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Enhancing Numeracy Literacy of Prospective Primary School Teachers through the Realistic Mathematics Education Approach in Teaching Practice

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ABSTRACT

This study examines how the Realistic Mathematics Education approach enhances numeracy literacy among prospective primary school teachers by synthesizing findings from recent empirical studies. The analysis demonstrates that RME significantly strengthens conceptual understanding, contextual reasoning, and mathematical communication by grounding instruction in meaningful real-life situations. Evidence indicates that RME promotes active engagement, higher-order thinking, and durable numeracy competence, particularly when integrated with ethnomathematics, digital tools, or project-based learning. However, the findings also highlight persistent challenges, including limited teacher readiness, difficulties in designing contextual tasks, and gaps between university instruction and school practices. These challenges underscore the need for structured coaching, curriculum alignment, and supportive institutional environments. The study concludes that enhancing numeracy literacy through RME requires comprehensive reforms across curriculum design, pedagogical strategies, and national policy frameworks. Such systemic integration ensures that future teachers acquire the professional and pedagogical skills necessary for delivering effective numeracy instruction.

INTRODUCTION

Numeracy literacy has become a core pedagogical requirement in the 21st-century primary school curriculum due to its role in shaping students' reasoning, problem-solving, and decision-making abilities across disciplines. For prospective primary school teachers, mastery of numeracy literacy is not only an academic expectation but also the foundation for constructing meaningful mathematics learning that is applicable to real-world contexts. However, numerous studies reveal that student teachers frequently demonstrate fragmented understanding of mathematical concepts, rely excessively on memorization and procedural formulas, and experience difficulties when connecting abstract mathematics to everyday situations, resulting in classroom instruction that is mechanistic and teacher-centered rather than meaningful and inquiry-based (Lubis & Siregar, 2022; Rohmah & Jupri, 2024). This indicates an urgent need for strengthened pedagogical innovation during teaching practice to ensure that

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numeracy literacy is embedded as an authentic learning experience rather than a set of disjointed cognitive skills.

The Realistic Mathematics Education (RME) approach has emerged as a promising alternative capable of transforming numeracy learning into contextual and reflective knowledge construction. Rooted in Freudenthal's notion that mathematics must be "human activity", RME positions students as active constructors of mathematical meaning through real-life situations, mathematical modeling, and guided reinvention. Existing empirical findings consistently show that RME enhances conceptual understanding, problem-solving, and mathematical reasoning when learning is initiated from familiar contexts and modeled toward formal abstraction (Papadakis et al., 2017; Sumirattana et al., 2017). For student teachers, this pedagogical shift redefines teaching practice from merely transmitting formulas to facilitating learners in investigating contextual problems, selecting strategies, and negotiating meaning. Such transformation underscores that mastering RME is not only relevant to content knowledge but also critical to shaping instructional identities rooted in constructivism.

The adoption of RME in teacher education is further motivated by its ability to strengthen mathematical communication, which is a central dimension of numeracy literacy. When student teachers design tasks grounded in real-world challenges—such as price comparison, measurement, statistical interpretation, or spatial reasoning—students are required to articulate ideas verbally, visually, and symbolically. These communicative processes are mirrored in microteaching sessions, where RME is shown to increase prospective teachers' pedagogical confidence and classroom interaction quality (Yuliana et al., 2023; Rohmah & Jupri, 2024). Thus, RME enhances not only technical competence but also professional dispositions necessary for contemporary classrooms, including clarity of instruction, dialogic questioning, and formative feedback.

Another critical reason for incorporating RME into teaching practice is its alignment with numeracy demands embedded in government and international assessment frameworks. Educational systems increasingly require teachers to cultivate students' ability to analyze data, interpret quantitative information, evaluate mathematical solutions, and apply reasoning to authentic societal contexts. Yet, research reveals that many prospective primary school teachers are not fully prepared to design assessments targeting higher-order numeracy skills (Ratnaya et al., 2024). Integrating RME into microteaching encourages student teachers to build learning trajectories that move systematically from contextual problems to structured formalization, thereby equipping them to align teaching, learning, and assessment with numeracy literacy goals.

Moreover, motivation and interest play a decisive role in numeracy mastery. Several studies emphasize that student teachers who experience meaningful, contextual mathematics instruction show greater enjoyment, persistence, and self-efficacy compared to those exposed to purely algorithmic learning (Amany et al., 2023; Nirtha et al., 2024). RME contributes positively because real situations—such as shopping, transportation, nature, culture, and local ethnomathematics—enable prospective teachers to build emotional, cultural, and cognitive attachment to mathematics. This emotional engagement is particularly important for teacher identity formation, as it encourages prospective teachers to envision themselves as facilitators of reasoning rather than transmitters of formulas.

Despite its advantages, the implementation of RME during teaching practice still faces obstacles. Common challenges include limited experience in designing contextual mathematical tasks, insufficient exposure to modeling-based pedagogy, and low confidence in handling open-ended student responses (Zulkardi et al., 2020). Some student teachers struggle to balance contextual exploration with curriculum pacing and formal mathematics representation. These challenges suggest that explicit pedagogical scaffolding must be embedded in teacher education programs so that prospective teachers do not reproduce procedural learning patterns from their prior schooling.

These considerations highlight that enhancing numeracy literacy of prospective primary school teachers is not merely a curricular expectation but a strategic foundation for long-term classroom success. Teaching practice becomes a decisive professional milestone because it is the first moment when pedagogical knowledge and instructional decisions directly influence learners. Therefore, teacher education institutions must ensure that teaching practice is not reduced to performance simulation, but rather becomes a pedagogical research and reflection process. RME is relevant in this transformation because it organically integrates contextual learning, collaboration, formative assessment, and reflective teaching into classroom practice.

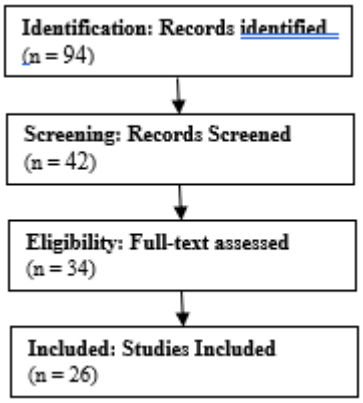
Based on these empirical gaps and theoretical relevance, this research aims to analyze how the Realistic Mathematics Education approach enhances numeracy literacy among prospective primary school teachers in teaching practice. The study seeks to provide evidence-based insight into how the principles of contextual learning, modeling, mathematical communication, and guided reinvention shape pedagogical readiness. The contribution of this paper is expected to serve as an academic reference for strengthening teacher education policies and instructional design frameworks to ensure that future primary school teachers are well-equipped to cultivate sustainable numeracy culture in elementary classrooms.

METHODOLOGY

This study adopts a Systematic Literature Review (SLR) design to synthesize empirical findings on the effectiveness of the Realistic Mathematics Education approach in enhancing numeracy literacy among prospective primary school teachers. The review covered peer-reviewed journal articles published between 2016 and 2025 sourced from Google Scholar, Scopus, Taylor & Francis, ScienceDirect, and DOAJ. The search used combinations of keywords such as Realistic Mathematics Education, numeracy literacy, pre-service teachers, microteaching, and teaching practice. Studies were included if they specifically reported the application of RME in teacher education or teaching practice and measured outcomes related to numeracy literacy, including conceptual understanding, problem-solving, mathematical communication, and contextual reasoning.

The SLR process followed four structured stages: identification, screening, eligibility assessment, and final inclusion. Out of 94 total articles initially identified, 42 met screening criteria, and 26 were selected for qualitative synthesis. Data were extracted using a thematic matrix that categorized publication year, research design, instructional intervention, RME learning components, and numeracy outcomes. Analysis was conducted through thematic coding to identify recurrent pedagogical patterns, effective instructional strategies, and challenges reported across studies. The synthesis enables comprehensive interpretation of how and why RME contributes to

numeracy literacy development in prospective primary school teachers during teaching practice.



RESULTS AND DISCUSSION

The Contribution of the Realistic Mathematics Education (RME) Approach to Enhancing Numeracy Literacy

The Realistic Mathematics Education (RME) approach has emerged as one of the most prominent didactical models for strengthening numeracy literacy among prospective primary school teachers. Rooted in Freudenthal's view that mathematics must remain close to reality and meaningful to learners, RME emphasizes contextual problems, guided reinvention, and progressive mathematization elements that are increasingly essential for preparing primary teacher education students to teach numeracy effectively in today's classrooms. Across the reviewed literature, RME significantly contributes to improving numeracy literacy through three major mechanisms: (1) contextualization of mathematical ideas; (2) development of students' cognitive engagement and reasoning; and (3) strengthening pedagogical readiness for classroom practice.

First, RME promotes contextualized understanding, a critical foundation for numeracy literacy. Numeracy skills extend beyond computation to the ability to interpret, analyze, and apply numerical information in real-life situations. Studies by Rohmah & Jupri (2024) and Lubis & Siregar (2022) demonstrated that learning environments grounded in realistic situations enable pre-service teachers to link mathematical ideas with everyday experiences. This alignment between mathematical abstractions and real-world context is further supported by culturally responsive approaches such as ethnomathematics modules integrated with RME (Yuliana et al., 2023). Through this contextualization, prospective teachers develop deeper intuitive understanding and become better equipped to design numeracy instruction that is relevant for primary students with diverse backgrounds.

Second, RME encourages cognitive engagement and active learning, enabling students to construct mathematical knowledge rather than merely absorbing it. Research by Yilmaz (2020) highlighted that RME fosters higher cognitive competencies, including reasoning, problem-solving, and representation skills. These competencies form the backbone of numeracy literacy. Similarly, Fauzan et al. (2024)—drawing from Indonesian elementary school settings—emphasized that teachers perceive RME as effective for developing students' analytical thinking and interpretive abilities. For pre-service teachers, such cognitive development is vital as they transition from

mathematics learners to mathematics educators capable of modeling productive mathematical thinking for their future pupils.

An additional body of research particularly studies involving technology-enhanced RME indicates that digital environments further reinforce cognitive engagement processes. Papadakis, Kalogiannakis & Zaranis (2017) found that integrating mobile applications in RME-based learning boosts conceptual understanding in early mathematics. Bray & Tangney (2016) similarly identified increased student engagement when RME is paired with mobile learning technologies, reinforcing the approach's potential to align numeracy instruction with 21st-century educational expectations. These findings provide strong justification for embedding technology-integrated RME tasks in microteaching and teaching practice modules for prospective teachers.

Third, RME plays a significant role in strengthening pedagogical readiness and professional competence among future primary teachers. Several studies discussed the challenges pre-service teachers often face: limited experience in designing contextual tasks, insufficient reasoning skills, and a tendency to teach procedural mathematics (Ratnaya et al., 2024; Piper et al., 2018). The RME approach directly addresses these issues. Through the reinvention process, students learn how to guide primary-level learners in discovering mathematical relationships gradually. Zulkardi, Putri & Wijaya (2020), reviewing two decades of Indonesian RME implementation, emphasized that prospective teachers trained in RME tend to design learning sequences that are more coherent, meaningful, and aligned with how children naturally develop mathematical thinking.

The literature also reveals a strong positive correlation between RME-based learning experiences and numeracy literacy performance. Lubis & Siregar (2022) empirically showed that students exposed to RME demonstrate higher numeracy literacy than those taught using conventional methods. Similarly, Nurrohmah & Mardiyana (2023) found a significant improvement in Grade 5 student numeracy abilities when taught using RME, implying that teacher candidates trained in this approach are likely to produce stronger numeracy outcomes when implementing it in practicum schools.

In addition, recent studies extend the scope of RME's contribution by revealing its potential to enhance not only problem-solving abilities but also critical reasoning and character formation. Elisa & Saputro (2024) found that Problem-Based Learning integrated with RME strengthens critical reasoning and numeracy simultaneously. Such hybrid models are particularly promising for teacher education programs that aim to build multidimensional teaching competencies.

A notable contribution of RME to teacher development is its ability to improve communication skills, a key numeracy component that helps learners articulate mathematical ideas. Studies such as Amany, Puteri & Karim (2023) and Dewi (2018) highlight that RME requires students to articulate reasoning through representations, models, and verbal explanation, thereby enhancing mathematical communication—an essential skill for future teachers. Moreover, Putri, Ulia & Sari (2023) demonstrate that outing-class activities using RME further strengthen communication and numeracy literacy through real environmental interaction.

Importantly, the reviewed studies indicate that RME's effectiveness is influenced by student interest and motivation, which are essential in numeracy development. Nirtha et al. (2024) highlight that numeracy motivation among PGSD

(Primary Teacher Education) students is shaped by the relevance of learning and active engagement; both factors are central attributes of RME practices. Antono (2024) similarly found that RME supported by media such as mathematical puzzles enhances learning enthusiasm and conceptual mastery.

Collectively, the literature demonstrates that the RME approach provides a comprehensive foundation for prospective primary school teachers to achieve high numeracy literacy. It enhances conceptual understanding, strengthens reasoning skills, improves pedagogical knowledge, and fosters positive attitudes toward mathematics teaching. These outcomes position RME as a crucial approach in preparing future teachers to support national numeracy goals in primary education.

Challenges, Pedagogical Implications, and Enhancement Strategies for RME Implementation in Teacher Education

Despite strong evidence of RME's effectiveness, its successful implementation in teacher education programs faces a series of conceptual, pedagogical, institutional, and motivational challenges. Nonetheless, these challenges also present actionable implications for redesigning microteaching, lesson planning, and teaching practice components to ensure that prospective teachers gain mastery in delivering RME-based numeracy instruction.

One of the major challenges identified across the reviewed literature concerns **limited** conceptual mastery of RME principles among pre-service teachers. Yilmaz (2020) emphasized that while many teacher candidates appreciate the contextual nature of RME, they struggle to understand its theoretical underpinnings, such as guided reinvention and progressive mathematization. Similar findings by Zulkardi et al. (2020) revealed that without deep comprehension of RME's epistemological foundation, students tend to oversimplify contextual tasks or revert to procedural teaching during practice. This conceptual gap underscores the need for stronger integration of RME theory in mathematics education courses.

A second category of challenges involves the pedagogical competence required to design and implement RME tasks. Several studies highlight that prospective teachers often find it difficult to develop meaningful contexts that align with mathematical goals. Elisa & Saputro (2024) and Ratnaya et al. (2024) both pointed out that pre-service teachers lack confidence in selecting contexts that simultaneously engage learners and support mathematical abstraction. Sumirattana et al. (2017) further noted that designing higher-order numeracy tasks with realistic contexts demands sophisticated problem-posing skills, which are not consistently developed in standard teacher education programs. As a result, RME instruction may become superficial unless teacher candidates undergo structured guidance in designing, sequencing, and validating RME tasks.

Another significant challenge relates to students' attitudes and numeracy readiness, including interest, motivation, and self-efficacy. Studies such as Nirtha et al. (2024) revealed that low numeracy motivation inhibits full engagement in RME tasks. Moreover, psychological barriers—such as mathematics anxiety and negative prior experiences—may affect the quality of engagement among pre-service teachers, as discussed by Piper et al. (2018). This suggests that enhancing numeracy literacy cannot rely solely on didactical models but must also address motivational and affective dimensions of teacher learning.

In addition to learner-based factors, institutional challenges also affect the implementation of RME in teacher education programs. Tanujaya et al. (2017) highlighted persistent challenges in Indonesian mathematics instruction, including lack of adequate learning resources, insufficient professional development, and inconsistent curriculum integration. Teaching practice environments may also limit implementation because many schools continue using traditional, teacher-centered approaches. This creates a mismatch between university-based preparation and school-based expectation, reducing the opportunity for prospective teachers to practice RME authentically.

However, these challenges present several important pedagogical implications. First, teacher education programs must adopt a scaffolded learning model for RME mastery. Similar to the DAPIC model (Sumirattana et al., 2017), a progression from observing RME lessons to designing tasks and conducting microteaching simulations can strengthen conceptual and practical understanding. The incorporation of technology—highlighted by Bray & Tangney (2016) and Papadakis et al. (2017)—offers additional scaffolding by providing interactive tools that support visualization and experimentation.

Second, curriculum designers in teacher education programs should explicitly integrate RME-focused professional development, including workshops on task design, context analysis, and assessment for numeracy literacy. Such professional development aligns with Piper et al. (2018), who argued that structured guides and coaching significantly improve teaching quality in numeracy and literacy domains. Integrating field-based practicum specifically centered on RME can further strengthen pedagogical readiness.

Third, strengthening assessment literacy is crucial because RME requires teachers to evaluate not only procedural accuracy but also reasoning, modeling, and communication. Dewi (2018) noted that developing RME assessment instruments requires deep understanding of learning trajectories and representational tools. Pre-service teachers must therefore be trained to design rubrics and evaluation frameworks aligned with RME principles to ensure accurate assessment of numeracy literacy outcomes.

Fourth, addressing motivational challenges requires the integration of student-centered learning environments that promote confidence, collaboration, and reflective practice. Studies such as Nurpratiwi et al. (2022) and Fahrurrozi & Wardi (2020) show that PjBL and team-based projects can improve self-confidence and communication skills, which directly support numeracy literacy in an RME framework. Creating reflective spaces journals, peer-feedback sessions, and lesson-study groups can also enhance professional identity formation among prospective teachers.

Finally, bridging the university school gap requires aligning university curricula with practicum school expectations. This involves partnerships with schools that already implement RME or inquiry-based mathematics approaches. As identified by Amany et al. (2023), collaborative planning between lecturers and school teachers enhances the relevance and coherence of teaching practice experiences.

Table 1. Synthesis of Key Empirical Findings on RME and Numeracy Literacy

Author(s)	Context	Key Findings Related to Numeracy Literacy	Relevance for Pre-Service Teacher Education
Rohmah & Jupri (2024)	Elementary schools	RME improves reasoning, contextual understanding	Reinforces need for contextual task training
Lubis & Siregar (2022)	Grade 5 students	Significant improvement in numeracy literacy via RME	Strong evidence supporting RME in microteaching
Yuliana et al. (2023)	Ethnomathematics + RME	Culturally relevant contexts enhance conceptual grasp	Supports local-context integration in teacher prep
Yilmaz (2020)	Prospective teachers	RME boosts cognitive competencies	Indicates need for conceptual theory instruction
Fauzan et al. (2024)	Elementary teachers	Teachers perceive RME as effective for numeracy	Important for teacher belief formation
Papadakis et al. (2017)	Kindergarten	Mobile-supported RME improves math learning	Suggests integration of digital tools in RME training
Sumirattana et al. (2017)	Secondary	RME + DAPIC increases mathematical literacy	Provides model for scaffolded RME instruction
Ratnaya et al. (2024)	PGSD students	Literacy–numeracy correlation influences teaching readiness	Highlights need for balanced literacy-numeracy training
Elisa & Saputro (2024)	Grade 4	PBL-RME enhances critical reasoning & numeracy	Supports integration of RME–PBL hybrids
Putri et al. (2023)	Outing class	Realistic contexts boost numeracy & communication	Useful for designing practicum activities

The synthesis presented in Table 1 indicates a coherent pattern across diverse contexts and educational levels: Realistic Mathematics Education consistently enhances learners' numeracy literacy by grounding mathematical content in meaningful, real-world contexts. Although the studies differ in sample characteristics—ranging from kindergarten pupils (Papadakis et al., 2017) to secondary school students (Sumirattana et al., 2017) and prospective teachers (Yilmaz, 2020; Ratnaya et al., 2024)—all

converge on the conclusion that contextual learning fosters deeper mathematical understanding and more durable numeracy skills. The recurrence of findings across international contexts (Indonesia, Turkey, Thailand, the Netherlands) suggests that the effectiveness of RME is not limited to specific cultural or curricular domains, making it broadly applicable to teacher education.

Another insight drawn from the table is that the strength of RME lies not only in content delivery but in its capacity to shape pedagogical reasoning. For example, Rohmah & Jupri (2024) and Lubis & Siregar (2022) demonstrate that context-driven instruction improves reasoning and application skills, while Dewi (2018) and Amany et al. (2023) show that RME also enhances communication and reflective capabilities—competencies essential for teaching numeracy. This suggests that RME provides a dual benefit for pre-service teachers: strengthening their mathematical proficiency and improving their pedagogical competence.

Furthermore, studies combining RME with complementary approaches—such as Project-Based Learning (PBL), digital learning, outing-class activities, and ethnomathematics—consistently report amplified numeracy outcomes (Elisa & Saputro, 2024; Papadakis et al., 2017; Yuliana et al., 2023; Putri et al., 2023). These hybrid models underscore that RME functions as a flexible design framework that allows integration with other pedagogical innovations. This opens significant opportunities for teacher education institutions to expand RME-based practicum design, ensuring that candidates learn to adapt numeracy instruction to real constraints and needs in primary classrooms.

Finally, the table reveals persistent challenges that require direct attention: conceptual misunderstandings of RME principles (Yilmaz, 2020), difficulty constructing meaningful contexts (Ratnaya et al., 2024), and motivational barriers (Nirtha et al., 2024). These challenges support the need for more structured RME training, guided task design modules, and reflective microteaching cycles.

Curriculum, Institutional, and Policy Implications for Strengthening RME-Based Numeracy Literacy in Teacher Education

Strengthening the numeracy literacy of prospective primary school teachers through the Realistic Mathematics Education approach requires more than effective classroom strategies; it demands systematic reforms in teacher education curriculum, institutional structures, and national policies. Discussion 3 synthesizes multi-level implications curricular, instructional, institutional, and policy-oriented—derived from the reviewed literature and framed within the broader demands of numeracy development in the 21st century.

At the **curricular level**, teacher education programs must reconfigure mathematics pedagogy courses to provide sustained exposure to RME principles. Current evidence indicates that pre-service teachers often receive fragmented or superficial training in RME, which leads to conceptual misunderstandings and ineffective implementation during teaching practice (Yilmaz, 2020; Zulkardi et al., 2020). To address this, programs should adopt a structured curriculum sequence beginning with foundational courses in RME theory, followed by guided task design workshops, and finally application-oriented microteaching cycles. This structure mirrors the DAPIC (Define–Assess–Plan–Implement–Communicate) problem-solving model used by Sumirattana et al. (2017), which effectively scaffolds students toward mathematical literacy mastery.

Furthermore, **integrating ethnomathematics-based RME**, as demonstrated by Yuliana et al. (2023), can serve as an important curricular enhancement. Indonesia's diverse cultural contexts offer rich opportunities to contextualize mathematics learning in culturally relevant forms. Embedding such modules within teacher education programs not only enhances numeracy literacy but also aligns with the national mandate for culturally responsive education. This is particularly relevant for PGSD students who will teach in varied socioeconomic and cultural environments.

At the instructional level, the findings call for an expansion of pedagogical models within RME-based training. The integration of digital technologies has proven especially effective for enhancing numeracy outcomes (Papadakis et al., 2017; Bray & Tangney, 2016). Digital manipulatives, mobile apps, and virtual learning environments enable dynamic visualization, experimentation, and immediate feedback—supporting both conceptual and procedural numeracy skills. Teacher training institutions therefore need to invest in digital pedagogy courses aligned explicitly with RME principles. This preparation is crucial for responding to the increasingly digital nature of primary education and to the expectations of Generation Z learners who will populate future classrooms.

Additionally, the use of collaborative, inquiry-based, and project-based learning models strengthens RME implementation. Studies such as Elisa & Saputro (2024) and Nurpratiwi et al. (2022) show that when RME is combined with PBL, students develop stronger critical reasoning, reflective habits, and communication skills. These competencies are central to numeracy literacy but are often underdeveloped in traditional teacher preparation models. Designing practicum tasks that require peer collaboration, project output, and iterative feedback can significantly increase the quality of RME-based numeracy instruction.

On an institutional level, teacher education programs must cultivate closer partnerships with elementary schools. A consistent theme in the literature is the misalignment between university instruction and school-based practice. Many practicum schools continue to rely on teacher-centered methods, limiting opportunities for pre-service teachers to experiment with RME (Tanujaya et al., 2017). To overcome this barrier, institutions need to establish laboratory schools or partner schools where RME is encouraged and structurally supported. These environments can function as pedagogical laboratories where prospective teachers observe experienced educators implementing RME, engage in co-teaching activities, and receive feedback based on real-world classroom dynamics. Such partnerships also support curriculum alignment between universities and schools, ensuring that the goals of numeracy literacy development are met consistently across contexts.

Another critical institutional implication is the need for professional development for lecturers and supervisors. As Piper et al. (2018) emphasized, effective numeracy instruction depends significantly on high-quality teacher coaching and structured instructional guides. Lecturers in teacher education programs must therefore undergo regular training in updated RME pedagogies, digital RME environments, and assessment models for numeracy literacy. Strengthening faculty competence is essential to ensuring that pre-service teachers receive accurate and consistent guidance.

At the policy level, the findings highlight the need for national frameworks that formally integrate RME into teacher education standards. Given the national emphasis on improving literacy and numeracy through programs such as ANBK and Merdeka Belajar, policymakers should recognize RME as a scientifically validated approach that

aligns with these national goals. Policies could include curriculum guidelines for PGSD programs mandating RME-based pedagogical components, assessment frameworks aligned with numeracy literacy competencies, and funding for university–school partnerships.

Furthermore, policy interventions must address challenges related to motivation and affect. Studies by Nirtha et al. (2024) and Fahrurrozi & Wardi (2020) show that affective variables such as interest, self-confidence, and communication ability play significant roles in numeracy performance. National policies for teacher education should therefore include psychosocial support systems, mentorship programs, and reflective practice frameworks that promote healthy professional identity development among pre-service teachers.

A final policy implication concerns the need for assessment reform. Dewi (2018) stressed the importance of developing RME-aligned assessment instruments that evaluate reasoning, modeling, and communication competencies often neglected in standardized tests. Policymakers could promote assessment models that move beyond computation to encompass multi-step reasoning and real-world application, ensuring alignment between what teacher candidates learn and what they will be expected to teach.

Collectively, these implications highlight the urgent need for systemic reform that integrates RME across curriculum, instruction, institutional structures, and policy frameworks. When implemented holistically, such reforms will strengthen the numeracy literacy of future primary teachers, align teacher education programs with national educational objectives, and ensure that Indonesian classrooms produce numerate, critically minded, and mathematically empowered learners.

CONCLUSION

The findings of this study demonstrate that the Realistic Mathematics Education approach is highly effective for strengthening the numeracy literacy of prospective primary school teachers. RME enhances conceptual understanding, contextual reasoning, and mathematical communication through its emphasis on real-world problem contexts and meaningful mathematization processes. The literature further shows that integrating RME with strategies such as ethnomathematics, digital pedagogy, project-based learning, and collaborative inquiry substantially increases its pedagogical impact. However, successful implementation requires strong foundational knowledge, teacher readiness, contextual resources, and structured coaching, all of which must be consistently cultivated across teacher education programs.

To maximize the role of RME in shaping high-quality numeracy instruction, curriculum development, institutional mechanisms, and educational policies must be aligned to support its adoption. Teacher education institutions need to provide systematic training, mentor support, and opportunities for practice in authentic classroom settings. At the national level, policy frameworks should mandate RME-based pedagogies and assessment reforms to ensure alignment with contemporary numeracy standards. Strengthening these multi-level structures will ensure that prospective teachers develop the competencies needed to deliver effective mathematics learning, ultimately enhancing students' numeracy literacy in Indonesian primary schools**.**

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