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Revealing Pre-Service Primary Mathematics Teachers' Mathematical Wellbeing Literacy Through Pedagogical Scenarios

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Abstract

This study introduces and empirically validates the Mathematical Wellbeing Literacy framework by investigating the pedagogical readiness of pre-service primary mathematics teachers. Utilizing a vignette-based qualitative design, the research explores how future educators navigate students' mathematical wellbeing crises and opportunities through their pedagogical language and actions. A two-layered content analysis of responses to four pedagogical scenarios identified five distinct profiles: Restorative, Pragmatic/Exam-Oriented, Collective Leader, Traditional/Authoritative, and Idealist/Visionary. A key finding is the emergence of a success paradox, better explained through the expert blind spot phenomenon; the Traditional/Authoritative group reported the highest personal mathematical wellbeing (Mean = 4.0) but demonstrated the most rigid, procedure-oriented pedagogical responses. Conversely, the Idealist/Visionary group reported the lowest personal wellbeing (Mean = 3.5) yet exhibited the most creative and metaphor-rich interventions. The findings further highlight a significant literacy gap between diagnostic capacity and interventional pedagogical fluency. This paper grounds Mathematical Wellbeing Literacy as a situated capability, introducing an interaction matrix that underscores the critical roles of intentionality and context awareness. The study underscores the necessity for teacher education programs to move beyond theoretical awareness toward cultivating a domain-specific literacy of care alongside mathematical mastery.

1.

The landscape of contemporary education is undergoing a profound transformation, moving from a traditional emphasis on singular cognitive metrics toward a more holistic vision of student development. In this evolving paradigm, wellbeing (WB) has transitioned from a peripheral concern to a core educational objective, recognized as intrinsically linked to academic success and lifelong flourishing. Within this broader context, understanding the multifaceted nature of WB within specific disciplines—particularly those traditionally characterized by high cognitive and emotional demands—becomes a vital necessity for modern pedagogical discourse.

1.1. Problem Statement and Significance

Global education agendas are increasingly shifting from a singular focus on cognitive attainment to a more holistic understanding of student development, where WB is recognized as a fundamental outcome (Organisation for Economic Co-operation and Development [OECD], 2019; United Nations, 2023). This paradigm shift acknowledges that academic success is inextricably linked with students' emotional, social, and psychological states (Hill et al., 2022). Integral to this holistic view is the concept of values, which serve as guiding principles that influence choices, judgments, behaviors, and actions toward individual and societal WB (OECD, 2019). The integration of values education has been shown to foster motivation, self-esteem, positive teacher-student relationships, and a sense of school belonging (Benninga et al., 2003, 2006; Clement, 2010), thereby strengthening the overall WB ecosystem within educational settings.

Within this broader context, mathematics education holds a unique and often challenging position. Traditionally characterized by a strong emphasis on rote learning, problem-solving procedures, and high-stakes assessments, mathematics classrooms often become arenas for student anxiety, disengagement,

and diminished self-efficacy (Geist, 2010; Grootenboer & Marshman, 2015). Despite significant global investments in improving mathematics education, persistent negative emotions and attitudes toward the subject are widely reported (Clarkson et al., 2019; Kennedy et al., 2014). This disconnect highlights a critical gap: while the importance of WB is acknowledged in general education, its specific manifestation and cultivation within the mathematics domain remain underexplored.

To address this gap, the concept of mathematical wellbeing (MWB) has emerged as a specialized area of inquiry (Authors, 2026; Clarkson et al., 2010; Hill et al., 2020). Unlike general WB, MWB extends beyond mere feelings of good in a mathematical context; it encompasses positive functionality aligned with individual and collective values, promoting active engagement, perseverance, and a sense of accomplishment in mathematics learning (Hill et al., 2022). What makes MWB special is its embeddedness in the unique cognitive, emotional, and social demands of mathematics. It recognizes that a student's WB in mathematics is shaped not only by their general emotional state but also by their specific interactions with mathematical concepts, problem-solving challenges, and the learning environment itself. For instance, successfully overcoming a complex math problem or contributing positively to a collaborative math activity can uniquely foster a sense of mathematical accomplishment and belonging, distinct from achievements in other subjects.

However, research on how teachers, particularly pre-service teachers, are prepared to manage and foster MWB crises or opportunities in the classroom remains limited. Navigating these complex student experiences effectively demands a specific set of competencies from educators. This is where wellbeing literacy (WBL), defined as the capability to *"comprehend and compose wellbeing language... to maintain or improve wellbeing"* (Oades et al., 2021b, p. 1), becomes a vital lens. Rooted in the capability approach (Oades et al., 2021a), WBL provides teachers with the agency to manifest WB through language and pedagogical action, enabling them to recognize students' emotional states, interpret underlying needs, and respond with effective pedagogical strategies (Lemon et al., 2025).

Therefore, this study aims to contribute to the evolving discourse by investigating how pre-service primary mathematics teachers (PMTs) utilize WBL to manage scenarios involving students' MWB crises. By evaluating fourth-year PMTs through practice scenarios, this research strategically assesses their WBL capacity and professional readiness to support students' WB in the mathematics classroom. This shift in focus from merely measuring students' MWB to understanding the teacher competencies that facilitate it is crucial. Ultimately, this study empirically grounds the novel concept of mathematical wellbeing literacy (MWBL) by integrating the MWB and WBL frameworks, introducing an interaction matrix that highlights intentionality and context awareness as vital for enhancing students' WB. Through this, we seek to provide a comprehensive framework that not only deepens our understanding of pre-service teacher readiness but also informs the development of more effective teacher education programs that foster a truly holistic and supportive mathematics learning environment.

1.2. Theoretical Framework

This study develops a comprehensive theoretical framework by integrating the concepts of MWB and WBL to introduce MWBL. This integrated approach offers a robust lens through which to understand pre-service

teachers' readiness and capacity to foster students' WB within mathematics education. Our framework is built upon established theories of WB, literacy, and the capability approach, systematically illustrating how these domains coalesce into a transformative competency for educators.

1.2.1. Wellbeing and the Capability Approach

At the core of our conceptualization of WB lies the capability approach, primarily advanced by Sen (1993, 1999) and further developed by Nussbaum (2003, 2011). The capability approach is a needs-based framework that emphasizes the importance of genuine freedom and opportunity for individuals to choose and achieve what they value in life. Rather than focusing solely on resources or outcomes (functionings), the capability approach prioritizes capabilities—what individuals are truly able to be and do (Oades et al., 2021a, p. 325). From this perspective, a society with high WB maximizes its citizens' freedom of choice. For instance, while access to a mathematics textbook (a resource) is important, the capability to truly learn and understand mathematics (a functioning) depends on various factors, including the individual's cognitive abilities, a supportive learning environment, and effective pedagogical guidance. WB, therefore, is not merely a state of contentment but a dynamic process shaped by an individual's agency to pursue their valued ways of being and doing. This perspective is particularly relevant in education, where fostering WB involves empowering students to actively shape their learning experiences and outcomes, rather than simply being passive recipients of instruction.

1.2.2. Wellbeing Literacy Framework

Building upon the capability approach, WBL emerges as a critical competency for cultivating WB. Oades et al. (2021b) define WBL as *"the capability to comprehend and compose wellbeing language, across contexts, with the intention of using such language to maintain or improve the wellbeing of oneself, others, or the world."* (p.1). This definition positions language not merely as a communication tool but as a powerful mechanism for shaping reality and fostering WB (Oades et al., 2021b). WBL empowers individuals with the agency to manifest WB through deliberate linguistic and communicative actions, bridging their internal potential with external pedagogical realities. It enables educators to recognize students' emotional states, interpret their underlying needs, and respond with effective pedagogical language (Lemon et al., 2025).

The WBL Framework, as conceptualized by Oades et al. (2021b, p. 5), comprises five interconnected components:

1. Vocabulary and knowledge about WB *(conceptual command)*: This component refers to an individual's proficiency in understanding and articulating WB-related concepts, terms, and evidence-based principles. For PMTs, this means possessing a robust lexicon to identify and discuss the various dimensions of students' WB, moving beyond generic terms toward a more nuanced, specific understanding.
2. Comprehension *(interpreting multimodal texts)*: WBL involves the ability to interpret diverse forms of WB-related communication, including verbal, non-verbal, visual, and written cues. In a classroom setting, this translates to PMTs' capacity to read students' emotional states, body language, and subtle

expressions of disengagement or triumph, and to understand the underlying WB needs conveyed through these multimodal texts.
3. Composition *(expression through writing, speaking, or pedagogical actions)*: This component signifies the ability to express WB language in various modalities effectively. For PMTs, this includes verbally expressing empathy, providing encouraging feedback, designing supportive learning activities, and even employing nonverbal cues, such as a reassuring glance or a moment of silence, to foster a positive emotional climate. Composition is the active output of WB-enhancing communication.
4. Context awareness: WBL necessitates an awareness of how WB language and interventions need to be adapted across different situations, cultural backgrounds, and individual needs (Lemon et al., 2025). PMTs with high context awareness recognize that a strategy effective for one student or scenario might be counterproductive for another, requiring flexible and nuanced application of their WB knowledge.
5. Intentionality *(the framework's core)*: This is the foundational element of WBL, emphasizing the deliberate *"habit of intention"* (Oades et al., 2021a, p. 334) to use language and actions specifically *"to maintain or improve wellbeing"* (p. 329). For PMTs, intentionality means not merely reacting to student behaviors but proactively designing interactions and learning environments with the explicit purpose of enhancing students' WB. This proactive stance distinguishes WBL from passive engagement with WB concepts.

1.2.3. Mathematical Wellbeing Framework

To understand the specific content and dimensions of WB within mathematics education, this study employs the MWB framework (Authors, 2026). This framework, building upon existing models (Clarkson et al., 2010; Hill et al., 2020), posits that MWB is a multifaceted construct encompassing ten key dimensions that capture the unique emotional, cognitive, and social experiences of students in mathematics. The integration of individually driven and social aspects of instruction within this framework is crucial because a student's MWB is not solely an internal psychological state but is profoundly shaped by their interactions within the learning environment. For example, individual perseverance is heavily influenced by the supportive relationships and learning environment a classroom provides.

The ten dimensions of the MWB Framework are (Authors, 2026):

1. Positive emotions: This dimension refers to students experiencing pleasurable feelings such as fun, happiness, excitement, peace, and enthusiasm during mathematics learning and engagement. It captures the joy and intrinsic motivation derived from mathematical activities.
2. Relationship: Encompasses supportive interactions with peers, teachers, and family. It reflects a sense of feeling valued, cared for, and secure in the classroom, fostering emotional security and belonging. This dimension highlights the social interconnectedness crucial for positive learning experiences.
3. Engagement: Describes active involvement and commitment to learning, characterized by concentration, focus, deep interest, and a willingness to be challenged and participate in mathematics tasks. It signifies being absorbed and immersed in mathematical activities.
4. Perseverance: Represents the ability to strive to complete tasks, stay determined, and overcome difficulties in mathematics. Indicators include hard work, seeking help, and resilience in the face of

mathematical challenges.

5. Learning environment: Refers to a supportive classroom climate characterized by minimal noise and distractions, effective organization, and norms that promote student engagement and respect. A conducive environment directly influences students' ability to learn and feel safe.
6. Cognition: Involves having the necessary skills and understanding to undertake mathematics, solve problems, and think critically. It reflects conceptual understanding, strategic problem-solving, and mastery of mathematical content.
7. Passion for learning: Captures a strong enthusiasm for acquiring new knowledge, exploring concepts, and appreciating knowledge as a tool for personal development. It signifies an intrinsic love for discovery and intellectual growth in mathematics.
8. Supportive actions: Encompass behaviors that foster a positive attitude towards mathematics, such as using creative methods for study (e.g., drawing pictures, using games), listening to music while studying, or personalizing learning materials. These actions enhance engagement and make learning more enjoyable.
9. Accomplishment: Reflects skill, confidence, and personal growth in academic competence, including achieving goals, completing tasks, and a sense of mastery in mathematics. It signifies the satisfaction derived from successful mathematical endeavors.
10. Connection: This dimension emphasizes the view that mathematics is a valuable and relevant discipline, highlighting its importance in everyday life, professions, and personal goals. It involves feeling that mathematics is purposeful and contributes to one's aspirations, such as becoming a mathematics teacher.

The combination of individually driven aspects (such as perseverance and passion for learning) and social aspects related to instruction (such as relationships and the learning environment) within the MWB framework is deliberate. It reflects the understanding that MWB is an ecological construct in which personal traits interact dynamically with the surrounding pedagogical and social ecosystem. A teacher's classroom organization, for instance, directly impacts a student's ability to focus, while positive peer relationships can bolster individual resilience during challenging tasks. Therefore, analyzing these intertwined dimensions provides a holistic view necessary for effective intervention.

1.2.4. Mathematical Wellbeing Literacy: An Integrated Framework

This study critically integrates the MWB and WBL frameworks to conceptualize MWBL. This novel concept represents a transformative competency for PMTs, enabling them to effectively understand, assess, and actively support students' WB within the unique context of mathematics education.

As our initial theoretical premise states, MWB defines the content *(the what)* of WB experiences in mathematics, detailing what students feel, think, and experience regarding their mathematical journey. WBL, in turn, provides the process-oriented lens *(the how)* for intervention, outlining how PMTs can deploy linguistic and pedagogical tools to comprehend, compose, and adapt WB language to support students. Therefore, MWBL signifies the capability of PMTs to:

- Comprehend the multifaceted dimensions of student MWB (*the what*) by interpreting various cues (e.g., a student's emotional state, their engagement level, their perception of the learning environment).
- Compose and adapt pedagogical language and actions *(the how)* that are intentionally designed to foster and improve these MWB dimensions, demonstrating context awareness and empathy.

This integrated MWBL framework moves beyond viewing MWB as a static attribute to be measured, instead framing it as a dynamic construct that PMTs can actively influence through their pedagogical literacy. It highlights that effective pre-service teacher readiness in supporting students' WB in mathematics is not merely about understanding psychological theories but crucially about the applied skill of using language and pedagogical strategies to identify, respond to, and cultivate positive MWB experiences. By studying PMTs' MWBL through practice scenarios, we aim to uncover the intricate ways these future educators mobilize their competencies to bridge theory and practice in promoting students' thriving in mathematics.

1.3. Purpose and Research Problem

This study aims to examine in depth the WBL capacities of PMTs as they navigate pedagogical scenarios involving students' MWB crises and opportunities. Specifically, the research explores the interaction between these two theoretical frameworks to understand how future educators' readiness to support student development manifests in their pedagogical language and actions. To achieve this goal, the following research questions were addressed:

RQ1. How do PMTs diagnose the specific dimensions of students' MWB within pedagogical scenarios?

RQ2. In what ways do PMTs mobilize their WBL components to construct interventions for the diagnosed MWB challenges?

RQ3. What distinct profiles of MWBL emerge from the interaction between PMTs' diagnostic and interventional approaches?

2. METHOD

2.1. Research Design

This study employed a qualitative multiple-case study design (Merriam, 2009; Yin, 2018) to explore the complex interactions between MWB and WBL. The multiple-case study approach was selected as it allows for an in-depth, multi-faceted exploration of a complex issue within its real-life context (Stake, 2006). By using pedagogical scenarios, the research aimed to elicit deeply reflective responses that reveal the PMTs' underlying pedagogical belief systems and professional readiness, moving beyond surface-level intuitions.

2.2. Participants and Context

To contextualize the pedagogical readiness of the participants, it is essential to outline the teacher education system in Türkiye. The Primary Mathematics Teacher Education program is a standardized four-year undergraduate curriculum provided by Faculties of Education. This curriculum is systematically built upon four core pillars: Subject Matter Knowledge, which comprises pure mathematics courses such as

Calculus, Linear Algebra, Statistics, and Geometry; Pedagogical Content Knowledge, specifically tailored to mathematics instruction through courses on teaching methods, misconceptions, and assessment in mathematics education; General Pedagogical Knowledge, encompassing broader educational sciences such as Educational Psychology, Classroom Management, and Measurement and Evaluation; and General Culture, covering interdisciplinary subjects such as the History of Education, Ethics, and Philosophy. By their fourth year, pre-service teachers have completed most of their theoretical and pedagogical coursework and are actively engaged in Teaching Practice, which involves school-based observations and supervised teaching trials under the guidance of mentors. In this sense, the participants in this study were 30 fourth-year PMT students (14 women, 16 men) in their final semester before graduation, selected from two state universities in Türkiye via convenience and criterion sampling methods (Patton, 2015). The selection was based on two criteria: successful completion of all pedagogical field courses and active involvement in Teaching Practice. This dual-institutional approach was chosen to enhance the transferability of the findings by diversifying the participants' pedagogical backgrounds (Lincoln & Guba, 1985). In addition to their pedagogical responses, data regarding participants' grade point averages, high school background, and self-perceived MWB (measured on a 5-point Likert scale) were collected. The group's mean average self-perceived MWB was 3.76/5.0, indicating a moderate level of personal WB in mathematics learning.

2.3. Data Collection Tools and Data Collection

The primary data collection tool was the Pedagogical Class Scenario Inventory developed by the researchers (see Appendix A). This study utilized the vignette technique (Finch, 1987), which is recognized as an effective method for exploring PMTs' attitudes, perceptions, and belief systems in a non-threatening manner (Skilling & Stylianides, 2020). The inventory consists of four distinct scenarios (vignettes), each representing a specific MWB crisis or opportunity commonly encountered in mathematics classrooms:

- *Scenario 1*: Focuses on a student experiencing high anxiety and a crisis of perseverance.
- *Scenario 2*: Addresses a student questioning the utility and connection of mathematics to real life.
- *Scenario 3*: Depicts a student whose creative but non-standard engagement might be misinterpreted as disengagement.
- *Scenario 4*: Presents a moment of successful discovery, requiring the teacher to manage shared accomplishment without alienating others.

For each scenario, PMTs were asked three open-ended questions designed to measure their Comprehension (diagnosis), Composition (pedagogical response), and Intentionality/Context Awareness (purpose).

The inventory was administered digitally, and PMTs were given a two-week window to provide their reflections. This extended timeframe was intentional to facilitate slow reflection, allowing PMTs to move beyond impulsive reactions toward more considered, professional responses.

2.4. Data Analysis: Two-Layered Coding Strategy

To decode the complex structure of pre-service teacher readiness, a systematic two-layered coding strategy was employed (Elo & Kyngäs, 2008). This process integrated both deductive and inductive approaches to ensure theoretical grounding and data-driven insights (Hsieh & Shannon, 2005):

- Layer 1: Identifying MWB dimensions (deductive): In this layer, a directed content analysis was used to identify which of the ten dimensions of the MWB framework (e.g., Cognition, Relationship, Accomplishment) the PMTs prioritized.
- Layer 2: Identifying WBL Components (inductive): The responses were then coded using the five components of WBL. This layer examined the PMTs' vocabulary, depth of comprehension, quality of composition, and level of context awareness.
- Synthesis and Interaction: By intersecting these two layers, an interaction matrix was created for each PMT. This allowed the researchers to visualize how specific literacy components were mobilized to address specific wellbeing dimensions (see Table 1).
- Profile Construction: Finally, through the constant comparative method (Corbin & Strauss, 2014), PMTs with similar interaction patterns were grouped into five distinct profiles (e.g., Traditional/Authoritative).

Table 1
Data Analysis Example

Scenario	Quotation	Layer 1: MWB Dimension	Layer 2: WBL Component	Researcher's Note (Findings)
Scenario 1	*"Ayşe is anxious and panicking... She is creating her own stress and prejudice."*	-Positive emotions (Negative pole: Anxiety/Panic)	-Vocabulary and knowledge about WB	PMT demonstrates *vocabulary and knowledge* proficiency by naming emotions with specific terms (anxiety, panic, stress).
	"I will explain that it is because of the noise in the classroom, and I would like him to step away for now... we will talk during recess."	-Learning environment (Noise factor) -Relationship (Individual attention)	-Context awareness -Intentionality	Rather than attempting to solve the problem during the crisis, PMT demonstrates *contextual awareness* and *intentionality* by changing the environment (e.g., taking a break).
Scenario 2	*"This is not disrespectful; it is an expression of need. Topics are considered unnecessary unless they are related to real life."*	-Connection (The value of mathematics)	-Comprehension	PMT correctly interprets the student's rebellion; the framework diagnoses the underlying *comprehension* rather than the behavior.
	"I explain that the soccer field is rectangular, the angle of the kick, and the probability of scoring a goal."	-Connection (Professional relationship) -Cognition	-Composition	PMT produces a rich pedagogical language and content *composition* tailored to the student's area of interest (soccer).
Scenario 3	*"A different kind of intelligence, a different way of learning... It symbolises it visually."*	-Supportive actions (Creative action) -Cognition	-Vocabulary and knowledge about WB	PMT demonstrates *vocabulary and knowledge* by explaining the situation through pedagogical terminology (e.g., learning type, symbolization).
	"I invite them to the blackboard and show them to the class. I say that scientists discovered it this way, too."	-Supportive actions (Approval) -Accomplishment	-Composition -Intentionality	PMT enacts *intentionality* by strategically transforming a potentially disruptive action into a scientific discovery activity.
Scenario 4	*"Problem-solving steps and strategies have been developed."*	-Cognition (Strategic thinking)	-Vocabulary and knowledge about WB	PMT demonstrates *vocabulary and knowledge* by describing the student's success using technical terminology (e.g., strategy, steps).

Scenario	Quotation	Layer 1: MWB Dimension	Layer 2: WBL Component	Researcher's Note (Findings)
	"I help them by asking simpler questions to others, so they feel good."	-Accomplishment (The thrill of achievement)	-Context awareness	PMT demonstrates *context awareness* by addressing the knowledge gap in the classroom through level-appropriate questioning.

2.5. Trustworthiness of the Study

To ensure the rigor and validity of the findings, the criteria of credibility, transferability, dependability, and confirmability were strictly followed (Lincoln & Guba, 1985). First, data were transcribed verbatim, and member checking was conducted by sharing the results with a subset of participants to validate the researchers' interpretations. Theoretical triangulation was achieved by integrating the MWB and WBL frameworks, while data triangulation was ensured using four diverse classroom scenarios (Nowell et al., 2017). To maintain reliability and minimize researcher bias, a peer review process was conducted; two independent experts reviewed 10% of the data (see Macnealy, 1999), resulting in a high inter-coder agreement coefficient (Cohen's Kappa) of 0.95. Finally, the findings were supported by extensive direct quotations to provide a thick description, ensuring the results are deeply rooted in the participants' original context.

2.6. Ethical Considerations

The study was conducted in accordance with the ethical standards of the institutional research committee. Ethical approval for this research was obtained from the ethics committee of the authors' institution. Prior to data collection, all participants were informed about the purpose of the research, the voluntary nature of their participation, and their right to withdraw from the study at any time without any penalty. To ensure confidentiality and anonymity, the names of the PSTs were replaced with codes (e.g., P1, P2, ..., P30) throughout data analysis and reporting.

3. FINDINGS

The analysis of 30 PMTs revealed a complex interaction between their diagnostic capacities and their interventional strategies. The findings are structured according to the three research questions, moving from specific components to integrated PMTs profiles.

3.1. Diagnostic and Interventional Patterns

The study first examined how PMTs used WBL to decode and address MWB issues. A fundamental pattern emerged: Diagnosis (RQ1) was primarily driven by WBL-Vocabulary and knowledge about WB and WBL-Comprehension, while Intervention (RQ2) was constructed through WBL-Composition, WBL-Context Awareness, and WBL-Intentionality.

- Diagnostic Tools (RQ1): Participants successfully identified student crises by utilizing pedagogical vocabulary. For instance, in the Scenario, participants moved beyond identifying sadness to diagnosing

cognitive congestion and learned helplessness. This indicates that their theoretical training allowed them to read the subtext of student behavior.

- Interventional Mobilization (RQ2): The transition from diagnosis to action showed significant variation. While all participants could name the problem, only 46% (n = 14) could construct a sophisticated pedagogical response. High-performing participants utilized metaphors (e.g., mathematics as mental conditioning) and context-specific adaptations (e.g., relating algebra to soccer) to repair students' connection with the subject.

3.2. Emergence of Mathematical Wellbeing Literacy Profiles

By intersecting diagnostic and interventional patterns, five distinct profiles of MWBL emerged. The PMTs' self-perceived MWB scores (on a scale of 1–5) provided an additional layer of understanding, suggesting that a PMT's personal relationship with mathematics shapes their pedagogical readiness (see Table 2).

Table 2
Distribution of PMTs according to WBL Profiles

Profile group	Mean self-perceived MWB	PMT	MWB dimension	Dominant WBL components used
Traditional/ Authoritative	4.0	P3, P6, P11, P18, P26	-Relationship -Engagement	-Composition: Fixed mindset language -Intentionality: Preserving authority
Pragmatic/ Exam-Oriented	3.83	P9, P10, P13, P21, P27, P29	-Connection -Accomplishment	-Context awareness: System realism and plan B -Comprehension: Negative acceptance
Collective Leader	3.8	P15, P16, P17, P25, P30	-Learning environment -Accomplishment	-Context awareness: Inclusion -Intentionality: Timing
Restorative	3.75	P4, P7, P8, P12, P19, P20, P23, P24	-Positive emotions -Cognition	-Intentionality: Re-attribution & Trust building -Composition: Self-disclosure & Inclusive language
Idealist/ Visionary	3.5	P1, P2, P5, P14, P22, P28	-Connection -Cognition	-Vocabulary and knowledge about WB: Scientific terminology -Composition: Powerful metaphors and analogies

3.2.1. Profile 1: Traditional/Authoritative

Surprisingly, while the Traditional/Authoritative profile reported the highest personal WB in mathematics (Mean = 4.0), they demonstrated the least pedagogical flexibility. Their approach to student support was primarily confined to the Relationship and Engagement dimensions of MWB; however, these dimensions were managed through a lens of teacher-led control rather than emotional resonance. Regarding their dominant WBL components, their Composition was characterized by fixed-mindset language (e.g., P11: *"Well done, you followed the steps correctly"*), which prioritized procedural accuracy over a student's emotional state. Furthermore, their Intentionality remained centered on preserving teacher authority and maintaining classroom order, often resulting in interventions that prioritized adherence to mathematical procedures over holistic emotional support.

3.2.2. Profile 2: Pragmatic/Exam-Oriented

The Pragmatic/Exam-Oriented profile (Mean MWB = 3.83) viewed students' WB predominantly through the lens of systemic requirements and high-stakes testing. Their WBL-Comprehension was characterized by negative acceptance, in which student distress was acknowledged as an inevitable byproduct of the competitive educational system rather than as a situation to be emotionally transformed. Consequently, their interventions focused on the Connection and Accomplishment dimensions of MWB, but these were framed purely in terms of future utility. Utilizing WBL-Context awareness rooted in system realism and Plan B strategies, they justified the value of mathematics as a pragmatic tool for exam success rather than an intrinsic pursuit (e.g., P13: *"...he might need this knowledge"*). Their primary aim was to maintain the students' sense of accomplishment by ensuring they remain functional within the existing constraints of the national examination system.

3.2.3. Profile 3: Collective Leader

The Collective Leader profile (Mean MWB = 3.8) distinguished itself by shifting the focus from individual student crises to the classroom ecosystem as a whole. This group primarily addressed the Learning environment and Accomplishment dimensions of MWB, aiming to cultivate a climate in which success is perceived as a communal asset rather than a basis for peer comparison. Their mobilization of WBL was rooted in Context awareness: Inclusion, as they consistently viewed individual student experiences through the lens of the whole class's WB. Furthermore, their Intentionality: Timing proved critical; they demonstrated a deliberate habit of choosing specific pedagogical moments to transform individual discoveries into shared learning opportunities. For example, in Scenario 4, rather than isolating a student's success, P25 reframed it as a collective victory to prevent peer inadequacy and foster a supportive learning environment: *"Success is... shared... showing different ways of thinking."* By doing so, they used individual accomplishment to strengthen the classroom's collective mathematical identity.

3.2.4. Profile 4: Restorative

The Restorative profile (Mean MWB = 3.75) demonstrated the most sophisticated use of pedagogical empathy and linguistic literacy. These PMTs primarily addressed the Positive emotions and Cognition dimensions of MWB, operating on the premise that emotional repair is a prerequisite for cognitive re-engagement. Their WBL-Composition was distinguished by the strategic use of self-disclosure and inclusive language, which served to normalize student struggle and lower affective filters. Furthermore, their

Intentionality was centered on re-attribution and trust building; instead of viewing student rebellion or disengagement as a lack of innate talent, they diagnosed it as an expression of need or emotional turbulence. By shifting the student's own failure attribution from internal/stable (lack of ability) to external/temporary (current stress), they aimed to restore both the student's positive emotions and their cognitive confidence. For example, P20 adopted a trust-building stance by stating, "I apologize... never stop working," demonstrating a commitment to repairing the student's damaged relationship with mathematics through vulnerable, supportive pedagogical language.

3.2.5. Profile 5: Idealist/Visionary

The Idealist/Visionary profile (Mean MWB = 3.5) exhibited a unique paradox; despite having the lowest personal WB scores in the study, these PMTs demonstrated the most creative and intellectually stimulating pedagogical language. Their interventions were primarily focused on the Connection and Cognition dimensions of MWB, aiming to help students find intrinsic meaning and intellectual value in mathematics. In terms of their WBL development, they utilized a robust Vocabulary and knowledge about WB: Scientific terminology to diagnose student crises, often identifying deep-seated cognitive barriers with technical precision. Their greatest strength lay in their Composition: Powerful metaphors and analogies that bridged abstract mathematical concepts with students' personal interests. For example, P23 utilized this visionary stance by reframing soccer as a coordinate plane: *"The best footballers... calculate the angle... in their minds."* By transforming a disconnected moment into a profound opportunity for mathematical connection, they aimed to re-ignite the student's cognition and passion for discovery.

3.3. Theoretical Interaction Between Mathematical Wellbeing and Wellbeing Literacy

The core of MWBL lies in the dynamic interaction between students' MWB experiences (the what) and PMTs' pedagogical responses (the how). This interaction is not merely a linear reaction but a sophisticated process of decoding student needs and constructing intentional interventions. To illustrate this process, Table 3 presents a representative matrix of the most dominant interactions observed in the study. While ten dimensions were analyzed in total, the following four-Positive Emotions, Relationship, Cognition, and Connection—best exemplify the transformative potential of high-level WBL.

Table 3
Representative Interactions within the MWBL Matrix (Selected Dominant Dimensions)

MWB dimension	WBL component				
	Vocabulary and knowledge about WB	**Comprehension**	**Composition**	**Context awareness**	**Intentionality**
Positive emotions	Anxiety, panic, cognitive load, and learned helplessness terms	Understanding the root cause of the crisis as emotional turbulence rather than a lack of talent	Normalisation: *"What you are feeling is perfectly normal; everyone experiences it."*	Physical environment: Being aware of the oppressive effects of noise and crowds.	Emotion regulation: Reducing and calming the student's current high anxiety
Relationship	Teacher-student bond, trust, sense of belonging	Distinguishing rebellion from a call for help as disrespectful	Inclusivity: *"I am here." "My only daughter.", "We will manage together."*	Power balance: Positioning teacher authority as protective rather than punitive	Building trust: Ensuring that the student does not feel alone and trusts the teacher
Cognition	Metacognition, cognitive schema, and reasoning	Viewing Elif's success as conceptual understanding rather than rote memorisation	Thinking language: *"You thought like a mathematician", "You grasped the logic."*	Cognitive level: Distinguishing between formula (operational) and logic (conceptual)	Mindset shift: Changing the perception of success from being results-oriented to process-oriented
Connection	Interdisciplinary connection, career, and real life	Coding mathematics as an exam obstacle (negative) or a tool for life (positive)	Metaphor: *"Mental muscle", "Coordinate field", "Key."*	Sociological reality: Taking into account the reality of the secondary school entrance exam or the student's career aspirations	Meaning-making: Providing a satisfactory answer to the student's question, *"Why am I learning this?"*

Note: The full interactional matrix covering all ten MWB dimensions is provided in Appendix B.

The interactions summarized in Table 3 reveal that a pre-service teacher's readiness is defined by their ability to move from Diagnosis to Action. Specifically, the components of Vocabulary and Comprehension provide the diagnostic foundation, allowing teachers to identify cognitive congestion or learned helplessness in scenarios where a less literate teacher might only see inattention.

The transition to intervention is then mobilized through Composition, Context Awareness, and Intentionality. A notable example of this mobilization is observed in the MWB-Connection dimension, where high-literacy PMTs (such as P2 and P23) avoided generic encouragement. Instead, they utilized sophisticated WBL-Composition to create metaphors that bridged the gap between abstract mathematics and students' personal worlds (e.g., reframing soccer as a coordinate plane). Furthermore, the mobilization of WBL-Intentionality proved critical in reshaping failure attributions; by shifting the student's perspective from internal inability to temporary struggle, teachers aimed to restore both the student's positive emotions and their cognitive confidence. These patterns suggest that MWBL is a transformative competency that converts classroom crises into opportunities for meaningful mathematical growth.

4. DISCUSSION

The findings of this study provide empirical grounding for the emerging concept of the MWBL, illustrating that pre-service teacher readiness to support students' WB is a multi-layered, transformative competency. The interaction between PSTs' personal WB and their pedagogical responses reveals critical insights into the literacy gap in mathematics education.

A primary contribution of this study is the development and empirical grounding of the MWBL framework. Traditional approaches to WB in mathematics often treat it as a static psychological outcome to be measured, resonating with a purely hedonic perspective that overlooks the eudaimonic potentials of classroom flourishing (Ryan & Deci, 2001). However, by integrating the multidimensional dimensions of MWB (Clarkson et al., 2010; Hill et al., 2020) with the process-oriented components of WBL (Oades et al., 2021b), this study reframes WB as a dynamic pedagogical capability.

The MWBL interaction matrix (Table 3) serves as a cognitive road map for educators. It demonstrates that supporting students' WB is not merely an act of vague empathy but a structured cycle of intention and action. Our findings suggest that high-level MWBL requires a seamless transition from conceptual command (diagnosing the *what*) to pedagogical composition (executing the *how*). As Oades (2021a) emphasizes through the capability approach, literacy is the capability to function. In the context of mathematics, this means that a PMT's literacy is not defined by what they know about student anxiety, but by their agency to transform that anxiety into a learning opportunity through deliberate language, serving as a measurable and intentional capability to maintain or improve WB (Hou et al., 2021).

Furthermore, the MWBL framework bridges the gap between the individual and the pedagogical. While general WB models like Seligman's PERMA (2011) provide a foundational lexicon of flourishing, they often lack the domain-specific nuances required for the mathematics classroom, where specific values and disciplinary demands uniquely shape the learning experience. The MWBL framework addresses this by embedding mathematical values—such as perseverance in problem-solving and logical connection—into the literacy components. This domain specificity distinguishes MWBL from general mental health literacy; it recognizes that WB in mathematics is uniquely tied to the cognitive struggles inherent in the subject, where affect is not merely a byproduct but an integral, socially situated component of mathematical cognition (Hannula, 2012). By providing a structured interactional lens, the MWBL framework offers teacher education programs a concrete tool to move beyond theoretical awareness toward applied pedagogical readiness,

aligning with the broader mandate of implementing strategic, evidence-based frameworks for WB in educational settings (White & Murray, 2015).

The use of pedagogical scenarios (vignettes) in this study proved a critical tool for uncovering the intricate and often contradictory layers of PMTs' WBL. According to Skilling and Stylianides (2020), vignettes provide a unique methodological bridge between espoused beliefs *(what teachers say they believe)* and intended pedagogical actions *(how they actually respond in a given context)*. Our findings regarding the literacy gap—where PMTs demonstrated high diagnostic vocabulary but struggled with interventional composition—strongly support Skilling and Stylianides' (2020) assertion that traditional questionnaires often overlook the situational complexities of pre-service teacher readiness.

While a general survey might capture a universal commitment to students' WB, our context-specific scenarios revealed the situated capabilities of the PMTs, exposing how underlying fixed mindsets (as seen in the Traditional profile) or creative agency (as seen in the Idealist profile) manifest only when triggered by simulated classroom crises and in alignment with the framework of Skilling and Stylianides (2020), the high degree of alignment between our scenario design and the MWBL framework ensured that the responses were not merely intuitive reactions but reflections of the PMTs' professional readiness. This confirms that MWBL is not a static knowledge base but a dynamic, situated capability that is activated during the complex and unpredictable moments of mathematical instruction.

A significant finding of this research is the inverse relationship between personal success and pedagogical flexibility, best exemplified by the Traditional/Authoritative profile. These PMTs reported the highest personal MWB (4.0), yet demonstrated a rigid, procedure-oriented approach. This suggests a success bias or, more specifically, an expert blind spot (Nathan & Petrosino, 2003). As Nathan and Petrosino (2003) demonstrated among pre-service teachers, high content mastery can paradoxically eclipse an educator's ability to recognize and empathize with the cognitive and emotional struggles of novice learners. In this study, the Traditional profile's reliance on fixed-mindset language (e.g., *"you followed the steps"*) indicates that their high personal WB is rooted in performance and procedural accuracy rather than the learning process itself. This focus on correctness may inadvertently undermine student autonomy and internal motivation, resonating with the Self-Determination Theory, which posits that over-reliance on external control and procedural rigidity can diminish a student's sense of competence and relatedness (Deci & Ryan, 2000).

In contrast, the Idealist/Visionary profile, despite having the lowest personal MWB (3.5), displayed the most sophisticated WBL-Composition. This suggests that personal struggle or a critical stance toward the subject might foster a deeper vocabulary of WB and a more creative drive to humanize mathematics for others. This aligns with the capability approach (Oades et al., 2021a), in which WB is not merely an individual state of being but a dynamic agency that enhances the lives of others. While Seligman's PERMA model (2011) emphasizes individual flourishing, our findings suggest that in a pedagogical context, high individual flourishing (4.0) does not automatically translate into a literacy of care unless it is coupled with a growth mindset (Dweck, 2006). Without this mindset, high-achieving future teachers may struggle to bridge the gap between their own expert understanding and the struggling world of their students (Nathan & Petrosino, 2003).

The study highlights a clear distinction between conceptual command (Vocabulary and knowledge about WB, Comprehension) and active mobilization (Composition, Intentionality). While most PMTs successfully decoded student distress using academic terminology (e.g., cognitive load, learned helplessness), only 46% could compose an effective restorative response. This gap confirms that knowing the language of WB is fundamentally different from being fluent in its pedagogical application (Oades et al., 2021b).

This finding resonates with previous research emphasizing that teacher education programs significantly shape PMTs' pedagogical and epistemological beliefs (Author, 2014). Identifying a student's anxiety (Diagnosis) is primarily a cognitive act rooted in the knowledge acquired during teacher training but reframing that anxiety through powerful metaphors (Composition) is a belief-driven and value-based pedagogical act. While teacher education provides PMTs with the necessary diagnostic tools and theoretical beliefs, there remains a notable gap in transforming these beliefs into applied pedagogical fluency (Author, 2014). The high-literacy PMTs used metaphors (e.g., "mental muscle") to transform abstract crises into relatable challenges, effectively bridging students' Cognition and Connection dimensions. As Lemon et al. (2025) argue, this pedagogical fluency allows PMTs to create a pedagogy of belonging that serves as a guiding principle in the traditionally cold and detached domain of mathematics (Allen & Bowles, 2014).

The emergence of the Pragmatic/Exam-Oriented profile underscores that MWBL is not a vacuum-sealed psychological trait but an ecological construct, deeply embedded in the various layers of human development and institutional structures (Bronfenbrenner, 1979). The negative acceptance observed in this group reveals how macro-systemic pressures from high-stakes testing (e.g., LGS/YKS in the Turkish context) can limit a PMT's Intentionality. When a PMT views the system as unchangeable, their WBL becomes defensive rather than transformative, confirming that teacher agency is often constrained by systemic responsibilities and the broader educational ecosystem (Biesta, 2015).

Even when a teacher has the vocabulary to recognize an MWB crisis, the pressure to cover the curriculum may force them into a pragmatic stance, prioritizing Accomplishment over Positive Emotions. This tension reflects a conflict between the OECD's (2019) holistic WB goals and the local realities of competitive assessment, illustrating how high-stakes testing frequently narrows pedagogical choices and forces teachers to prioritize exam-driven outcomes over student emotional health (Polesel et al., 2014). For MWBL to be truly effective, teacher education must address not only individual competencies but also how to navigate these systemic boundaries without losing pedagogical agency (Authors, 2026).

Finally, the Collective Leader profile offers a promising model for classroom intervention. By reframing individual accomplishment as a shared victory, these PMTs demonstrated high Context Awareness. This move shifts the focus from competitive social comparison—often a source of mathematical illbeing—to a supportive Learning Environment. This pedagogical move aligns with the social constructivist view of WB, where individual flourishing is inextricably linked to the social identity and collective health of the entire classroom (Haslam et al., 2009). This suggests that high-level MWBL involves the ability to manage the emotional climate of the entire room. While such emotional regulation is vital for student engagement, our findings suggest it remains a skill that is largely overlooked in traditional mathematics methods courses, despite evidence that a teacher's emotional experience and their ability to manage class-wide emotional antecedents are fundamental to positive learning outcomes (Frenzel et al., 2009).

5. CONCLUSION

This study introduces and empirically validates the MWBL framework as a transformative competency for future mathematics educators. The research moves the academic discourse beyond the mere measurement of students' WB, focusing instead on the pedagogical readiness required to foster it within the unique cognitive and emotional demands of the mathematics classroom.

A primary conclusion of this research is the identification of the success paradox, where high personal MWB (Mean = 4.0) does not automatically translate into effective WBL. In fact, the rigid pedagogical responses observed in the Traditional profile suggest that personal success can lead to an expert blind spot (Nathan & Petrosino, 2003), in which PMTs' own mastery inadvertently eclipses their ability to empathize with students' struggles. This suggests that MWBL is not an innate trait but a situated capability that requires deliberate training to develop the pedagogical fluency—the transition from mere diagnosis to restorative composition—needed to support students emotionally.

Ultimately, the MWBL framework provides a cognitive and pedagogical road map for teacher education. By moving from a diagnosis-only stance to an intentional intervention stance, future teachers can learn to transform classroom crises into opportunities for meaningful connection. Cultivating MWBL is not an addition to the mathematics curriculum but a fundamental re-imagining of it—one where the literacy of care and mathematical mastery are inextricably linked through a growth-oriented pedagogical mindset.

6. LIMITATIONS AND FURTHER RESEARCH

Despite its contributions, this study has several limitations that offer fertile ground for future inquiry. First, the data were collected through pedagogical scenarios (vignettes). While scenarios are effective for eliciting deep pedagogical reflections, as noted by Skilling and Stylianides (2020), they capture intended actions and espoused beliefs rather than real-time classroom behaviors. Further research may employ longitudinal observations or video-stimulated recall to examine how these MWBL profiles manifest in the unpredictable and complex environment of actual mathematics instruction.

Second, the study highlights a significant ecological constraint imposed by system realism and high-stakes testing (e.g., LGS/YKS in Türkiye). Since systemic pressures were found to limit participants' intentionality, further research may investigate how WBL can be sustained within competitive educational ecosystems. Quantitative studies with larger, international samples are needed to test the statistical correlations between teacher traits, their own WB scores, and their literacy levels across different cultural contexts.

Third, the identified literacy gap between diagnosis and intervention provides a clear mandate for teacher education reform. Further research may focus on intervention studies that test specific training modules designed to enhance WBL-Composition and WBL-Context awareness. Investigating how to move PSTs from a Traditional profile toward a Restorative or Collective Leader stance through professional development remains a critical area for improving the holistic quality and emotional climate of mathematics education.

Declarations

Competing Interests: The authors declare no competing interests.

Data Availability: The datasets generated and/or analysed during the current study are not publicly available due to participant privacy and ethical considerations; however, a de-identified version has been provided as a supplementary file for the purposes of the peer review process.

Ethical Approval: Ethical approval for this study was obtained from the Scientific Research and Publication Ethics Committee of [University Name Redacted for Review] (Approval No: [Protocol Number Redacted], January 24, 2026). All procedures performed in this study were conducted in accordance with the ethical standards of the institutional research committee and relevant ethical guidelines.

Informed Consent: Informed consent was obtained from all participants and/or their legal guardians involved in the study.

Author Contributions: G.S. conceptualized the research, developed the methodology, performed the data collection and analysis, and wrote the initial draft of the manuscript. Y.D. supervised the research, provided critical feedback on the theoretical framework and analysis, and revised the manuscript for important intellectual content. Both authors reviewed and approved the final version of the manuscript.

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Figures

Pedagogical Class Scenario Inventory

Guidance: Below are four different student scenarios that you are very likely to encounter in your professional life. Please read each scenario carefully and answer the questions by saying, *"If I were the class teacher..."*.

Scenario	Question 1	Question 2	Question 3
You are in your Year 7 maths lesson. The class is quite crowded, and the noise from the students at the back makes it difficult to teach. At that moment, you notice Ayşe, a quiet student sitting at the front, closing her test book. When you go over to her, you see that Ayşe's eyes are filled with tears and she is furiously scribbling on the page. In a low, trembling voice, she says to you, *"Sir, it's so noisy, my brain has stopped working. I understood this topic at home, but I can't do it now. No matter how hard I try, it's not working. I guess I'll never be able to do maths."*	How would you describe Ayşe's situation and how she feels? What do you think is the root cause of the problem here?	At that moment, leaning over to Ayşe, what exactly would you say to calm her down and get her back to the lesson?	What emotion or thought of Ayşe's did you aim to change with this sentence you constructed?
Mert, an eighth-grade student, is overwhelmed by the pressure of preparing for the secondary school entrance exam. While working on algebraic expressions, he suddenly puts down his pen and raises his voice in a rebellious tone: *"Teacher, enough is enough! What use are these x's, y's, and square roots to me in real life? I want to be a footballer; I'm going to be a coach. Are we going to use factorisation in the grocery store? We're wasting our time; this class is nothing but torture for me!"*	Do you view Mert's reaction as disrespectful or as an expression of need?	How would you respond to Mert about the value of mathematics in a way that is convincing but does not devalue his dreams?	When giving this response, how would you create a context that maintains the motivation of the rest of the class?
Can, a Year 6 pupil, instead of listening to your explanation of fractions in maths class, is drawing cakes and pizzas representing fractions in his notebook with coloured pens and showing them to his neighbour, laughing. From a traditional perspective, this situation could be seen as disrupting the lesson. However, when you look at Can's notebook, you realise that he is actually expressing the topic you explained through pictures and play in his own world.	How would you assess Can's behaviour in terms of his mathematics learning?	Without suppressing Can's energy and communication with his friend, what would you say to Can (and the class) to turn this into a learning opportunity for the class as a whole?	How did you aim to shape your relationship with Can through your response?
Fifth-grade student Elif struggles for a long time to solve a challenging, reasoning-based question you have written on the board. While the other students in the class are still unable to put pen to paper, Elif develops a different strategy and solves the question. In the excitement of the moment, she raises her finger, her eyes sparkling, and shouts: *"Teacher, I've got it! I forgot the formula you gave us, but it works if you break the shape down into parts. I feel like a genius, this is amazing!"*	What does Elif forgetting the formula and finding her own way make you think about her?	What would you say to Elif to reinforce and make permanent this feeling of being a genius that she experienced?	How would you turn Elif's success into a shared achievement without making the other students in the class who couldn't solve the problem feel inadequate?

Figure 1

Pedagogical Class Scenario Inventory. This figure presents four distinct student scenarios (Ayşe, Mert, Can, and Elif) and the corresponding reflective questions designed to evaluate pedagogical responses in a mathematics classroom context (Appendix A).

Supplementary Files

This is a list of supplementary files associated with this preprint. Click to download.

- SuplementaryFileENG.xlsx
- AppendixAandB.docx