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Assessing core competencies of pre-service teachers in the context of 21st Century Skills

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Abstract
In the rapidly transforming educational landscape, the ability of pre-service teachers to meet the demands of 21st century classrooms is critical. With shifts toward learner-centered pedagogies, digital integration, and globalization, teacher education must now prioritize the development and assessment of competencies that transcend basic content knowledge. This paper explores the essential core competencies required for pre-service teachers in the modern era and examines how these competencies are assessed in diverse educational contexts. It discusses prevailing theoretical frameworks, assessment tools, and international practices, while also analyzing the challenges encountered by teacher education institutions. The review identifies the pressing need for updated training models that reflect real-world demands, promotes innovative assessment strategies, and emphasizes reflective, technological and interpersonal capabilities. The paper concludes by offering recommendations for future research and policy directions in competency-based teacher preparation.

Keywords: Teacher preparation, transforming educational landscape, interpersonal capabilities, emphasizes reflective, technological

Introduction
The onset of the 21st century has introduced profound transformations in the structure and demands of education systems across the world. Globalization, digital disruption, rapid advancements in technology, and the need for sustainable development have reshaped not only what students must learn but also how educators must be prepared to teach. Within this shifting landscape, the traditional role of the teacher as a transmitter of knowledge has evolved into that of a facilitator, mentor, designer of learning environments, and lifelong learner. Consequently, the focus of teacher education has also undergone a paradigm shift from a content-centered approach to one that emphasizes the development of a broad range of competencies aligned with 21st century demands.

Pre-service teachers those currently undergoing formal training before entering the teaching profession represent a critical segment of the educational ecosystem. The quality of their preparation directly influences future classroom practices, student outcomes, and the broader goals of education in society. However, preparing teachers for a complex, interconnected, and rapidly evolving world requires more than subject expertise and pedagogical theory. It demands the cultivation of what are now recognized as 21st century skills, a collection of knowledge, attitudes, and abilities that include critical thinking, communication, collaboration, creativity, information literacy, technological proficiency, intercultural understanding, and socio-emotional awareness. These competencies are essential for navigating modern classrooms characterized by diverse learners, evolving curricula, and dynamic educational technologies.

Globally, educational organizations and research institutions have attempted to define and promote these competencies through various frameworks. The Partnership for 21st Century Learning (P21) identifies key skills such as learning and innovation skills, life and career skills, and digital literacy as essential for future-ready individuals. The OECD's Future of Education and Skills 2030 initiative emphasizes transformative competencies that empower individuals to shape a better future, including the ability to create new value, reconcile tensions and dilemmas, and take responsibility. UNESCO's Teacher Competency Framework and Sustainable Development Goal 4 also stress the importance of equipping teachers with competencies that foster inclusive, equitable, and quality education.

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These frameworks converge on a shared understanding: that the effective teacher of the 21st century is not defined solely by academic credentials but by a multifaceted ability to engage, inspire, and empower learners.

Despite this consensus, one of the persistent challenges faced by teacher education programs is the meaningful integration and assessment of these competencies in pre-service training. In many contexts, existing curricula remain heavily weighted toward theoretical content and standardized testing, leaving limited space for experiential learning, reflective practice, and holistic assessment. Furthermore, teacher educators themselves may lack the resources, training, or institutional support required to model and evaluate 21st century teaching competencies effectively. As a result, the gap between what pre-service teachers are taught and the realities they encounter in the classroom often remains unaddressed.

Assessment is a critical component of the teaching-learning process, and its role in shaping pre-service teachers' competencies cannot be overstated. Effective assessment provides feedback, guides instructional decisions, and helps future teachers understand their strengths and areas for growth. However, evaluating competencies such as collaboration, creativity, ethical reasoning, or cultural competence poses unique challenges. These are often context-dependent, dynamic, and less amenable to traditional paper-based or summative evaluation methods. Therefore, institutions must move toward more innovative, formative, and authentic assessment strategies, such as performance tasks, reflective journals, digital portfolios, peer reviews, and simulations. These approaches align more closely with the complexity of real-world teaching and offer richer insights into the readiness of future educators.

In parallel, there is growing recognition of the importance of teacher identity formation and self-efficacy in the development of core competencies. The process through which pre-service teachers internalize their roles, reflect on their practice, and engage with peers and mentors plays a significant role in shaping their professional outlook. This implies that competency development must not only be embedded in course content but also be supported by learning environments that promote inquiry, feedback, mentorship, and collaboration.

Another aspect that complicates the assessment of pre-service teacher competencies is the cultural and contextual diversity that characterizes education systems worldwide. What constitutes effective teaching in one context may differ markedly from another due to varying societal expectations, resource availability, policy frameworks, and student demographics. Therefore, while global frameworks provide a valuable reference, competency assessment must be adapted to local realities to ensure relevance and equity.

This review paper aims to explore how pre-service teacher education programs are addressing the need to build and assess 21st century competencies. It begins by outlining the conceptual and theoretical foundations underpinning the notion of core competencies. It then delves into the specific methods and tools used for assessment, critically examining their effectiveness, limitations, and applicability across diverse contexts. Drawing on global case studies and emerging best practices, the paper highlights innovative strategies for bridging the gap between theory and practice. It also discusses the barriers institutions face in implementing comprehensive assessment frameworks and proposes pathways for reform.

Ultimately, this review argues that a reimagining of teacher education is urgently needed one that places competencies at the heart of curriculum design, instructional practices, and assessment systems. Only then can we ensure that pre-service teachers are truly equipped to lead meaningful, engaging, and future-ready learning experiences for all students.

Literature Review

The body of literature concerning teacher education in the 21st century reflects a growing emphasis on equipping pre-service teachers with a multidimensional skill set that transcends conventional pedagogical competencies. Research has consistently shown that the dynamic nature of modern classrooms-shaped by technological evolution, cultural diversity, and a knowledge-based economy-necessitates a shift in teacher training from purely content delivery to competence-based instruction and assessment. This transformation is evident in both global and regional educational discourses that highlight the importance of integrating 21st century skills into teacher education frameworks.

A foundational perspective comes from the work of Trilling and Fadel (2009) [1], who argue that the traditional model of education is misaligned with the demands of the information age. They emphasize the integration of the 4Cs-critical thinking, communication, collaboration, and creativity-into teaching and learning processes, including the preparation of educators. Their work laid the groundwork for subsequent explorations into how these competencies could be assessed and embedded within pre-service teacher training.

Further expansion of this view is seen in the OECD's "Future of Education and Skills 2030" initiative, which outlines a framework for the development of transformative competencies that allow learners to shape a sustainable and inclusive future. These include creating new value, reconciling tensions and dilemmas, and taking responsibility. When applied to teacher education, these competencies require pre-service teachers to not only master content but also develop adaptability, resilience, and ethical reasoning. Darling-Hammond (2017) [3] builds on this by asserting that effective teacher education programs are those that deeply integrate clinical practice with theoretical learning, allowing for the development of skills that are both intellectually and emotionally responsive.

In the context of competency-based education, literature highlights the role of reflective practice and experiential learning as critical mechanisms for fostering essential teacher skills. Schön's (1983) [4] concept of the reflective practitioner remains highly influential, with numerous studies suggesting that regular engagement in self-assessment, journaling, and critical reflection can significantly enhance professional identity and teaching efficacy. These reflective methods have been successfully employed in institutions that prioritize constructivist and inquiry-based models of teacher development.

Empirical studies further indicate that digital literacy is an indispensable competency for 21st century educators. Research by Voogt et al. (2013) [5] underscores the need for pre-service teachers to develop not only operational proficiency with digital tools but also pedagogical strategies for integrating technology meaningfully into instruction.

However, studies also reveal significant variability in how digital competencies are addressed in teacher education programs globally. In many low-resource settings, limited infrastructure and inadequate faculty preparedness hinder the effective development of such skills.

In terms of assessment, a growing body of literature critiques the inadequacy of traditional evaluation methods in capturing the complexity of 21st century teaching competencies. Cochran-Smith *et al*. (2015) [6] argue that standardized testing and summative evaluations do not accurately reflect the competencies required in real-world classrooms. They advocate for performance-based assessments, such as teaching portfolios, microteaching, and video-based analysis, which provide more holistic and authentic evaluations of pre-service teachers' abilities. Supporting this, Zeichner and Liston (2014) [7] emphasize the use of practice-based teacher education models where performance in simulated or real classroom environments forms the basis of competency assessment.

Several studies also explore culturally responsive teaching as a core competency, especially in increasingly diverse classrooms. Gay (2010) [8] and Ladson-Billings (1995) [9] assert that teacher education must prepare pre-service teachers to be culturally competent, inclusive, and sensitive to learners from different backgrounds. Literature on global teacher education programs highlights that in multicultural contexts, the inclusion of intercultural communication, ethical sensitivity, and socio-emotional intelligence in training is indispensable. These attributes are often not explicitly assessed in conventional models, leading to a disconnect between institutional objectives and classroom realities.

International case studies further enrich the literature by demonstrating how countries have successfully embedded core competencies into their teacher education systems. Finland's teacher education model, as studied by Sahlberg (2011) [10], is widely cited for its emphasis on research-based training, student autonomy, and reflective assessment practices. Singapore's National Institute of Education employs the V^3SK model (Values, Skills, Knowledge), which provides a balanced and structured approach to developing holistic teacher competencies. Canada's use of Teaching Performance Assessment (TPA) as a standardized yet adaptable evaluation tool offers another model for combining formative and summative assessment of pre-service teacher readiness.

Despite the existence of these robust models, other studies identify gaps in policy implementation and institutional capacity. For example, Darling-Hammond and Hyler (2020) [11] caution that without sustained investment in professional development for faculty, curriculum redesign, and assessment reform, the integration of 21st century competencies in teacher education remains superficial. Similarly, research from Sub-Saharan Africa and South Asia shows that systemic challenges such as underfunding, curriculum rigidity, and faculty shortages continue to impede meaningful progress in this direction.

In synthesizing the current literature, it is evident that there is a strong theoretical and empirical foundation for integrating core competencies into pre-service teacher training. However, significant challenges remain, particularly in the areas of assessment design, institutional alignment, and contextual adaptation. The literature calls for a coherent policy framework, capacity-building initiatives, and the adoption of innovative assessment practices that accurately capture the multifaceted nature of 21st century teaching. Moving forward, further research is needed to evaluate the long-term impact of competency-based teacher education on student learning outcomes and to develop context-sensitive models that can be scaled across diverse educational systems.

2. Theoretical Foundations and Competency Constructs

Understanding how competencies are formed in pre-service teachers requires grounding in several educational theories. Theories such as Bloom's Taxonomy, Kolb's Experiential Learning, and Mezirow's Transformative Learning provide valuable insights into the processes by which individuals acquire and apply knowledge. These theories emphasize active engagement, reflection, and real-world application, which are essential for embedding 21st century skills into teacher education.

Contemporary competency models converge on a set of multi-dimensional skills that include cognitive, intrapersonal, interpersonal, and technological domains. Cognitive competencies encompass abilities such as critical thinking, analysis, problem-solving, and decision-making. Intrapersonal competencies involve self-awareness, emotional intelligence, ethical judgment, and resilience. Interpersonal competencies focus on effective communication, teamwork, conflict resolution, and empathy. Technological competencies address the growing need for digital literacy, ICT integration, media evaluation, and virtual pedagogy. Finally, reflective competencies encourage metacognition, feedback assimilation, and the ability to evaluate one's own professional growth.

Global frameworks reinforce the importance of these competencies. For instance, UNESCO's ICT Competency Framework for Teachers emphasizes not only digital skills but also pedagogical innovation and professional collaboration. OECD's Learning Compass 2030 outlines transformative competencies such as responsibility, agency, and collaboration, while the P21 framework categorizes learning into life and career skills, learning and innovation skills, and digital literacy skills.

In effective teacher education programs, these competencies are interwoven into curriculum design, pedagogical practices, and evaluation methods. They must be viewed not as isolated skills but as interconnected qualities that define effective teaching in the 21st century.

3. Assessment practices in teacher education

Assessing core competencies in pre-service teachers requires an approach that is holistic, authentic, and continuous. Traditional written examinations are insufficient for measuring applied skills or professional dispositions. Instead, teacher education programs have increasingly adopted performance-based assessments, digital portfolios, and reflective practices.

Performance-based assessments involve observing pre-service teachers during actual teaching experiences. These assessments evaluate how effectively a teacher manages the classroom, delivers lessons, engages students, and adapts to unexpected challenges. Digital portfolios provide a rich and evolving record of teacher development. These often include lesson plans, student feedback, reflections, multimedia artifacts, and evidence of professional growth.

Rubric-based evaluation has also become a common practice. Institutions use detailed rubrics to assess micro-teaching sessions, classroom presentations, and group activities. These rubrics provide clarity and consistency while allowing assessors to evaluate not just content knowledge but also creativity, communication, and classroom presence.

Self-assessment and peer feedback offer valuable opportunities for metacognitive development. When pre-service teachers critically evaluate their own work or that of their peers, they develop deeper insight into pedagogical practices and professional responsibilities. Case studies and simulations are used to present ethical dilemmas, culturally sensitive scenarios, or inclusive education challenges, enabling pre-service teachers to demonstrate practical decision-making and problem-solving abilities.

Despite the availability of these tools, many institutions face difficulties in implementing comprehensive assessment systems. The lack of standardization, inconsistent faculty expertise, and limited resources often lead to assessments that are fragmented or overly theoretical.

4. Challenges in Competency Assessment
One of the major challenges in assessing 21st century competencies is the absence of a universally accepted framework. Without a shared understanding of what constitutes core competencies, institutions develop their own models, leading to inconsistency in evaluation standards. Faculty members often struggle to assess subjective qualities such as empathy, collaboration, or ethical reasoning due to limited training or reliance on traditional grading practices.

In many contexts, particularly in developing countries, there is a lack of access to technological infrastructure that would support digital assessment tools. Consequently, institutions may be unable to incorporate online portfolios, virtual simulations, or AI-supported feedback systems.

Another challenge is the overemphasis on cognitive skills, often at the expense of socio-emotional and technological competencies. This imbalance arises from long-standing academic traditions that prioritize content mastery over skill-based performance. Moreover, certain assessment formats, such as peer evaluations or self-reflections, are susceptible to bias and may not yield objective insights.

These limitations highlight the need for systemic reform, policy support, and professional development programs for teacher educators.

5. Emerging Strategies and Global Innovations
To address these challenges, several innovative strategies have emerged globally. Many institutions are adopting hybrid models that combine traditional assessments with digital and experiential methods. Technology is increasingly being used to personalize feedback and track competency growth over time. Artificial intelligence tools, learning analytics, and data dashboards can help visualize progress and identify gaps in training.

Institutions are also moving toward standardized rubric systems that align with global education goals. These rubrics offer transparency and help maintain consistency across teaching practice assessments. Reflective practice is encouraged through journaling, narrative inquiry, and peer mentoring, fostering a culture of self-improvement and critical reflection.

In technologically advanced countries, digital learning platforms such as Google Classroom, Edmodo and Padlet are being integrated into teacher training programs to assess digital pedagogy, collaborative tasks, and media fluency.

7. Conclusion
Preparing pre-service teachers for the realities of 21st-century classrooms is a multifaceted endeavor. It requires a shift from knowledge acquisition to competency development, from isolated assessments to integrated evaluation systems. As educators navigate an increasingly complex educational environment, their ability to think critically, use digital tools, communicate across cultures, and reflect on their practice becomes paramount.

This paper has shown that while many innovative assessment tools exist, there is still a pressing need for greater standardization, resource allocation, and professional development. Future research should focus on developing dynamic assessment models that are culturally responsive, technologically enabled, and pedagogically grounded. By doing so, teacher education programs can ensure that tomorrow's educators are fully equipped to meet the challenges and opportunities of the 21st century.

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