



Hybrid Counseling Model for Analyzing Math Anxiety Among Prospective Teachers in the Era of 21st-Century Numeracy Literacy

Fanny Septiany Rahayu^{1*}, Putik Rustika², Fitri Hikmawati³

^{1,2,3}Primary School Teacher Education Study Program, Universitas Muhammadiyah Cirebon, Indonesia

*Correspondence E-mail: fanny.septiany@umc.ac.id

ABSTRACT

This study aimed to examine the feasibility and preliminary effectiveness of a hybrid counseling model in reducing mathematics anxiety among prospective elementary school teachers. A descriptive qualitative feasibility study was conducted at the Primary School Teacher Education Study Program, Universitas Muhammadiyah Cirebon, Indonesia. An initial screening involved 179 undergraduate students, from whom six participants representing moderate and high mathematics anxiety levels across the first, third, and fifth semesters were purposively selected for the intervention. Data were collected using a validated Mathematics Anxiety Self-Report Instrument, observations, semi-structured interviews, student reflection sheets, and documentation. The instrument demonstrated good psychometric properties, with 22 valid items and a Cronbach's Alpha coefficient of 0.89. Data were analyzed using descriptive qualitative techniques supported by ATLAS.ti, while changes in mathematics anxiety were examined using pre-test and post-test scores. The findings showed that all participants experienced reductions in mathematics anxiety following the intervention. Improvements were consistently observed across cognitive, emotional, behavioral, and physiological dimensions, accompanied by increased confidence, greater engagement in mathematics learning, and reduced anxiety-related physical symptoms. These findings provide preliminary evidence that integrating face-to-face counseling with digital reflective activities is a feasible approach to reducing mathematics anxiety among prospective elementary school teachers and contributes to the development of technology-supported counseling services in higher education.

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1. INTRODUCTION

Numeracy literacy has become one of the essential competencies in twenty-first-century education because it equips learners with the ability to interpret quantitative information, solve real-world problems, and make evidence-based decisions. For prospective elementary school teachers, numeracy literacy is particularly important because it forms the foundation for developing students' mathematical reasoning and lifelong learning skills (Melissa & Kristanto, 2024; Taguma et al., 2023). Strong numeracy skills are closely associated with critical thinking, problem-solving, and decision-making abilities in everyday life. Many university students continue to experience mathematics anxiety, which is characterized by feelings of tension, worry, and fear when engaging in mathematical activities. Recent meta-analyses have demonstrated that mathematics anxiety significantly impairs students' concentration, working memory capacity, problem-solving performance, and motivation to learn mathematics, ultimately contributing to lower academic achievement (Barroso et al., 2021; Sammallahiti et al., 2023; Vargas, 2021).

Large-scale meta-analyses have consistently identified a negative correlation between math anxiety and mathematics achievement (Barroso et al., 2021). Furthermore, studies integrating cognitive perspectives indicate that math anxiety may disrupt working memory functions, making mathematical thinking processes less efficient (Vargas, 2021). Various interventions to reduce math anxiety have also been examined. Meta-analytic findings demonstrate that approaches incorporating cognitive support and emotional regulation are moderately effective in reducing math anxiety while simultaneously improving mathematical performance (Sammallahti et al., 2023). Individuals experiencing anxiety commonly exhibit symptoms such as irritability, difficulty concentrating, sleep disturbances, and excessive worry. Physiological symptoms may include excessive sweating, rapid heartbeat, cold hands or feet, digestive problems, dry mouth, pale appearance, and frequent urination (Rahayu, 2021). Early studies suggested that mathematics anxiety reduces working memory efficiency and interferes with mathematical reasoning processes (Caviola et al., 2022). More recent evidence has confirmed these findings, demonstrating that mathematics anxiety occupies cognitive resources required for mathematical processing, thereby reducing students' problem-solving performance (Vargas, 2021). Similarly, the OECD PISA 2022 results show that students experiencing higher levels of mathematics anxiety consistently achieve lower mathematics performance than those with lower anxiety levels (OECD, 2023).

In Indonesia, mathematics anxiety has become an increasingly important issue, as national assessments and the Programme for International Student Assessment (PISA) 2022 continue to indicate that Indonesian students' numeracy literacy remains below the OECD average, suggesting persistent challenges in mathematical competence (OECD, 2023; Taguma et al., 2023). As future educators, students enrolled in Primary School Teacher Education (PGSD) programs are expected to possess strong numeracy competencies to effectively support elementary students' mathematical learning. However, mathematics anxiety represents a significant barrier to achieving this competence and may subsequently influence their future teaching practices and contribute to the transmission of mathematics anxiety to their students (Smith et al., 2023; Yanti et al., 2025). At the same time, guidance and counseling services in higher education continue to rely predominantly on conventional face-to-face approaches, which often provide limited flexibility and accessibility for today's students. As members of Generation Z, university students are highly accustomed to digital technologies and online interactions, making technology-supported counseling increasingly relevant to their learning characteristics (Taguma et al., 2023). Recent evidence also indicates that digital

mental health (e-mental health) interventions effectively reduce symptoms of anxiety, stress, and depression while improving psychological well-being among university students (Madrid-Cagigal et al., 2025; Worsley et al., 2022).

One approach considered relevant is *hybrid counseling*, which combines face-to-face interaction with digital-based counseling support. This model is considered capable of providing flexibility, accessibility, and alignment with students' learning styles and needs (Cabiati, 2021; Pink et al., 2022). Comparative studies conducted further demonstrate that integrated counseling models combining offline and online services are often more effective than fully online approaches, particularly in improving service quality for groups that are difficult to reach through conventional counseling services (Chan et al., 2023).

Although previous studies have demonstrated the effectiveness of digital counseling and Cognitive Behavioral Therapy (CBT)-based interventions in reducing anxiety, most studies have focused on general anxiety, depression, or psychological well-being rather than mathematics anxiety among prospective teachers. Recent systematic reviews indicate that digital CBT interventions improve accessibility, treatment adherence, emotional regulation, and students' engagement through teletherapy and digital support tools (Nakao et al., 2021; Alanazi et al., 2026). However, empirical evidence regarding hybrid counseling specifically designed to reduce mathematics anxiety among prospective elementary school teachers remains limited, particularly within the Indonesian higher education context. Existing studies generally examine either online counseling or face-to-face counseling separately, whereas limited studies integrate cognitive restructuring, emotional regulation, behavioral engagement, and structured reflective activities within a single hybrid counseling framework (Bai, 2023).

The present study addresses this gap by developing a hybrid counseling model specifically for students in the Primary School Teacher Education (PGSD) Study Program in Indonesia. Unlike previous studies, the proposed model integrates six interconnected stages, namely initial assessment, rapport building, cognitive restructuring, emotional and physiological regulation, behavioral engagement, and reflection and evaluation. The model combines face-to-face counseling with structured digital reflective activities, enabling continuous counselor support beyond conventional counseling sessions. This approach extends current hybrid counseling literature by adapting digital CBT principles to mathematics anxiety experienced by prospective elementary school teachers, a population that has received limited empirical attention. Since mathematics anxiety among future teachers may influence both their own academic performance and their future instructional practices, the present study contributes to expanding the application of hybrid counseling within teacher education (Khasawneh et al., 2021).

Recent studies also indicate that technology-based counseling can enhance engagement, comfort, and reduce the stigma often associated with traditional counseling services. Within the Indonesian context, the integration of technology into guidance and counseling services has also gained increasing attention. Studies concerning the role of information technology in counseling services reveal that digital applications and online platforms may improve accessibility and flexibility, although challenges related to infrastructure and counselor competence still remain. Therefore, this study aims to develop and examine the feasibility of a hybrid counseling model for reducing mathematics anxiety among prospective elementary school teachers in Indonesia. The proposed model is expected to contribute to the advancement of technology-supported counseling by integrating digital CBT principles with face-to-face counseling, while providing preliminary empirical evidence for its application in teacher education.

2. METHODS

The study was conducted in the Primary School Teacher Education (PGSD) Study Program, Faculty of Teacher Training and Education, Universitas Muhammadiyah Cirebon, Indonesia. The preparation phase began with a Focus Group Discussion (FGD) involving the principal researcher and research team members to formulate the research design, identify research priorities, and develop the hybrid counseling intervention. During this stage, gatekeepers were appointed to facilitate participant recruitment and coordinate the administration of the Mathematics Anxiety Self-Report Questionnaire.

The research employed four primary instruments: (1) a Mathematics Anxiety Self-Report Questionnaire, (2) an observation sheet, (3) a semi-structured interview guideline, and (4) a student reflection sheet, supported by documentation records. The Mathematics Anxiety Self-Report Questionnaire consisted of 24 Likert-scale items representing four dimensions of mathematics anxiety, namely cognitive, emotional, behavioral, and physiological aspects. Representative items included *"I feel nervous when solving mathematics problems in front of the class"* and *"I avoid participating in mathematics-related activities because I am afraid of making mistakes."* The observation sheet was used to record participants' behavioral responses during learning and counseling sessions, including participation, confidence, and anxiety-related behaviors. The semi-structured interview guideline explored students' experiences, perceptions, and coping strategies related to mathematics anxiety, while the reflection sheet documented participants' self-evaluation following each counseling session.

All instruments were developed based on established mathematics anxiety indicators and were evaluated through expert judgment involving specialists in guidance and counseling and mathematics education to establish content validity. Subsequently, the Mathematics Anxiety Self-Report Questionnaire was piloted with 30 university students outside the main research sample. The pilot study demonstrated that 22 of the 24 items met the established validity criteria, whereas two items representing the cognitive and physiological dimensions were revised to improve clarity before implementation in the main study. Reliability analysis yielded a Cronbach's Alpha coefficient of 0.89, indicating high internal consistency and confirming the suitability of the instrument for the main research.

The main study involved 179 undergraduate students enrolled in the first, third, and fifth semesters of the Primary School Teacher Education Study Program. Participants were recruited using purposive sampling and initially completed the Mathematics Anxiety Self-Report Questionnaire to identify their levels of mathematics anxiety. Based on the screening results, six participants were purposively selected to participate in the hybrid counseling intervention. The intervention group consisted of one student with a moderate level of mathematics anxiety and one student with a high level of mathematics anxiety from each academic level (Semesters 1, 3, and 5), resulting in a total of six participants. This selection strategy ensured representation of mathematics anxiety across different stages of teacher education while allowing an in-depth qualitative exploration of participants' experiences. Given the intensive nature of the intervention, this study is presented as a qualitative feasibility study, and the findings should be interpreted within this context.

Data collection was conducted in four sequential stages. First, all participants completed the Mathematics Anxiety Self-Report Questionnaire as an initial screening instrument. Second, six participants meeting the predetermined inclusion criteria for moderate and high mathematics anxiety were selected for the hybrid counseling intervention. Third, qualitative data were collected through classroom observations, semi-structured interviews, student reflection sheets, and documentation throughout the counseling process. Finally, participants

completed the post-intervention questionnaire to identify changes in their mathematics anxiety levels. The overall research procedure is illustrated in **Figure 1**.

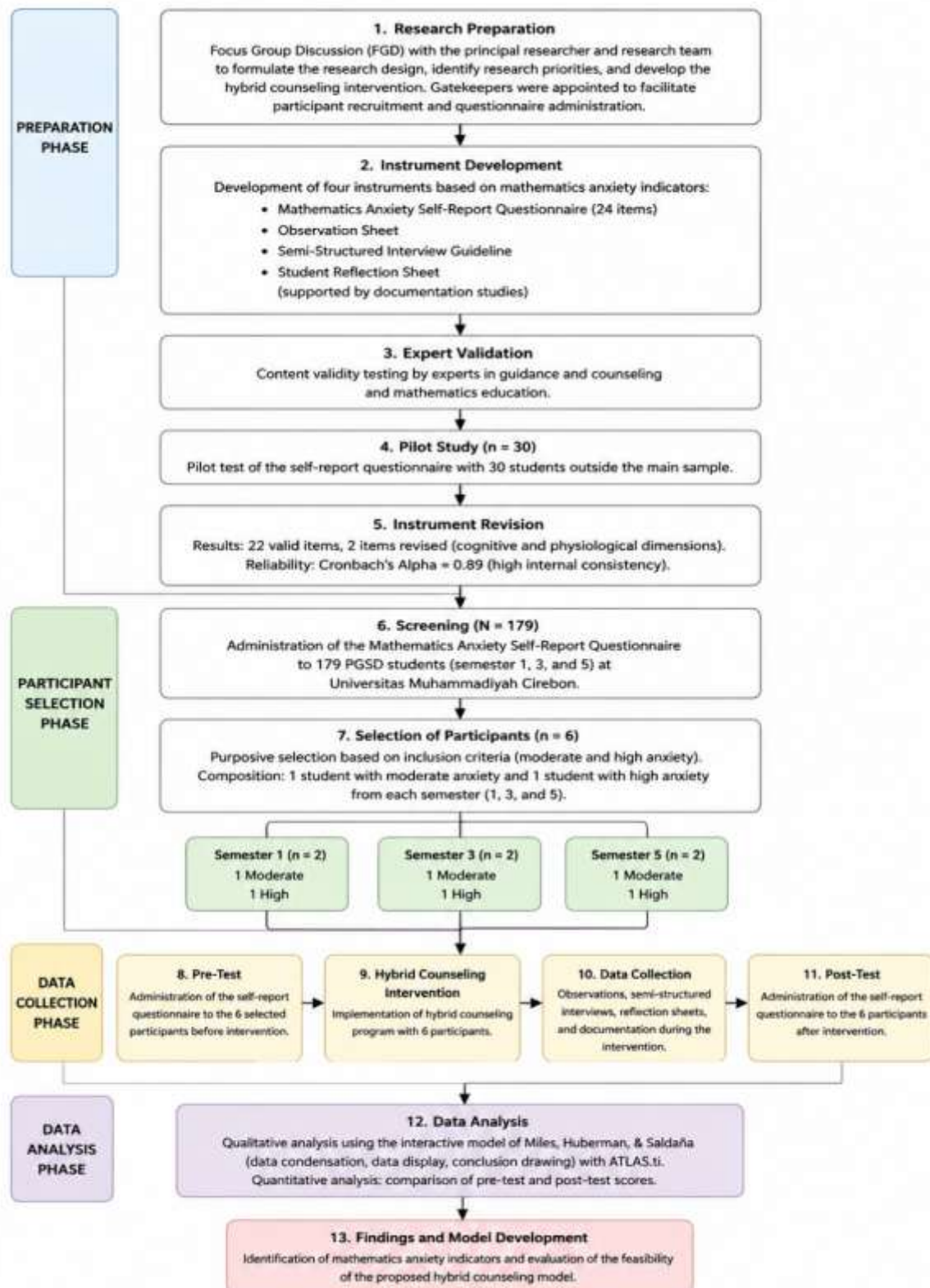


Figure 1. Research Flow

Qualitative data were analyzed using the interactive model of Miles, Huberman, and Saldaña, consisting of data condensation, data display, and conclusion drawing. ATLAS.ti

software was used to facilitate coding, categorization, and theme development from interview transcripts, observation notes, student reflections, and documentation records. Quantitative data obtained from the Mathematics Anxiety Self-Report Questionnaire were analyzed descriptively by comparing participants' pre-test and post-test scores. The integration of quantitative and qualitative findings served as the basis for identifying mathematics anxiety indicators and evaluating the feasibility of the proposed hybrid counseling model. The results generated from each research instrument are presented and discussed comprehensively in the Results and Discussion section.

3. RESULTS AND DISCUSSION

The study involved 179 undergraduate students enrolled in the Primary School Teacher Education (PGSD) Study Program at Universitas Muhammadiyah Cirebon, distributed across the first, third, and fifth semesters. Prior to the intervention, all participants completed the Mathematics Anxiety Self-Report Questionnaire to identify their initial levels of mathematics anxiety. The questionnaire, consisting of 24 Likert-scale items representing cognitive, emotional, behavioral, and physiological dimensions of mathematics anxiety, had previously undergone expert validation and pilot testing involving 30 students outside the main research sample. The pilot study indicated that 22 of the 24 items met the established validity criteria, whereas two items representing the cognitive and physiological dimensions were revised before implementation in the main study. Reliability analysis produced a Cronbach's Alpha coefficient of 0.89, indicating high internal consistency and confirming the suitability of the instrument for the present research.

Based on the screening results and predetermined inclusion criteria, six students were purposively selected to participate in the hybrid counseling intervention. The intervention group consisted of one student with a moderate level of mathematics anxiety and one student with a high level of mathematics anxiety from each academic level (Semesters 1, 3, and 5), resulting in a total of six participants. Students categorized as having low mathematics anxiety or incomplete research data were excluded from the intervention stage. The selection strategy was designed to ensure representation of mathematics anxiety across different academic levels while allowing an in-depth qualitative exploration of participants' experiences. Therefore, the intervention was conducted only with these six intensive cases, and this study should be interpreted as a qualitative feasibility study providing preliminary evidence rather than broad generalizations to the entire student population.

The hybrid counseling model was developed to comprehensively address mathematics anxiety by integrating cognitive restructuring, emotional regulation, behavioral engagement, and reflective learning into a unified intervention framework. The counseling process consisted of six sequential stages, including initial assessment, rapport building, cognitive restructuring, emotional and physiological regulation, behavioral engagement, and reflection and evaluation. The intervention combined face-to-face counseling sessions with structured reflective activities, enabling participants to receive continuous support throughout the counseling process.

During the implementation of the intervention, gradual behavioral and emotional changes were observed among the participants. At the beginning of the counseling process, most participants demonstrated avoidance behaviors, low self-confidence, hesitation when solving mathematics problems, and visible signs of anxiety such as nervousness and tension. As the intervention progressed, participants became increasingly willing to express their opinions, ask questions, and actively engage in mathematics learning activities. By the end of the

intervention, they demonstrated greater confidence, improved emotional regulation, and more positive attitudes toward mathematics.

The effectiveness of the hybrid counseling model was supported by both quantitative and qualitative findings. Quantitative analysis showed that all six participants experienced reductions in mathematics anxiety scores between the pre-test and post-test assessments (see **Table 1**). Score reductions were consistently observed among participants initially classified as having moderate and high mathematics anxiety across the first, third, and fifth semesters. Qualitative findings further supported these results. Cognitive improvements were reflected in reduced negative thoughts and increased confidence in solving mathematics problems. Emotional improvements included decreased feelings of fear and anxiety accompanied by greater emotional stability during mathematics learning. Behavioral improvements were demonstrated through increased classroom participation, greater willingness to complete mathematics tasks, and reduced avoidance behaviors. Physiological improvements were indicated by reduced symptoms of nervousness, muscle tension, and rapid heartbeat during mathematics-related activities. Collectively, these findings provide preliminary evidence that the hybrid counseling model was feasible and effective in helping prospective elementary school teachers manage mathematics anxiety across cognitive, emotional, behavioral, and physiological dimensions within the context of this study. The pre-test and post-test scores of participants with moderate and high mathematics anxiety are presented in **Table 1**. The results indicate a consistent reduction in mathematics anxiety scores following the implementation of the hybrid counseling intervention.

Table 1. Pre-Test and Post-Test Results of Mathematics Anxiety

Semester	Moderate Anxiety		High Anxiety	
	Pre-test	Post-test	Pre-test	Post-test
Semester 1	72 (Nh)	50	119 (Nb)	70
Semester 3	73 (Th)	54	104 (Nd)	68
Semester 5	73 (NI)	56	100 (SI)	60

Based on **Table 1**, the implementation of the hybrid counseling model was associated with a consistent reduction in mathematics anxiety among all six participants who received the intervention. The figure illustrates a clear downward trend in mathematics anxiety scores from the pre-test to the post-test across participants categorized as having moderate and high mathematics anxiety. Participants with moderate anxiety demonstrated score reductions from 72–73 to 50–56, whereas participants with high anxiety experienced larger reductions from 100–119 to 60–70. These findings indicate that the hybrid counseling intervention was feasible in reducing mathematics anxiety among the intensive case participants. Similar findings have been reported by [Sammallahti et al. \(2023\)](#), who concluded that interventions integrating cognitive restructuring and emotional regulation effectively reduce mathematics anxiety while simultaneously improving mathematical performance.

The reduction in mathematics anxiety was reflected across the four dimensions examined in this study. From the cognitive perspective, participants demonstrated greater confidence in understanding mathematical concepts and solving mathematical problems. Emotionally, participants reported feeling calmer and less fearful during mathematics-related activities, particularly examinations and classroom presentations. Behavioral improvements were reflected in increased classroom participation, greater willingness to ask questions, and reduced avoidance of mathematical tasks. Physiological improvements included reductions in muscle tension, nervousness, and rapid heartbeat during mathematics learning. These multidimensional improvements support recent findings that mathematics anxiety is a

complex construct involving cognitive, emotional, behavioral, and physiological processes rather than merely negative emotions toward mathematics (Barroso et al., 2021; Vargas, 2021).

The observed improvements are consistent with the principles of Cognitive Behavioral Therapy (CBT). According to CBT, anxiety is maintained by maladaptive beliefs and negative automatic thoughts that interfere with adaptive behavior. Through cognitive restructuring, emotional regulation, and guided reflection, participants gradually replaced irrational beliefs regarding mathematics with more realistic and adaptive thinking patterns. Recent reviews have demonstrated that digital and hybrid CBT interventions are effective because they combine structured cognitive exercises with continuous self-monitoring and personalized feedback, thereby enhancing emotional regulation and treatment adherence (Madrid-Cagigal et al., 2025). These mechanisms were also evident in the present study, where participants reported greater confidence and reduced anxiety following repeated counseling sessions.

The findings may also be interpreted through Self-Efficacy Theory. Students with stronger beliefs in their academic capabilities are more likely to persist when facing difficult mathematical tasks. Throughout the hybrid counseling intervention, participants gradually experienced successful problem-solving experiences, constructive feedback, and reflective learning, which strengthened their perceived self-efficacy. Increased confidence subsequently reduced avoidance behaviors and encouraged greater engagement during mathematics learning. These findings are consistent with recent educational research indicating that self-efficacy functions as an important protective factor against mathematics anxiety and contributes to improved academic resilience (Schukajlow et al., 2023; Taguma et al., 2023).

From the perspective of Working Memory Theory, mathematics anxiety consumes cognitive resources that are essential for reasoning and problem-solving. Students experiencing high anxiety often allocate substantial working memory capacity to intrusive thoughts and excessive worry rather than mathematical processing. Following the intervention, participants demonstrated greater concentration and fewer cognitive distractions, suggesting that the reduction of anxiety allowed cognitive resources to be redirected toward mathematical reasoning. Although working memory was not directly measured in this study, these findings support recent evidence indicating that reducing mathematics anxiety contributes to more efficient cognitive processing and improved mathematical performance (Vargas, 2021).

The present findings are also consistent with previous studies demonstrating the effectiveness of technology-supported counseling. Recent systematic reviews have shown that digital CBT and hybrid counseling increase accessibility, improve student engagement, facilitate continuous reflection, and produce significant reductions in anxiety symptoms among university students (Madrid-Cagigal et al., 2025). However, unlike previous studies that primarily examined general anxiety, depression, or psychological well-being, the present study specifically focused on mathematics anxiety among prospective elementary school teachers. Moreover, previous interventions generally implemented either face-to-face counseling or digital counseling independently, whereas the proposed model integrates cognitive restructuring, emotional regulation, behavioral engagement, and structured reflective activities into a unified hybrid counseling framework. This integrated approach represents the principal contribution of the present study.

Another distinctive contribution of this research lies in its educational context. Mathematics anxiety experienced by prospective elementary school teachers may influence not only their own academic achievement but also their future instructional practices and the

mathematics attitudes of their students. By implementing a hybrid counseling model specifically designed for students in the Primary School Teacher Education Program (PGSD), this study extends previous hybrid counseling research into a teacher education context that has received limited empirical attention. Consequently, the findings provide preliminary evidence supporting the feasibility of hybrid counseling as an alternative counseling service within higher education institutions.

Although the intervention involved only six intensive cases and therefore should be interpreted as a qualitative feasibility study rather than evidence of broad effectiveness, the findings provide important preliminary implications for the development of technology-supported counseling services. Future studies involving larger samples, multiple universities, and experimental research designs are recommended to further examine the effectiveness and generalizability of the proposed hybrid counseling model.

4. CONCLUSION

Based on the findings of this study, it can be concluded that the proposed hybrid counseling model demonstrates preliminary evidence of feasibility and potential effectiveness in reducing mathematics anxiety among prospective elementary school teachers. The development and implementation of the model addressed the research objective by integrating face-to-face counseling with structured digital reflective activities to support cognitive restructuring, emotional regulation, behavioral engagement, and self-reflection. Among the six participants who received the intervention, mathematics anxiety scores decreased consistently from the pre-test to the post-test, accompanied by improvements across the cognitive, emotional, behavioral, and physiological dimensions. These findings indicate that the proposed model has the potential to help prospective teachers manage mathematics anxiety while enhancing their confidence and adaptive responses toward mathematics learning.

Nevertheless, the intervention was implemented only with six purposively selected participants as part of a qualitative feasibility study. Therefore, the findings should be interpreted as preliminary evidence rather than conclusive proof of effectiveness and should not be generalized to the broader population of prospective teachers. Future studies involving larger samples, multiple higher education institutions, and experimental or quasi-experimental research designs are recommended to further evaluate the effectiveness, generalizability, and long-term impact of the hybrid counseling model. Despite these limitations, this study contributes to the development of technology-supported counseling services by providing an initial hybrid counseling framework specifically designed to address mathematics anxiety among prospective elementary school teachers.

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development of guidance and counseling services, particularly in addressing math anxiety among prospective elementary school teachers in the era of numeracy literacy.

6. AUTHORS' NOTE

This article is part of a research project funded by Majelis Diktilitbang PP Muhammadiyah through the RisetMu research grant program. The study focuses on the development of a *hybrid counseling* model to reduce *math anxiety* among prospective elementary school teachers in the era of numeracy literacy. The authors declare that all stages of the research process, including data collection, analysis, interpretation, and manuscript preparation, were conducted objectively, ethically, and in accordance with academic research standards. All references and sources cited in this article have been appropriately acknowledged. The authors expect that the findings of this study will contribute to the advancement of technology-based guidance and counseling services, particularly in supporting the academic readiness and professional competence of prospective elementary school teachers.

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