

# Digital Profiling for Assessing Implicit Competencies in Holistic Pre-service Teacher Education

Yanmei Zhao, Jijun Liu, Zhufen Yang\*

School of Foreign Languages, Yuxi Normal University, Yuxi, China

\*Corresponding Author Email: [yzf@yxnu.edu.cn](mailto:yzf@yxnu.edu.cn)

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## Abstract

Global changes in education call for a shift from mechanistic knowledge transmission to a more holistic model of teacher development. However, a persistent gap remains in traditional pre-service teacher (PST) education, which often emphasizes explicit pedagogical skills while paying insufficient attention to essential implicit competencies. This study addresses this issue by examining the application of digital profiling technology in PST education. Through a structured interdisciplinary literature review and framework synthesis, it explores how multi-modal data collection, emotion recognition, and behavioral analytics can be used to identify and assess non-cognitive dimensions such as emotional intelligence, empathy, and professional ethics. The analysis indicates that digital profiling can support personalized development pathways, targeted cultivation of emotional competencies, and evidence-based reflective feedback in diverse pedagogical contexts. Overall, the study argues that digital profiling offers a feasible pathway for strengthening holistic teacher preparation and supporting the development of implicit competencies in contemporary pre-service teacher education.

**Keywords:** Holistic Education, Digital Profiling, Pre-Service Teacher Education, Implicit Competencies

## Introduction

Global shifts in education have brought teacher preparation to a critical crossroads, presenting a mix of unprecedented challenges and transformative opportunities. As technology reshapes the classroom, our understanding of teacher competence is evolving—moving beyond the simplistic measuring of “knowledge transmission” toward a more nuanced, integrated view of professional quality. At the heart of this evolution lies holistic education, a philosophy that champions the development of the “whole person” (Maslow, 1954; Miller, 2007; Rogers, 1969). While its importance in PST training is widely acknowledged, a persistent gap remains: traditional models still lean heavily on explicit competencies—the easily observable skills—while often overlooking implicit dimensions such as emotional resilience and empathic engagement (Damon, 2007; Jennings & Greenberg, 2009). This oversight leaves teacher education incomplete, failing to capture the full spectrum of a teacher’s professional identity and ultimately weakening their future impact in the classroom.

Recently, however, the digital revolution has offered a way to bridge this gap. Digital profiling technology has emerged not merely as a data tool, but as a lens through which the multidimensionality of individuals can be understood. By integrating diverse data points, digital profiling makes it possible to capture and quantify implicit traits that were once considered difficult to assess, thereby providing a stronger basis for personalized mentorship and professional growth (Buckingham Shum & Deakin Crick, 2012; Ferguson, 2012; Siemens & Long, 2011).

This study explores how digital profiling can be used to build a more authentic and holistic portrait of PSTs. In doing so, it seeks to address the long-standing neglect of non-cognitive dimensions in teacher education and to offer a new perspective on how these vital qualities may be identified and nurtured. Two questions guide this inquiry: How can digital profiling effectively track the implicit growth of PSTs? And in what ways can this technology contribute to a more holistic approach to teacher cultivation? Through these questions, the study aims to connect the ideals of holistic education with the practical realities of contemporary teacher training.

### **Literature Review**

#### *The Evolution and Core Principles of Holistic Education Theory*

The roots of holistic education trace back to the 20th century, emerging as a profound response to the limitations of fragmented, skill-based learning. It posits that the true aim of education is not simply to fill a mind with knowledge, but to nurture a person's complete being—spanning the physical, emotional, social, and spiritual realms (Miller, 2007; Nava, 2001). This perspective is strongly grounded in humanistic psychology, particularly through the lenses of Maslow and Rogers. Maslow's hierarchy of needs reminded us that education must first satisfy a learner's foundational security before it can ignite their drive for self-actualization (Maslow, 1954). Similarly, Rogers' focus on autonomy championed the idea that education should be a supportive environment where the individual's unique self is allowed to flourish fully (Rogers, 1969).

As we moved into the 21st century, calls for global educational reform intensified, bringing holistic ideals into the mainstream. In today's complex and rapidly changing world, the traditional obsession with academic metrics is being replaced by a more compassionate, integrated view of the "whole person" (Miller, 2007; Palmer, 1998). The core mission has shifted: we are no longer just training students to pass exams; we are cultivating resilient, well-rounded individuals who can navigate the moral and social intricacies of modern society. This shift has profound implications for how we prepare the next generation of educators. PSTs can no longer be seen merely as subject-matter experts; they must become mentors capable of guiding a student's entire developmental journey. Consequently, holistic education demands that teachers themselves embody a higher level of integrated competence. Beyond their instructional "toolbox," they must cultivate deeply human, implicit qualities—such as emotional intelligence, a capacity for genuine empathy, and a steadfast sense of moral responsibility (Miller, 2007; Noddings, 1984; Palmer, 1998).

To better understand this ideological shift, Figure 1 maps the historical trajectory of holistic education theory from the 1940s to 2020. This timeline illustrates more than just a chronological sequence of events; it captures the essential transformation of education from

a mechanistic, performance-driven process into a deeply humanistic endeavor. By examining these milestones, we can see how the focus has gradually expanded from basic psychological needs to the complex global reform standards that define contemporary teacher preparation.

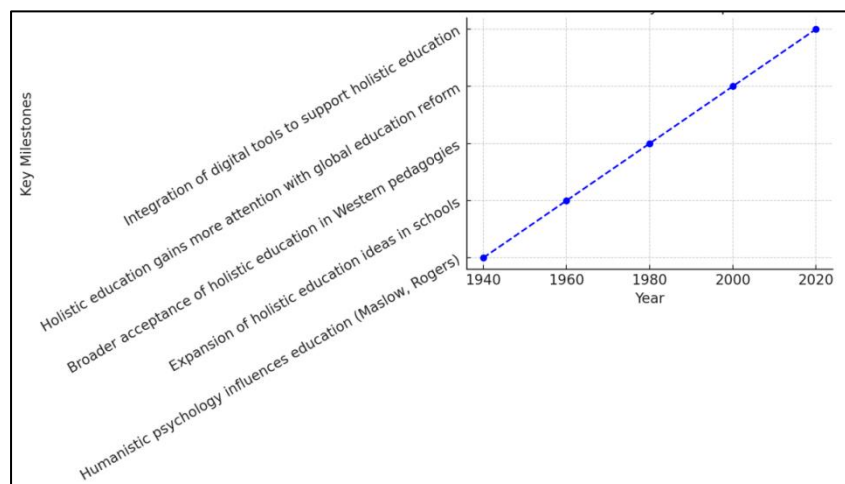


Figure 1. Holistic Education Theory Development Timeline

### *The Emergence of Implicit Dimensions and Their Role in Teacher Assessment*

Implicit educational dimensions encompass those subtle yet profound qualities that often elude the grasp of traditional, standardized assessments. These dimensions—centering on emotions, attitudes, values, and the core traits of empathy and emotional intelligence—are not easily distilled into numerical scores (Salovey & Mayer, 1990; Zhou, 2022). Instead, they live and breathe through a teacher's daily interactions: the nuance in their language, the warmth of their classroom presence, and their instinctive response to a student's silent struggle. Historically, because these traits are difficult to "measure" in a conventional sense, they have often been sidelined in PST education, overshadowed by more quantifiable pedagogical skills (Damon, 2007).

However, as our understanding of the classroom matures, the significance of these "invisible" competencies has moved to the forefront. Research increasingly reveals that a teacher's implicit qualities are important contributors to teaching quality and student well-being (Aldrup et al., 2022; Jennings & Greenberg, 2009). Empathy, for instance, does far more than foster a kind environment; it actively shapes the quality of teacher-student rapport, igniting a student's internal motivation and emotional security (Bouton, 2016; Murphy et al., 2018; Zhou, 2022). Similarly, high emotional intelligence acts as a steady rudder in the turbulent waters of complex teaching scenarios, allowing educators to maintain a constructive atmosphere even under pressure (Mayer & Salovey, 1997; Mayer et al., 2004).

Recognizing this, a growing body of scholarship advocates a shift in teacher assessment. To understand a teacher's capability more fully, it is necessary to look beyond explicit skills alone. By integrating the assessment of both explicit and implicit qualities, teacher education can develop a more comprehensive view of professional competence. This holistic approach not only supports professional development but also reflects the broader educational goal of fostering human growth rather than merely delivering content (Campbell, 2000; Sockett, 1993).

To visualize this impact, Figure 2 highlights the relative importance of various implicit qualities within contemporary teacher education frameworks. Rather than treating them as secondary “soft skills,” the figure emphasizes their central role in effective and holistic teaching.

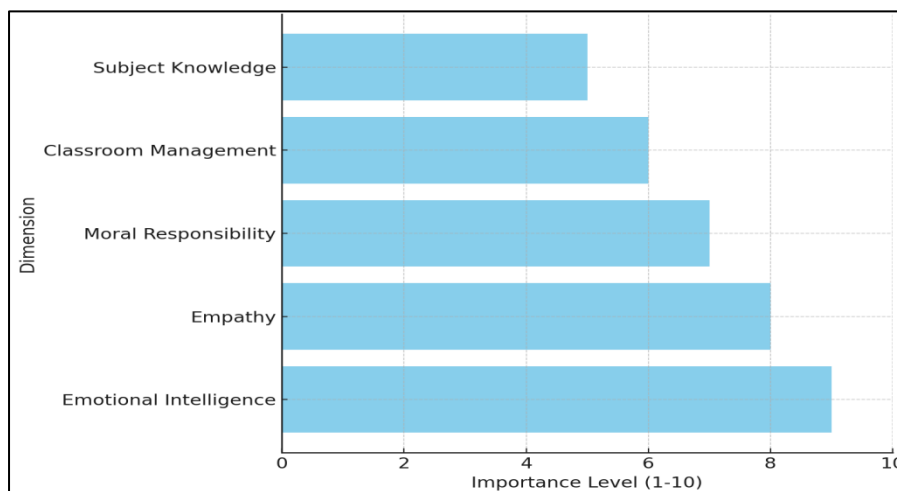


Figure 2. Significance Ratings of Implicit Dimensions in PST Education

#### *Evolution of Digital Profiling and Its Emergence in Educational Contexts*

While digital profiling found its early footing in psychology and marketing—used primarily to map behavioral patterns and consumer preferences—the surge of Big Data and Artificial Intelligence has propelled it into the heart of educational innovation. At its core, digital profiling is not merely data aggregation; it is the construction of a multidimensional portrait of an individual through the integration of diverse data sources (Ferguson, 2012; Greller & Drachsler, 2012; Siemens & Long, 2011).

In the realm of education, digital profiling has transcended its commercial origins to become a transformative tool for understanding the “whole learner” and the “whole teacher.” By harnessing data mining and machine learning, educators can look beyond surface-level grades to perceive the underlying rhythm of classroom life, including social interactions, emotional responses, and learning engagement (Buckingham Shum & Deakin Crick, 2012, 2016; Greller & Drachsler, 2012). Through the analysis of multi-modal data—ranging from classroom dialogue patterns to reflective digital activities—previously intangible dimensions, such as a teacher’s pedagogical style or a student’s emotional state, can be described more systematically (Ferguson, 2012; Scheffel et al., 2014).

The potential of digital profiling in teacher education is particularly compelling. By moving toward a more comprehensive, data-informed portrait, PSTs may come to recognize not only their technical instructional strengths but also the competencies that define their professional identity. This technology thus links the aspirations of holistic education with the practical need for personalized growth and evidence-based support (Admiraal et al., 2020; Michos et al., 2023).

*Evolving Trends in Pre-service Teacher Education and the Imperative for Digital Assessment*

As global educational reforms deepen, the landscape of PST education is undergoing a profound shift toward personalization, comprehensiveness, and technological integration. For decades, teacher preparation has leaned on a stable triad: classroom instruction, practicum experience, and the evaluation of explicit pedagogical skills. Yet, as the ideals of holistic education take root, this traditional model faces a significant hurdle—the effective cultivation and assessment of a teacher’s “inner landscape,” or their implicit competencies (Datnow & Hubbard, 2016; Mandinach & Gummer, 2016).

Current trends suggest that the “teacher of the future” must be more than a subject-matter expert; they must be emotionally resonant, deeply empathic, and critically minded. These implicit qualities are not mere personal ornaments; they are central to student growth and classroom well-being (Aldrup et al., 2022; Jennings & Greenberg, 2009). Consequently, a pivotal direction in reform is the shift away from an exclusive emphasis on technical proficiency toward a more balanced attention to human-centered, non-cognitive qualities.

In this evolving context, the limitations of traditional assessment have become increasingly apparent. Conventional methods—often static and subjective—struggle to capture the fluidity of a teacher's emotional and social intelligence. Digital profiling technology offers a possible response by providing a data-informed framework for identifying and assessing implicit dimensions in more systematic ways (Admiraal et al., 2020; Michos et al., 2023).

Looking ahead, the reliance on digital assessment tools will likely shape the next era of teacher preparation. In particular, digital profiling may become an important instrument for evaluating integrated competencies, developing individualized support pathways, and advancing the practical implementation of holistic education in PST education (Buckingham Shum & Deakin Crick, 2016; Greller & Drachsler, 2012; Siemens & Long, 2011).

**Methodology**

This study adopts a structured review of the literature to examine the intersection of holistic education and digital profiling in pre-service teacher (PST) education. By reviewing and synthesizing relevant studies, it aims to identify key theoretical foundations, analytical themes, and potential applications of digital profiling in the cultivation of implicit competencies (Aldrup et al., 2022; Datnow & Hubbard, 2016).

*Research Design*

The architecture of this study is rooted in a multi-phased review design, aimed at distilling actionable insights from a vast corpus of interdisciplinary literature. The process involves a strategic progression: mapping the historical and contemporary trajectories of holistic education, identifying critical research lacunae regarding implicit competencies, and ultimately synthesizing these findings into a coherent digital profiling model. This methodological approach clarifies the theoretical underpinnings of “the whole teacher” while offering a transformative perspective — integrating digital analytics into the human-centric process of educator development.

As illustrated in Figure 3, the research workflow follows a logical ascent—from the initial identification of core themes and the systematic harvesting of data to the final synthesis of the theoretical framework. This visual roadmap underscores how the integration of existing evidence provides the necessary scaffolding for future digital tool applications in teacher education.

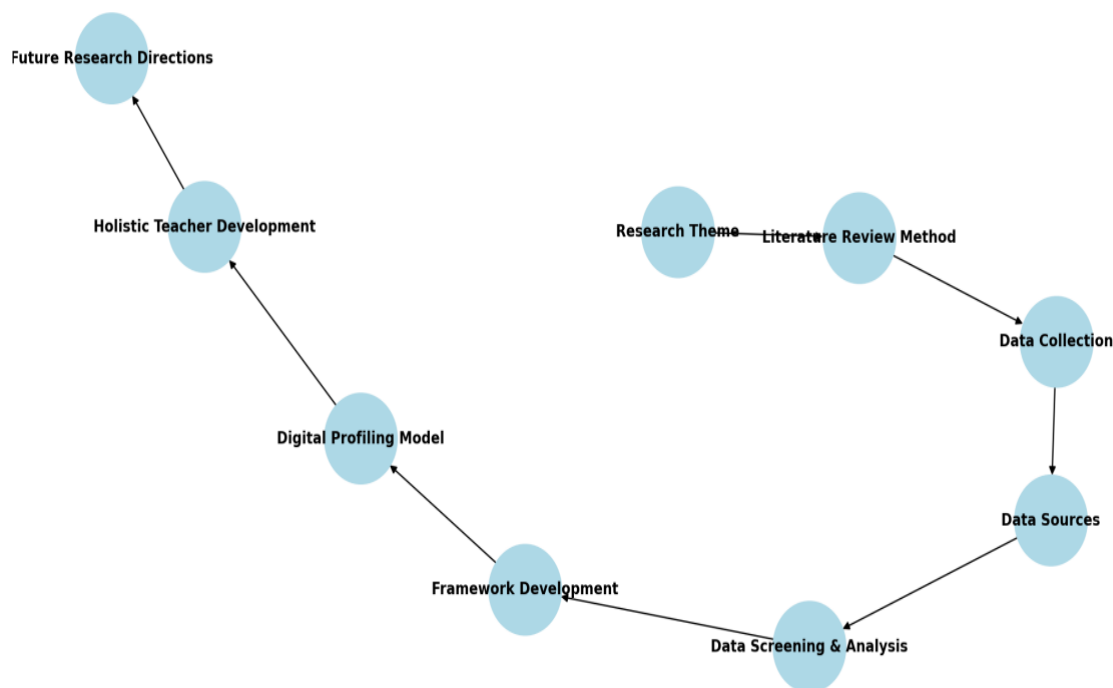


Figure 3. The Systematic Review and Framework Development Workflow

#### *Data Sources and Selection Strategy*

Relevant literature was retrieved from CNKI, Web of Science, ProQuest, and Google Scholar. The search focused on combinations of keywords such as holistic education, pre-service teacher education, teacher education, implicit competencies, implicit dimensions, emotional intelligence, empathy, digital profiling, digital assessment, and learning analytics. Chinese equivalents of these terms were also used in CNKI. The review mainly covered studies published between 2014 and 2025, while a small number of earlier foundational studies were included to clarify the theoretical background. This approach is consistent with prior review-based studies in teacher education, empathy research, and learning analytics (Aldrup et al., 2022; Datnow & Hubbard, 2016; Ferguson, 2012). Relevant records were identified through database searches. After duplicate removal and title-abstract screening, the remaining studies were reviewed in full text. Studies meeting the inclusion criteria were retained for thematic analysis.

#### *Literature Selection Criteria*

Studies were included if they addressed holistic education, implicit competencies in teacher education, or digital profiling and related assessment technologies in educational contexts. Priority was given to peer-reviewed journal articles, academic books, conference papers, and authoritative research reports. Studies were excluded if they were duplicates, non-scholarly materials, or unrelated to teacher education or competency assessment.

### *Data Analysis and Framework Synthesis*

The analysis followed a systematic, multi-tiered screening and coding procedure. Initially, a keyword-driven retrieval strategy was deployed to isolate core literature at the intersection of holistic pedagogy and digital assessment. Subsequently, these texts underwent a process of thematic coding, where diverse theoretical viewpoints on teacher cultivation and implicit competency were classified and compared. This comparative lens was essential for uncovering the strengths and limitations of current models and for charting a new course for future inquiry.

Building upon this evidence-based synthesis, the study articulates a comprehensive assessment model that bridges the gap between explicit instructional skills and implicit emotional literacy. By integrating these two traditionally separate domains, the model provides a structured theoretical foundation for subsequent empirical validation. This innovative framework serves as a vital first step in exploring how quantitative digital tools can be harmonized with the qualitative essence of holistic education.

### **Key Themes and Analytical Insights**

#### *The Technical Architecture: Decoding Implicit Dimensions through Digital Profiling*

Synthesizing current research, this section outlines how digital profiling may be used to capture implicit dimensions of pre-service teaching through multi-modal data analysis. This process is not a mere collection of metrics but a structured analysis of emotional intelligence, empathy, and relational dynamics through multi-modal data streams (Buckingham Shum & Deakin Crick, 2012; Ferguson, 2012; Greller & Drachsler, 2012).

#### *Multi-modal Data Harvesting*

The process begins in the classroom, whether physical or virtual, where cameras, microphones, and related tools may be used to capture teacher-student interaction. In practical applications, such data collection should be conducted under formal ethical clearance and rigorous privacy protection protocols to ensure informed consent and data security (Pardo & Siemens, 2014; Rodríguez-Triana et al., 2016; Slade & Prinsloo, 2013). These video and audio streams provide the raw material for subsequent emotional and behavioral analysis.

#### *Intelligent Emotion Recognition*

Moving beyond simple observation, the technology employs sophisticated facial expression analysis and vocal prosody algorithms (Mayer et al., 2004; Michos et al., 2023). By tracking micro-expressions and shifts in speech rhythm, tone, and volume, the system can detect the subtle emotional undercurrents of a lesson. For instance, the transition from a teacher's calm explanation to a moment of anxiety during a student's challenging query provides a quantifiable window into their real-time emotional self-regulation.

#### *Behavioral Analytics and Computer Vision*

Through the lens of computer vision, the system interprets nonverbal aspects of teaching—gestures, posture, and gaze patterns. These physical markers, when cross-referenced with pedagogical metrics like questioning frequency and feedback latency, offer a multidimensional assessment of classroom management and professional ethics (Campbell,

2000; Sockett, 1993). This analysis transforms fleeting interactions into durable data, reflecting the teacher's level of genuine engagement and ethical responsibility.

#### *Dynamic Real-time Feedback Loops*

One of the most important features of digital profiling is its capacity for timely feedback. By processing emotional and behavioral data together, the system can generate reflective reports that support teachers' self-understanding and instructional adjustment (Admiraal et al., 2020; Michos et al., 2023). These reports allow PSTs to compare their self-perception with their actual classroom performance.

#### *Synthesis of Emotional Intelligence Profiles*

The culmination of this process is a longitudinal emotional intelligence assessment. By aggregating historical data with real-time performance, the system constructs a narrative of the teacher's growth—specifically their ability to navigate unexpected classroom friction and build meaningful emotional connections with students. This assessment may serve as the foundation for highly tailored professional development and targeted support (Admiraal et al., 2020; Michos et al., 2023).

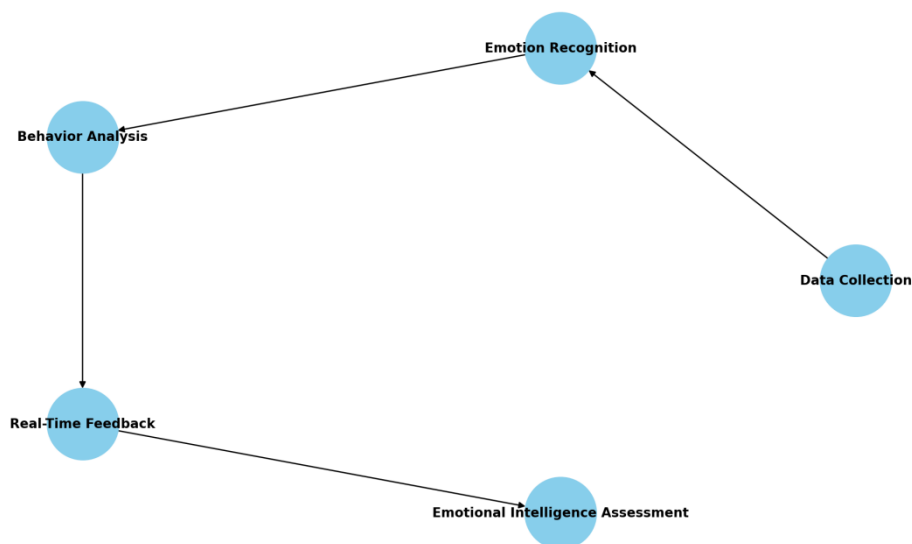


Figure 4. The Technical Workflow for Capturing Implicit Pedagogical Dimensions

#### *Unveiling the Invisible: Multi-dimensional Portraits of Teacher Competencies*

The systematic analysis of current research suggests that digital profiling offers a useful framework for understanding the complex spectrum of a PST's implicit competencies. By digitizing aspects of teaching that were once considered difficult to assess, this technology generates a clearer picture of emotional and ethical performance (Buckingham Shum & Deakin Crick, 2016; Ferguson, 2012). Specifically, the findings categorize these implicit dimensions into four critical pillars:

#### *Emotional Intelligence (EI): The Affective Foundation*

EI is more than a personal trait; it constitutes part of the emotional infrastructure of the classroom. Teachers with high EI regulate their own stress while remaining attentive to the emotional states of their students. Digital profiling captures this by analyzing facial micro-expressions and vocal patterns. This data-informed approach makes it possible to assess a

teacher’s emotional resilience and their ability to maintain a constructive learning atmosphere under pedagogical pressure (Mayer & Salovey, 1997; Mayer et al., 2004; Salovey & Mayer, 1990).

*Empathy: A Key Relational Competence*

Empathy serves as a key relational competence that facilitates the learning journey. An empathic educator decodes students' unspoken anxieties and adjusts their instructional pace accordingly. Through natural language processing (NLP) and discourse analysis, digital profiling quantifies this connection. By evaluating the frequency of validating feedback and the quality of teacher-student dialogue, the system provides a measurable index of a teacher’s empathic responsiveness, ensuring that the human element of teaching is prioritized (Aldrup et al., 2022; Bouton, 2016; Zhou, 2022).

*Professional Ethics: An Ethical Foundation*

Professional ethics, often considered the most elusive dimension, finds a visible form through behavioral modeling. Digital profiling tracks instructional decision-making and consistency in student treatment. By analyzing interaction logs and fairness metrics—such as the distribution of attention across different student groups—the technology renders a teacher’s commitment to equity and justice transparent. This makes the ethical "blind spots" visible, offering a path for cultivating deep professional integrity (Campbell, 2000; Noddings, 1984; Sockett, 1993).

*Classroom Interaction Skills: Interactional Competence*

Instructional effectiveness is largely determined by the quality of the communicative bridge. Beyond simple lecturing, this involves the subtle art of questioning, timing, and active listening. Digital profiling analyzes multi-modal behavioral data—including eye contact patterns and feedback latency—to reveal the underlying mechanics of a teacher's engagement strategy. This quantitative insight allows PSTs to refine their "interactional rhythm," moving from mechanical instruction to authentic engagement (Aldrup et al., 2022; Jennings & Greenberg, 2009).

By synthesizing these dimensions, digital profiling offers teacher educators a sophisticated dashboard for personalized mentorship. Instead of generic evaluations, these data-informed insights allow for the creation of tailored growth pathways that honor the unique strengths and needs of each teacher.

Table 1

*Dimensions of Implicit Competencies and Their Digital Detection Methods*

<b>Implicit Dimension</b>	<b>Assessment Focus</b>	<b>Technical Instrumentation</b>
Emotional Intelligence	Emotional regulation & reaction patterns	Facial expression recognition; Prosodic analysis
Empathy	Interaction quality & affective feedback	Speech-to-text; Sentiment & discourse analysis
Professional Ethics	Decision-making consistency & equity	Behavioral pattern analysis; Textual auditing
Classroom Interaction Skills	Questioning techniques & engagement	Computer vision; Interaction log analytics

The use of behavioral pattern analysis in Table 1 suggests that digital profiling may move beyond surface-level activity monitoring to reveal patterns related to fairness and instructional decision-making. By examining the distribution of teacher attention, response time, and interaction frequency across different students, such analysis may help identify potential biases that are often difficult to detect through traditional observation alone. In this way, professional ethics may be examined not only as a normative concept but also as a reflective dimension of teaching practice.

#### *Contextual Impact: Application of Digital Profiling Across Pedagogical Scenarios*

The value of digital profiling lies in its applicability across multiple contexts of teacher preparation. Rather than functioning as a static assessment, it can serve as a dynamic feedback mechanism that supports PSTs in translating classroom data into actionable professional insights (Admiraal et al., 2020; Buckingham Shum & Deakin Crick, 2016; Michos et al., 2023).

#### *Dynamic Classroom Interaction*

As the primary arena for digital profiling, the classroom offers a rich stream of interactive data. By synchronizing linguistic patterns, questioning frequency, and student engagement levels, the technology provides a panoramic view of instructional dynamics. The ability to map how a teacher's prompt triggers a student's response—and how the teacher subsequently navigates that feedback—allows for a more precise understanding of communicative empathy and dialogic agility (Aldrup et al., 2022; Jennings & Greenberg, 2009).

#### *Strategic Lesson Preparation*

Instructional excellence begins long before the first student enters the room. Digital profiling assists in the pre-active phase of teaching by evaluating the coherence of instructional design and the inclusivity of material selection. It identifies implicit traits such as pedagogical foresight and careful planning, offering a data-informed basis for teachers to refine their preparation and better anticipate diverse learner needs (Admiraal et al., 2020; Mandinach & Gummer, 2016).

#### *Multi-modal Student Feedback*

Beyond traditional end-of-term surveys, digital profiling synthesizes real-time indicators of student sentiment and participation. By correlating assignment completion rates with the emotional quality of classroom interactions, the system helps teachers perceive their impact through the students' eyes. This insight is particularly valuable for identifying areas in which a teacher's emotional intelligence or empathy may require further development and adjustment (Admiraal et al., 2020; Mandinach & Gummer, 2016).

#### *Evidence-based Teacher Reflection*

Self-reflection is the engine of professional growth, but it is often clouded by subjectivity. Digital profiling introduces a more objective perspective by integrating teaching journals with classroom video analytics. This convergence helps PSTs move beyond vague impressions toward a deeper analysis of their self-regulatory mechanisms and in-situ problem-solving capabilities (Datnow & Hubbard, 2016; Michos et al., 2023).

*Synergistic Collaborative Teaching*

In the context of team teaching, digital profiling helps reveal patterns of collaboration that may otherwise remain unnoticed. By analyzing role distribution and the fluidity of communication between peers, it becomes possible to better understand distributed leadership, collaborative responsibility, and the collective efficacy of PST cohorts (Datnow & Hubbard, 2016; Mandinach & Gummer, 2016).

Table 2

*Functional Applications of Digital Profiling Across Pedagogical Contexts*

<b>Teaching Scenario</b>	<b>Strategic Application of Digital Profiling</b>	<b>Targeted Professional Outcome</b>
Classroom Interaction	Analyzes questioning logic, response latency, and engagement ebb-and-flow.	Enhanced dialogic agility and empathy.
Lesson Preparation	Evaluates alignment between material selection and learner-centric goals.	Improved foresight and meticulous planning.
Student Feedback	Aggregates real-time affective reactions and participation metrics.	Accurate perception of instructional impact.
Teacher Reflection	Triangulates self-logs with objective behavioral data.	Objective self-regulation and growth.
Collaborative Teaching	Maps communication patterns and role fluidity in team settings.	Stronger teamwork and shared leadership.

*Catalyzing Growth: The Strategic Facilitation of Digital Profiling in Teacher Preparation*

The integration of digital profiling goes beyond simple data collection and has significant implications for the professional development of PSTs. By synthesizing explicit performance with implicit potentials, this technology may help teacher education become more responsive, evidence-informed, and development-oriented (Admiraal et al., 2020; Mandinach & Gummer, 2016; Michos et al., 2023).

*Precision Architecting of Personalized Growth*

Digital profiling shifts the focus from standardized training to more personalized development. By generating granular competency reports that encompass emotional intelligence, empathy, and classroom interaction, it provides a basis for tailored developmental pathways. This makes it possible for pedagogical interventions to be aligned more closely with each teacher's professional profile and developmental needs (Admiraal et al., 2020; Michos et al., 2023).

*Targeted Scaffolding for Emotional Competencies*

In the context of holistic education, emotional competencies are central to effective teaching and teacher-student relationships. Digital profiling can help identify subtle deficits in affective management by showing how teachers respond to classroom tension, student frustration, or emotional conflict. In this way, it may support more targeted training in emotional awareness, empathy, and regulation (Aldrup et al., 2022; Mayer et al., 2004).

*Optimization of Reflective and Feedback Ecosystems*

Digital profiling can also strengthen reflective practice and feedback systems. By combining instructional records with student engagement data and other behavioral evidence, it supports a more evidence-based form of reflection. This allows PSTs to move beyond impressionistic self-evaluation toward a deeper understanding of their strengths, weaknesses, and areas for growth (Datnow & Hubbard, 2016; Mandinach & Gummer, 2016).

*Enhancement of Collaborative Capital and Team Efficacy*

As teaching increasingly involves teamwork, digital profiling may also contribute to the improvement of collaborative efficacy. By examining communication patterns, role allocation, and interactional balance within team-teaching contexts, it can help teacher educators and PSTs better understand how collaborative practices develop and how collective effectiveness may be strengthened (Datnow & Hubbard, 2016).

*Adaptive Calibration of Instructional Strategies*

Finally, digital profiling may support the adaptive adjustment of instructional strategies. By connecting real-time classroom analytics with broader learning patterns, it can provide evidence that helps PSTs refine their teaching approaches in response to different learners and changing classroom conditions. Such data-informed adjustment may improve instructional flexibility and responsiveness in diverse educational contexts (Admiraal et al., 2020; Greller & Drachsler, 2012).

Table 3

*The Transformative Impact of Digital Profiling on Holistic Teacher Preparation*

<b>Strategic Dimension</b>	<b>Mechanism of Impact</b>	<b>Holistic Outcome</b>
Personalized Development	Generates multi-modal competency benchmarks.	Bespoke professional identity.
Emotional Support	Identifies affective gaps via behavioral data.	Resilient teacher-student rapport.
Reflective Feedback	Triangulates self-logs with objective analytics.	Deepened pedagogical self-awareness.
Collaborative Efficacy	Maps interactional synergy in team settings.	High-performance teaching cohorts.
Adaptive Pedagogy	Provides real-time instructional calibration.	Context-sensitive teaching mastery.

**Conclusion**

Based on the preceding analysis, Figure 5 presents a conceptual framework that integrates data sources, analytical processes, implicit competency dimensions, and developmental outcomes in holistic PST education.

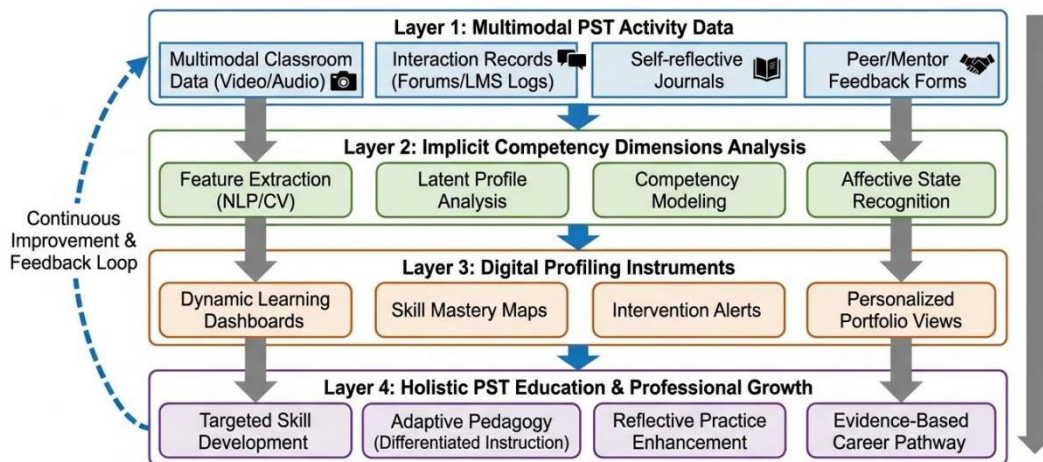


Figure 5. Conceptual Framework of Digital Profiling for Holistic PST Education

As shown in Figure 5, digital profiling connects multi-modal data, analytical procedures, implicit competency dimensions, and developmental outcomes into an integrated framework for holistic PST education. This integrated perspective reinforces the argument that digital profiling can serve as a meaningful framework for understanding and supporting the development of implicit competencies in PST education.

This study has traversed the intersection of holistic education theory and digital profiling technology, articulating a framework for capturing the implicit dimensions of PST competence. The findings suggest that digital profiling is not merely a technical addition to the educator's toolkit but also a potentially meaningful approach to understanding professional quality in more integrated ways (Buckingham Shum & Deakin Crick, 2016; Siemens & Long, 2011).

Beyond its role as an assessment instrument, digital profiling has demonstrated potential value across diverse pedagogical scenarios. From classroom interaction to teacher reflection, the technology may provide a data-informed feedback mechanism that supports personalized development (Admiraal et al., 2020; Michos et al., 2023).

### Limitations and Critical Reflections

Despite the theoretical richness of this framework, several limitations remain. This study is primarily grounded in a systematic synthesis of literature; while it provides a robust conceptual foundation, it still requires further validation through large-scale empirical research (Aldrup et al., 2022; Datnow & Hubbard, 2016). From a technological perspective, the accurate capture of human nuances—such as empathy and ethical judgment—continues to depend on the evolving reliability of emotion recognition and vocal analysis algorithms. Importantly, digital profiling should not be viewed as a replacement for human mentorship; rather, it should function as a Decision Support System (DSS) that complements educators' professional judgment. As an evidence-based support tool, it can help mentors make more informed and empathetic interventions without diminishing the humanistic connection at the heart of holistic pedagogy. Furthermore, the application of these digital tools must be critically examined across diverse cultural and socio-political educational systems to ensure that the portrait of a holistic teacher remains culturally responsive and ethically sound (Pardo & Siemens, 2014; Rodríguez-Triana et al., 2016; Slade & Prinsloo, 2013).

### Pathways for Future Inquiry

To advance this field, future research should move from conceptual modeling toward empirical validation. Rigorous experimental designs and longitudinal case studies are needed to examine the actual impact of digital profiling on teachers' professional development over time (Datnow & Hubbard, 2016; Michos et al., 2023). In addition, interdisciplinary collaboration among pedagogy, cognitive psychology, and data science will be important for refining the interpretation and use of digital data in teacher education. As artificial intelligence and big data continue to evolve, future studies should also pay greater attention to the ethical governance of digital profiling, ensuring that data-informed practices are used to support rather than monitor educators (Pardo & Siemens, 2014; Slade & Prinsloo, 2013). Furthermore, cross-cultural comparative research will be essential for developing models of teacher education that are both globally relevant and locally responsive. Through these directions, future inquiry may provide a stronger empirical and ethical foundation for the responsible integration of digital profiling into pre-service teacher education.

In summary, digital profiling offers a promising perspective for understanding and supporting the development of implicit competencies in pre-service teacher education. Its long-term value, however, will depend on careful empirical validation, ethical governance, and context-sensitive application.

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