaps remain that warrant further investigation. A significant gap exists in the explicit facilitation of 21st-century skills in preservice teachers, hindered by curriculum constraints that limit opportunities for creativity and critical thinking [2]. The disconnect between pre-service education and post-service training adversely affects teachers' professional literacy and development, necessitating a more cohesive approach [16]. Additionally, there is insufficient focus on the professional development of teachers who instruct outside their content area, such as physics, highlighting the need for empowerment in their professional practices [7].

The literature often overlooks the professional development needs of teacher educators transitioning from diverse educational backgrounds, leaving a gap in understanding how to support these individuals effectively [17]. Furthermore, questions remain regarding the scalability of successful models, such as Japan's, in different cultural contexts, particularly concerning technology integration in education [18]. The incorporation of AI tools into existing educational practices presents additional challenges, including ethical concerns related to data privacy [6].

Moreover, a lack of consensus exists on the most effective training methods and their long-term impacts on teacher performance and student learning outcomes [19]. Disparities in professional development opportunities between rural and non-rural schools further underscore the need for targeted interventions to address these inequities [20]. The professional development of teachers in non-formal education settings is another area requiring attention, complicated by the diverse backgrounds of students [5].

This survey paper aims to address these identified gaps by providing a comprehensive analysis of the current state of post-service and in-service training in teacher professional development. The objective is to propose evidence-based strategies for enhancing training programs, with a focus on reducing disparities in professional development opportunities and incorporating objective assessments to minimize biases in human judgment [21]. Through this survey, we seek to contribute to the ongoing discourse on teacher professional development by offering insights that can inform policy and practice, ultimately leading to improved educational outcomes.

1.4 Structure of the Survey

This survey is structured to provide a thorough exploration of teacher professional development, particularly focusing on post-service and in-service training. It begins with an introductory section that establishes the significance of teacher professional development in contemporary educational contexts. Following this, an overview of key concepts elucidates definitions and interrelationships among post-service training, in-service training, quality assessment, physical education curriculum, and compulsory education standards.

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The third section examines post-service training, its role, impact, and various models and approaches employed in its implementation. Challenges associated with post-service training are discussed alongside potential solutions to enhance its effectiveness. The subsequent section on in-service training analyzes its significance, exploring different methods and strategies, the integration of technology, and the role of teacher-led initiatives in promoting professional growth.

Quality assessment in teacher training is addressed in the fifth section, highlighting mechanisms and criteria used to evaluate the effectiveness of training programs and their alignment with educational standards. The sixth section focuses on the physical education curriculum within compulsory education, discussing how teacher training programs support the delivery of a comprehensive curriculum and the integration of traditional sports.

The penultimate section identifies key challenges in implementing effective teacher training programs and explores future directions for research and practice, including the integration of emerging trends and technologies, the importance of collaboration, and the development of professional identity among teachers. The survey concludes with a synthesis of the main findings and reflections on the importance of continuous professional development for educators.The following sections are organized as shown in Figure 1.

2 Background and Definitions

2.1 Key Concepts in Teacher Professional Development

Teacher professional development (PD) is pivotal for improving educational quality and teaching efficacy, encompassing both pre-service and post-service training. Pre-service training establishes foundational skills like creativity, critical thinking, communication, collaboration, and information, media, and technology skills (IMTS) [2]. Post-service training, on the other hand, focuses on continuous education post-certification, facilitating skill enhancement and adaptation to evolving educational standards [22].

The PD landscape integrates teaching development, scientific advancement, personal growth, and organizational development [19]. This comprehensive approach ensures educators are proficient in their subject areas and capable of navigating the broader educational environment. Seamlessly integrating pre-service with post-service training is crucial for maintaining continuity in professional ideals, knowledge, skills, and ethics, thus boosting educational effectiveness [16].

A notable challenge in PD is bridging the gap between theoretical education and practical classroom application, particularly in developing regions where outdated methods prevail [23]. This gap underscores the need to align teacher education with practical experiences. The integration of AI tools in educational assessments presents new opportunities and challenges for enhancing teaching effectiveness and student outcomes [6].

Quality education is influenced by factors such as learners, learning environments, content, processes, and outcomes [24]. Tailoring teacher training programs to address these elements can meet educators' specific needs within their contexts. The professional development of teachers within a community of practice, especially in fields like physics education, highlights the value of collaborative learning and shared experiences [7].

Structuring PD into qualification standards, pre-service training, in-service professional development, and career advancement provides a framework for teacher education progression [18]. Post-service education can be organized around awareness, content relevance, training methods, and evaluation systems to ensure program effectiveness [10].

The integration of key PD concepts—including professional ideals, knowledge, skills, and ethics—enhances teaching quality and addresses gaps between pre-service and in-service training. Teachers often express dissatisfaction with pre-service training, highlighting the need for continuous PD that effectively bridges both stages. By cultivating professional ideals, acquiring theoretical knowledge, refining practical skills, and implementing ethical principles, educators can strengthen their professional identity and fulfill their roles in diverse educational contexts [25, 16]. Comprehensive attention to these concepts will enable PD initiatives to support educators in their ongoing growth and improvement.

In exploring the complexities of post-service training, it is essential to understand its hierarchical structure and the multifaceted roles it plays in enhancing teacher competencies. As illustrated in Figure 2, this figure delineates the various models and approaches to post-service training, while also addressing the significant challenges encountered during implementation. Notably, it highlights the advancements in teacher competencies and innovative training models, alongside the integration of technology. Furthermore, the figure underscores critical issues related to resource limitations and technological challenges that can hinder effective training. By incorporating this visual representation, we can better appreciate the intricate dynamics at play in post-service training and its overall impact on educational outcomes.
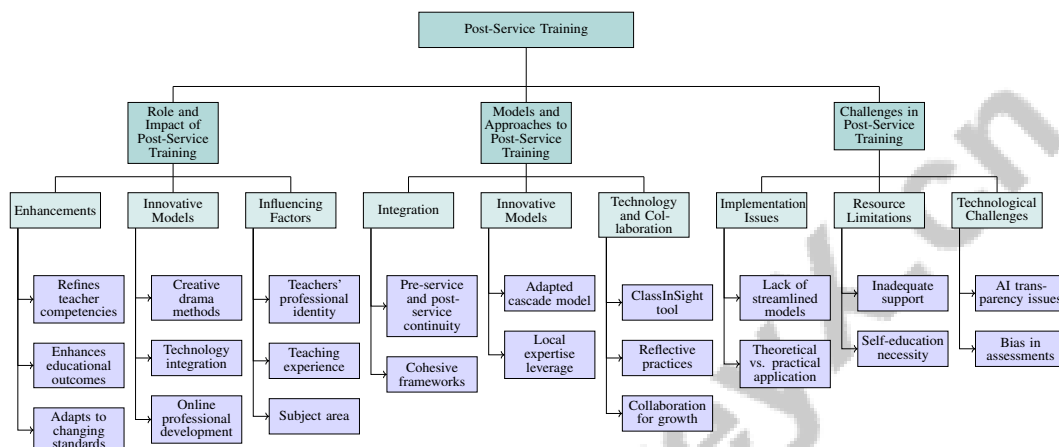

Figure 2: This figure illustrates the hierarchical structure of post-service training, detailing its role and impact, various models and approaches, and the challenges faced in implementation. It highlights enhancements in teacher competencies, innovative training models, and the integration of technology while addressing implementation issues, resource limitations, and technological challenges.

3 Post-Service Training

3.1 Role and Impact of Post-Service Training

Post-service training is pivotal in refining teacher competencies and enhancing educational outcomes, forming a foundation for ongoing professional development. This training enables educators to adjust to changing educational standards and methodologies, thereby improving teaching quality and student success. Collaborative approaches in post-service training effectively bolster teacher proficiency [11]. Innovative models, such as creative drama methods, significantly enhance teachers' comprehension of active learning techniques, positively affecting their instructional practices [8].

The incorporation of technology into post-service training amplifies its effectiveness by increasing accessibility. Online professional development programs have shown efficacy comparable to traditional formats, offering flexibility while maintaining quality [1]. This integration allows educators to engage with materials at their own pace, facilitating personalized learning experiences. Tools like ClassInSight exemplify how visualizing classroom discussion data supports teachers in structuring reflections, thereby enhancing teaching practices [3].

Teachers' perceptions of their professional identity significantly influence the effectiveness of post-service training. Factors such as teaching experience and subject area shape educators' engagement with programs and their professional roles [25]. Addressing these perceptions and fostering an inclusive training environment can mitigate power dynamics between novice and veteran teachers, enhancing participation and learning [26]. Despite challenges like limited resources and resistance to change, post-service training remains crucial for improving teacher skills and educational outcomes.

The professionalization and certification processes embedded in these training programs lead to notable improvements in service quality and better educational outcomes for students [18]. However, the perceived ineffectiveness of certain in-service training programs in fostering vocational develop-

ment underscores the necessity for ongoing evaluation and enhancement of training methodologies [15].

As illustrated in Figure 3, the hierarchical structure of post-service training highlights key methods, challenges, and outcomes. It categorizes training methods such as collaborative approaches, creative drama, and technology integration, while also addressing challenges and solutions like teacher identity, socio-emotional risks, and resource limitations. The outcomes and improvements focus on professionalization, teaching strategies, and feedback systems. By adopting innovative, inclusive training models and leveraging technology, post-service training can effectively support educators' professional growth and contribute to the overall quality of education. Enhanced teaching strategies, improved assessment accuracy, and personalized feedback for students are key strengths of current research in this area, further emphasizing the importance of post-service training [6].
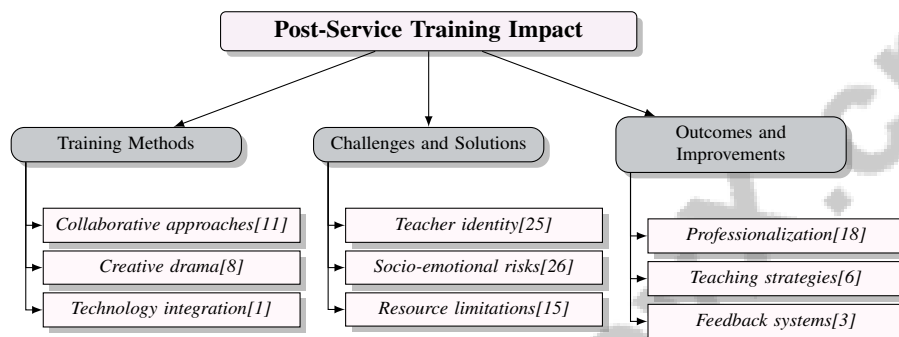
Figure 3: This figure illustrates the hierarchical structure of post-service training, highlighting key methods, challenges, and outcomes. It categorizes training methods such as collaborative approaches, creative drama, and technology integration. The challenges and solutions include teacher identity, socio-emotional risks, and resource limitations. The outcomes and improvements focus on professionalization, teaching strategies, and feedback systems.

3.2 Models and Approaches to Post-Service Training

Post-service training encompasses various models and approaches designed to meet educators' specific needs and enhance their professional development. A significant innovation is adapting evidence-based in-service training programs for pre-service education, particularly for early childhood education and care professionals, ensuring training relevance and impact [4].

Integrating pre-service education with post-service training is vital for maintaining continuity in professional development. A cohesive framework bridging these stages emphasizes the alignment of educational ideals, knowledge, skills, and ethics, enhancing the efficacy of teacher training [16]. This integration ensures teachers are well-prepared to meet modern educational demands.

Innovative models like the adapted cascade model leverage local expertise by employing teacher-trainers who are active educators within their communities. These trainers receive specialized instruction from field experts, equipping them with skills to design and implement professional development programs tailored to local contexts. This approach addresses gaps in both pre-service and in-service training while promoting continuous professional growth among educators, ensuring training relevance to practical challenges [27, 28, 16]. Such models enhance sustainability and relevance by fostering a community of practice and supporting knowledge transfer among educators.

Technology plays a critical role in augmenting post-service training. Tools like ClassInSight provide teachers with insights into classroom interactions by visualizing discussion metrics such as Talk Ratio and Turn-Taking. This technology facilitates reflective practices by offering data-driven insights, enabling educators to develop effective teaching strategies. Consequently, it fosters personalized professional development, enhances educators' confidence in digital tools, and improves educational outcomes for students [29, 23, 3, 16].

Collaboration is pivotal in enhancing the effectiveness of post-service training models, facilitating the integration of pre-service education and ongoing professional development. This integration is essential for addressing gaps in teachers' competencies and promoting continuous growth, ultimately

resulting in improved educational outcomes [27, 2, 28, 16]. Collaborative environments foster knowledge sharing and peer learning, particularly benefiting less experienced teachers. Such approaches enhance teaching efficacy and promote professional growth by allowing educators to learn from each other and apply new techniques in supportive settings.

Despite the effectiveness of large models in quality assessment and their alignment with cognitive processes, significant challenges persist, including the need to ensure scalability and effectively address resource limitations, which are critical for educators' professional development and systemic educational reforms [30, 2, 17]. Optimizing educational resources and improving labeling efficiency are vital for enhancing the quality and impact of post-service training. By adopting diverse and innovative training models, post-service training can effectively assist teachers in navigating the complexities of contemporary educational landscapes.

3.3 Challenges in Post-Service Training

The implementation of post-service training programs faces several challenges that can limit their effectiveness and accessibility. A primary issue is the absence of a streamlined model that effectively addresses both educational needs and organizational challenges, resulting in ineffective in-service training programs [14]. Additionally, the theoretical nature of many training programs, coupled with a lack of practical application, often leads to the perception of these programs as formalities rather than valuable professional development opportunities [15].

Inadequate support from faculty and administrators exacerbates these challenges, as insufficient practical training and excessive paperwork can burden educators [13]. This issue is particularly evident for teachers required to teach outside their area of expertise, where a lack of structured support can contribute to their de-professionalization [7].

Resource limitations present another significant barrier, with many educators resorting to self-education due to inadequate institutional support. This lack of resources, combined with insufficient management and planning, undermines the potential impact of post-service training programs [31]. Furthermore, the absence of systemic routes for ongoing learning and the lack of comprehensive research documentation regarding the professional development of teacher educators hinder the establishment of effective training frameworks [17].

The integration of technology, such as AI tools, into training programs introduces additional challenges, including transparency issues in AI algorithms and potential biases in assessments. These concerns necessitate human oversight to ensure fair and valid evaluations in educational settings [6].

To address these challenges, it is essential to develop training programs responsive to educators' real needs, emphasizing practical application and relevance. Enhancing resource allocation, improving management and planning, and fostering a supportive institutional environment can significantly improve the efficacy of post-service training. Establishing structured pathways for ongoing professional development that integrate both pre-service education and in-service training is essential for enhancing training systems. Additionally, conducting comprehensive research to document effective practices will provide valuable insights into the strengths and weaknesses of existing training programs, ultimately fostering a more robust framework for teacher professional literacy encompassing ideals, knowledge, skills, and ethics [27, 16].

4 In-Service Training

In-service training is a cornerstone of educators' professional development, aimed at enhancing teaching skills and pedagogical practices post-qualification. This training facilitates the acquisition of competencies such as addressing learning difficulties and the effective use of teaching aids, while deepening curriculum implementation understanding, particularly in the Tanzanian competency-based English curriculum. Table 1 presents a comparative overview of different in-service training methods and strategies, detailing their respective target audiences, training focuses, and the challenges faced in their implementation. The success of in-service training hinges on meticulous planning, alignment with teachers' needs, and stakeholder engagement, ultimately enhancing education quality by enabling teachers to adapt to changing socio-economic and cultural landscapes [27, 28]. Exploring diverse methods and strategies within in-service training demonstrates how tailored approaches fulfill educators' varied needs, fostering growth and effectiveness in the classroom.

4.1 Methods and Strategies

In-service training employs diverse methods and strategies crucial for enhancing teaching practices and educational outcomes. Its effectiveness is closely tied to careful planning and implementation, with tailored programs in rural settings successfully addressing specific educator needs and fostering pedagogical skills and student engagement [15, 27].

Training methods vary by target audience, including adaptation training, on-the-job training, and further training. Adaptation training equips teachers for new educational environments, while on-the-job training emphasizes practical experience. Further training deepens subject area knowledge, bridging gaps between pre-service education and ongoing professional development, fostering literacy across pedagogical skills, theoretical understanding, ethical principles, and personal growth [27, 28, 25, 16, 32]. These varied approaches support educators at different career stages.

Personal experiences and professional development opportunities shape teachers' educational theories. Effective in-service training incorporates comfort-building strategies to mitigate socio-emotional risks, enhancing collaborative learning and fostering supportive environments. The relationship between professional development and teacher effectiveness underscores the need for diverse, tailored experiences that address gaps between pre-service and in-service training, fostering continuous growth and adaptability. By integrating professional literacy dimensions—ideals, knowledge, skills, and ethics—educators enhance competencies and navigate evolving demands, ultimately improving educational outcomes [7, 25, 16, 20, 17].

Innovative models like the adapted cascade model utilize local teachers as trainers, providing ongoing expert support and fostering community practice for effective scaling of digital education professional development. These models enhance sustainability and relevance by incorporating workshops, reflective coaching, and professional learning communities, empowering educators to implement curricula effectively. They also promote continuous professional development, addressing gaps between pre-service education and in-service training, while cultivating competencies in pedagogical knowledge, practical skills, and ethical standards. By fostering collaboration and reflection, these models enable teachers to refine instructional practices, improving student outcomes and aligning educational practices with contemporary workforce needs [23, 27, 12, 16].

School administrators play a pivotal role in identifying values to impart through in-service training, categorized into personal, professional, universal, and cultural themes. Integrating these values enhances teachers' effectiveness, equipping them with skills to foster positive student development and meet diverse classroom needs. Research shows that prioritizing values like communication, empathy, and innovation improves teachers' competencies and enriches students' educational experiences, leading to more impactful teaching practices [33, 27, 28, 15, 16].

Research underscores the benefits of in-service training in enhancing instructional competencies and fostering positive teacher-student relationships, contributing to improved academic outcomes. Well-planned in-service training aligns with national educational priorities and actively involves teachers, addressing their development needs. However, challenges remain, such as the need for better alignment between training objectives and actual teacher requirements and increased school leadership involvement in planning. Continuous professional development is essential for teachers to adapt to diverse classroom environments and effectively support student learning [27, 31, 28, 15, 16]. By employing diverse methods and strategies, in-service training programs can address educators' multifaceted needs, supporting their continuous professional growth and enhancing overall education quality.

4.2 Technological Integration in Teacher Training

Integrating technology into in-service training programs modernizes teacher professional development, enhancing teaching methodologies and aligning training with educators' evolving needs. The use of Information and Communication Technology (ICT) in training enriches pedagogical practices and improves content delivery [28]. ICT tools provide innovative ways for educators to engage with training materials, fostering a more interactive learning environment. As illustrated in Figure 4, this figure highlights the integration of technology in teacher training, showcasing key aspects such as the use of ICT tools for enhancing pedagogy and fostering interactive learning.

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However, challenges persist in the widespread adoption of technology in teacher training. Limited access to resources and inadequate training impede effective technology utilization in educational settings [29]. Additionally, intrinsic barriers such as teachers' confidence and attitudes toward technology must be addressed for successful integration. Overcoming these challenges requires a comprehensive framework emphasizing research-based planning aligned with teachers' daily work and school realities [34]. The figure also emphasizes these challenges in technology adoption, particularly due to resource limitations and teacher confidence.

Current research categorizes the role of Generative AI (GenAI) in supporting content delivery, enhancing pedagogical practices, and facilitating performance-based assessments, highlighting the interconnectedness of these stages [23]. By leveraging GenAI, educators can access personalized training experiences that cater to specific needs and contexts, enhancing the overall effectiveness of in-service training programs. The transformative role of GenAI in content delivery and pedagogical support is also depicted in the figure, underscoring its significance in modern educational contexts.

Involving stakeholders in planning in-service training is essential to address teachers' specific needs, ensuring programs are tailored to the unique requirements and contextual factors influencing their work [27]. By aligning training with teachers' needs, technology can be effectively integrated into professional development initiatives, leading to meaningful and engaging training sessions [32].

The effectiveness of in-service training programs varies, with school administrators expressing differing satisfaction levels based on the training received [35]. This variation underscores the importance of continuously evaluating and refining training programs to better meet educators' needs and enhance their professional growth. By embracing technological integration and innovative practices, in-service training can be modernized to support teachers in navigating the complexities of contemporary educational landscapes.
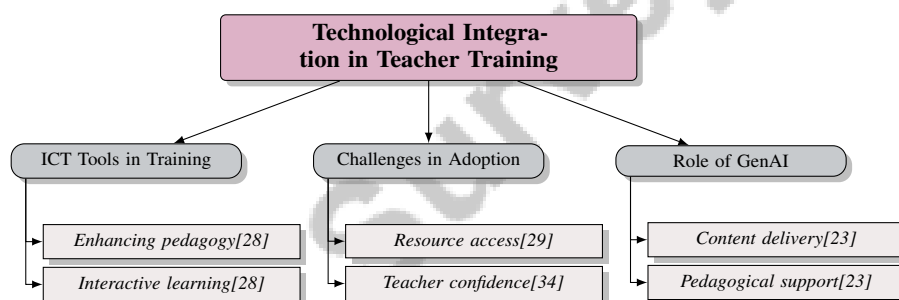

Figure 4: This figure illustrates the integration of technology in teacher training, highlighting key aspects such as the use of ICT tools for enhancing pedagogy and fostering interactive learning, challenges in technology adoption due to resource limitations and teacher confidence, and the transformative role of Generative AI in content delivery and pedagogical support.

4.3 Teacher-Led Professional Development

Teacher-led professional development initiatives empower educators to take charge of their learning and growth, fostering ownership and engagement in their professional journeys. These initiatives effectively address the disconnect between training content and teachers' actual needs, allowing educators to tailor their development experiences to specific contexts and challenges [32]. By focusing on unique requirements, these programs can overcome limitations of traditional training methods that often fail to meaningfully engage participants.

However, challenges impede the effectiveness of teacher-led professional development. The fragmented nature of in-service training and varying levels of teacher engagement can limit the impact of these initiatives [34]. Additionally, a lack of coherence between training objectives and teachers' needs, coupled with limited collective participation, poses significant obstacles to successful implementation [27]. These challenges highlight the need for a more integrated approach involving stakeholders, including school heads, in planning and executing professional development activities.

Despite these challenges, teacher-led initiatives hold significant potential to revolutionize professional development by promoting collaboration and shared learning among educators. This approach addresses gaps in professional learning needs identified in comparative analyses of teacher educators

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across countries and empowers teachers to take charge of their development. By designing and implementing their own professional development opportunities, educators can foster community, enhance teaching practices, and adapt to evolving educational demands. This shift towards a collaborative, self-directed model can lead to greater satisfaction among teachers and ultimately improve educational outcomes [7, 17]. Creating opportunities for teachers to lead workshops, facilitate discussions, and share best practices enhances engagement and promotes a culture of continuous improvement, ensuring that professional development is relevant, practical, and directly applicable to classroom settings.

Feature	Methods and Strategies	Technological Integration in Teacher Training	Teacher-Led Professional Development
Target Audience	Varied Career Stages	Tech-savvy Educators	Self-directed Educators
Training Focus	Pedagogical Skills	Ict Tools Usage	Collaborative Learning
Implementation Challenges	Alignment Issues	Resource Limitations	Fragmentation

Table 1: This table provides a comparative analysis of various in-service training methods and strategies, highlighting their target audience, training focus, and implementation challenges. It underscores the distinctions between general methods, technological integration in teacher training, and teacher-led professional development initiatives, offering insights into their effectiveness and limitations.

5 Quality Assessment in Teacher Training

5.1 Mechanisms and Criteria for Quality Assessment

Benchmark	Size	Domain	Task Format	Metric

Table 2: This table presents a structured overview of representative benchmarks used in the quality assessment of teacher training programs. It details the size, domain, task format, and metrics associated with each benchmark, providing a foundation for evaluating the effectiveness and alignment of training programs with educational standards.

Ensuring the efficacy of teacher training programs necessitates rigorous quality assessment aligned with educational standards. Expert evaluations establish benchmarks to ensure programs enhance teaching practices [36]. Table 2 offers a comprehensive summary of the benchmarks utilized in evaluating the quality of teacher training programs, highlighting the essential criteria and metrics for effective assessment. A comprehensive framework for quality assessment considers emotional and cognitive dimensions, addressing socio-emotional risks and participant comfort [26]. This holistic approach supports both informative and emotionally supportive training environments.

Technological tools, such as ClassInSight, offer innovative solutions for assessing quality by providing quantifiable insights into discussion practices, such as talk ratio and turn-taking, thus enabling educators to refine facilitation techniques [3]. Pre-tests and post-tests, along with repeated measurements of interaction skills, are employed to gauge changes in knowledge and teaching competencies over time [8, 4].

Challenges persist, notably the absence of standardized evaluation frameworks and metrics that align with human judgment. The complexity of assessing AI-generated content further complicates evaluations, underscoring the need for comprehensive and reliable tools [30]. Addressing these challenges is crucial for ensuring that teacher training programs effectively enhance educators' professional growth and educational quality.

5.2 Impact of Quality Assessment on Educational Standards

Quality assessment is crucial for aligning educational standards and fostering curriculum development. Advanced models, like large language models, provide nuanced evaluations that reflect human perceptions, ensuring training programs meet educational standards [30]. Insights from these assessments identify strengths and areas for improvement, informing curriculum refinement and ensuring programs are rigorous and responsive to evolving educational demands.

Integrating quality assessment mechanisms into teacher training supports continuous professional development by addressing gaps between pre-service and in-service training and enhancing educators'

professional literacy across ideals, knowledge, skills, and ethics [37, 27, 25, 16]. These assessments influence broader educational policies by establishing benchmarks and criteria that promote consistency across institutions, enhancing the overall educational system's quality. Since 2006, Romanian institutions have implemented structured evaluation algorithms to improve educational quality, measured through indicators like government investment and teacher qualifications, contributing to universal education access and teaching effectiveness [37, 36, 16, 24, 30].

6 Physical Education Curriculum and Standards

The physical education curriculum serves as a blueprint that defines learning objectives and standards, aligning with broader educational goals to promote holistic student development. Teacher training programs are crucial in equipping educators with the necessary skills, knowledge, and ethical understanding to implement curricula that meet educational standards and cater to diverse student needs. The integration of pre-service education and ongoing professional development enhances teachers' professional literacy, preparing them to adapt to evolving classroom demands [25, 27, 16]. This highlights the critical role of teacher training in improving the quality and effectiveness of physical education within compulsory education.

6.1 Physical Education Curriculum within Compulsory Education

The integration of teacher training programs into the delivery of a comprehensive physical education curriculum is essential for meeting national and regional educational standards. These programs equip educators with the skills and knowledge necessary to implement curricula that foster holistic student development, promoting physical literacy and lifelong fitness [10]. A well-structured curriculum emphasizes the development of students' physical, cognitive, and social skills, with teacher training programs providing essential tools and strategies for creating engaging and inclusive learning environments. By adapting teaching methods to accommodate diverse student needs, these programs ensure equitable access to quality physical education [7].

Innovative teaching approaches, such as the integration of traditional sports and culturally relevant activities, enhance student engagement and appreciation for physical activity's role in overall well-being. Teacher training programs support these approaches, ensuring educators can create dynamic and relevant physical education experiences [24]. Additionally, these programs develop assessment and evaluation techniques aligned with educational standards, enabling educators to measure student progress effectively and fostering a culture of continuous improvement [6].

6.2 Integration of Traditional Sports

Incorporating traditional sports into the physical education curriculum enriches the educational framework and aligns with national educational policies. This approach preserves cultural heritage and enhances student experiences by introducing diverse, culturally significant activities. Traditional sports provide unique opportunities for students to engage with their cultural history while promoting physical fitness and social interaction [10]. Teacher training programs are pivotal in equipping educators with the knowledge and skills to effectively teach these sports, integrating both pre-service and in-service education to enhance professional competence and address the varied experiences and backgrounds of learners [27, 16].

The inclusion of traditional sports fosters inclusivity and creates a dynamic learning environment by promoting diverse cultural perspectives and engaging students with varied interests. Offering a variety of activities that cater to different interests and abilities allows educators to engage a broader range of students and promote lifelong participation in physical activity, enhancing students' physical literacy and encouraging the development of social skills and cultural appreciation [10, 16].

Furthermore, integrating traditional sports supports the broader educational goal of promoting holistic student development. By aligning with national educational policies, these initiatives contribute to developing a comprehensive curriculum that embraces cultural diversity and fosters physical and social well-being, enhancing overall education quality and promoting continuous professional development for educators [24, 16]. Through the strategic incorporation of traditional sports, physical education programs provide students with meaningful and culturally relevant learning experiences that enrich their overall education.

7 Challenges and Future Directions

7.1 Challenges and Solutions

Teacher training programs face challenges such as inconsistent qualifications and professional standards, complicating cohesive framework establishment [18]. Standardized benchmarks and evaluation metrics are essential for ensuring program uniformity and quality [30]. The limited applicability of creative drama techniques across subjects is another issue, with societal expectations often restricting their use [8]. Training programs should focus on adapting creative methods to diverse subjects and classroom contexts.

Poor organizational settings hinder the implementation of models like the Empowering Education Model, which requires supportive institutional environments [14]. Enhancing organizational support and fostering collaboration can facilitate innovative training model implementation. Current studies often fail to address practical needs, offering insufficient training and support [13]. Programs must prioritize practical experiences aligned with real-world challenges, involving school leaders to ensure training objectives meet educators' needs [27].

Research frequently neglects challenges in non-formal settings, such as after-school programs [5]. Expanding research to these contexts can provide insights into diverse professional development needs. The lack of human interaction in AI-based assessments and inadequate AI tool training for educators are significant limitations [6]. A balanced approach integrating AI with human oversight is crucial for fair evaluations and effective AI tool utilization.

Questions about optimal training structures and provider roles highlight the need for comprehensive research to identify best practices across fields [15]. A holistic approach considering educators' diverse needs and contemporary educational complexities can enhance professional growth and educational outcomes.

7.2 Future Directions

Future teacher professional development research should focus on integrating emerging technologies and innovative pedagogical strategies. Incorporating large models in quality assessment marks a transformative shift requiring ongoing innovation and adaptation [30]. Integrated training programs bridging pre-service and post-service education, incorporating emerging educational trends, are crucial [16].

Developing tailored in-service education and training (INSET) programs incorporating teacher feedback and emphasizing practical classroom applications is essential [5]. These programs should reflect actual classroom challenges, emphasizing inclusive planning and relevant training objectives [27]. Future research should explore innovative training delivery methods integrating teacher feedback and prioritizing practical skills [15].

The ethical use of AI in educational assessments is a critical area for exploration. Developing transparent AI algorithms and providing adequate educator training are essential for ethical and effective AI use, mitigating biases and enhancing AI-driven assessment reliability [6].

Focusing on pre-service and post-service education integration can effectively connect theoretical frameworks with practical applications, ensuring programs are innovative and adaptable to educators' evolving needs. Addressing gaps in competence and satisfaction will contribute to improved educational outcomes by fostering continuous professional growth and aligning teacher ideals, knowledge, skills, and ethical practices with real-world challenges [17, 7, 16].

7.3 Integrating Emerging Trends and Technologies

Integrating emerging trends and technologies is pivotal for future teacher training and professional development. Advanced assessment models like semi-supervised learning and real-time assessments revolutionize training by providing dynamic evaluation mechanisms [21]. These innovations offer immediate feedback, fostering adaptive learning environments.

Active learning techniques, particularly in labeling processes, enhance content delivery accuracy and efficiency in training programs, improving professional development quality [38]. Engaging

educators in active learning scenarios facilitates deeper understanding and retention of pedagogical strategies.

Seamless technology integration into training programs requires a robust framework supporting continuous learning and adaptation. This framework should prioritize developing digital literacy among educators, ensuring effective technology integration into teaching practices. Targeted digital pedagogy training enhances teachers' confidence and competence with ICT tools, significantly improving attitudes towards digital technologies. Incorporating Generative AI's transformative potential supports bridging pedagogical modeling and assessment gaps, fostering critical thinking and enhancing outcomes [29, 23]. These trends will drive innovation in training, leading to improved outcomes and teaching efficacy.

7.4 Collaboration and Professional Identity

Collaboration and professional identity are integral to teacher development, significantly enhancing educational practices and outcomes. Cultivating professional identity involves continuous negotiation of personal and professional roles, influenced by teaching experience, subject expertise, and institutional culture [25]. This evolving identity shapes engagement with professional development opportunities and adaptability to changing contexts.

Collaboration is pivotal in fostering professional identity, providing shared learning experiences and facilitating idea exchange and best practices. This approach enhances reflective practices and supports knowledge co-construction, leading to improved teaching efficacy [7]. Participation in professional learning communities fosters belonging and shared purpose, reinforcing professional identity and commitment to continuous growth.

Collaboration also catalyzes teaching practice innovation. Through networks, educators explore new strategies and integrate diverse perspectives, enriching student experiences. This spirit extends to technology integration, where shared expertise facilitates effective digital tool adoption, enhancing instruction quality [6].

The collaboration-professional identity interplay is strengthened by school leaders and administrators fostering collaborative cultures. Supportive environments encouraging open communication and teamwork empower teachers to own their professional development and contribute to educational community advancement [27].

8 Conclusion

Continuous professional development (CPD) emerges as a cornerstone for advancing teaching methodologies and aligning with educational standards. It plays a fundamental role in equipping educators to meet the dynamic challenges of contemporary classrooms, as evidenced by the diverse service needs of teachers. The necessity to reform training programs is evident, aiming to better prepare teacher candidates for the multifaceted demands of today's educational environments. The integration of innovative models and methodologies in both post-service and in-service training is pivotal for enhancing teacher capabilities and achieving superior educational outcomes. The utilization of data-driven processes (DDP) underscores the potential for optimizing educational resource management, thereby improving processing efficiencies. This survey highlights the indispensable nature of CPD in fostering teacher growth and upholding educational excellence, emphasizing the need for ongoing research and adaptation to cater to the evolving requirements of educators and learners.

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