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Posing Problems, Setting Up Situations and Asking Questions of Problem-Solving Menus Activities: Towards the Steps in Helping Students Interact with One or More Mathematical Ideas

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Abstract

This study examined the relationship among posing problems, setting up situations, and asking questions through problem-solving menu activities in helping students interact with mathematical ideas. Specifically, it assessed teachers' implementation of these instructional components, determined whether significant differences existed according to respondents' demographic profiles, and examined the relationships among the variables. The study was anchored on experiential learning and constructivist perspectives, emphasizing active student participation and meaningful knowledge construction in mathematics instruction. A quantitative research approach employing comparative and correlational research designs was utilized. The respondents were randomly selected Master Teachers from secondary schools in the Province of Cavite. Data were collected using a researcher-made questionnaire that underwent expert validation and reliability testing before administration. The gathered data were analyzed using descriptive statistics, independent t-test, one-way analysis of variance (ANOVA), and Pearson's correlation coefficient. The findings revealed that teachers demonstrated evident practices in posing problems, setting up situations, and asking questions through problem-solving menu activities, indicating consistent implementation of learner-centered instructional strategies. No significant differences were found in these practices when respondents were grouped according to age, years in service, educational attainment, position or rank, and grade level assignment. However, significant positive relationships were identified among posing problems, setting up situations, and asking questions, suggesting that these instructional components complement one another in promoting effective mathematics instruction and students' problem-solving abilities. The study concludes that integrating problem-posing and problem-solving menu activities strengthens meaningful mathematics learning by fostering critical thinking, analytical reasoning, and active student engagement. It recommends continuous professional development, collaborative instructional practices, and supportive learning environments to further enhance teachers' implementation of these strategies. The study supports Sustainable Development Goal 4 (Quality Education) by promoting effective and learner-centered mathematics instruction and contributes to educational sustainability through evidence-based practices that strengthen teaching quality and meaningful learning outcomes.

Keywords: Analytical Reasoning, Mathematics Education, Posing Problems, Problem-Solving Menu Activities, Quantitative Research, Setting Up Situations, Teacher Assessment

1. Introduction

Mathematics education increasingly emphasizes learner-centered approaches that develop students' conceptual understanding, critical thinking, creativity, and problem-solving abilities. Among these approaches, problem-solving menus and problem-posing activities encourage students to become active participants in learning by allowing them to explore mathematical concepts independently, make meaningful choices, and construct knowledge through authentic learning experiences. These instructional strategies also enable teachers to better understand students' mathematical thinking and design learning experiences that promote deeper engagement and meaningful learning.

1.1 Background of Problem-Posing, Problem-Solving Menu Activities, and Mathematical Learning

Problem-solving menus provide students with collections of mathematical activities that encourage independent learning, self-paced exploration, and responsible decision-making. Unlike sequential learning tasks, menu activities allow students to select the order in which they complete tasks while engaging with different mathematical concepts. Effective implementation requires clear classroom procedures, structured monitoring of progress, and opportunities for both individual and collaborative learning. Through these activities, teachers can facilitate meaningful classroom discussions and continuously assess students' understanding while promoting autonomy and responsibility. Problem posing extends traditional problem solving by encouraging students to create their own mathematical problems. This approach enables students to assume greater intellectual responsibility for their learning while allowing teachers to examine students' conceptual understanding through the problems they generate. Research indicates that problem posing reduces careless computational errors, strengthens students' ownership of learning, integrates their personal experiences into mathematics instruction, and enhances conceptual understanding, reasoning, communication, creativity, autonomy, and interest in mathematics (e.g., English, 2020; Cai et al., 2015). Furthermore, engaging students in creating mathematical problems strengthens problem-solving abilities while providing teachers with valuable insights into students' procedural and conceptual understanding (e.g., Cai et al., 2013; Xu et al., 2020; English, 2020). Problem-solving skills also prepare learners to address real-life situations requiring critical thinking, logical reasoning, and analytical decision-making, enabling students to apply mathematics in authentic contexts that they encounter in everyday life (Premadasa & Bhatia, 2013; OECD, 2017). Innovative instructional methods that encourage questioning, reflection, and authentic problem-solving experiences help students develop competencies that extend beyond the classroom. Teachers therefore play an essential role in cultivating these lifelong skills by creating learning environments that stimulate curiosity, confidence, and independent thinking.

1.2 Themes and Insights on Problem Posing, Setting Up Situations, and Asking Questions in Mathematics Education

The literature consistently identifies problem posing as a powerful instructional approach that connects mathematics with students' real-world experiences while promoting inquiry, creativity, collaboration, and meaningful learning. As a core component of inquiry-based instruction, problem posing allows students to construct mathematical understanding, generate original ideas, and actively participate in the learning process rather than merely solving predetermined problems (Cai et al., 2015a; Ellerton et al., 2015; Carrillo & Cruz, 2015). Educational frameworks also emphasize developing mathematical connections, higher-order thinking, and metacognitive skills through student-generated problems. These perspectives are consistent with the synthesis of problem-posing research presented by Singer, Ellerton, and Cai (2013), which identifies problem posing as a significant avenue for advancing mathematics education research. Creating mathematical problems requires learners to integrate concepts meaningfully while demonstrating their understanding of relationships among mathematical ideas. Studies further show that problem posing enhances student engagement, motivation, creativity, and cognitive flexibility while providing teachers with a more comprehensive understanding of students' mathematical thinking than conventional problem-solving activities alone (Candiasa, Santiyadnya, & Sunu, 2018; Bevan et al., 2019; Guvercin, Cilavdaroglu, & Savas, 2014; Walkington, 2017; Walkington & Bernacki, 2015; Cai & Hwang, 2019; Xu et al., 2020; Goldin, 2013; English, 2020). Recent evidence also indicates that problem-posing instruction has a positive overall effect on students' mathematical performance and dispositions (Wang, Walkington, & Rouse, 2022). This finding is further supported by Akyüz (2020), who reported that engagement in non-routine problem-solving activities enhances prospective teachers' mathematical problem-solving performance.

1.3 Local, National, and Global Context of Problem-Posing and Problem-Solving Menu Activities in Mathematics Instruction

Problem posing has gained increasing recognition internationally as an effective instructional approach that promotes meaningful mathematics learning by engaging students in creating, analyzing, and reflecting on mathematical problems. Rather than limiting learning to solving existing problems, problem posing enables students to construct mathematical understanding, demonstrate conceptual knowledge, and connect mathematics with authentic experiences. This learner-centered approach supports educational frameworks that prioritize active engagement, critical thinking, and meaningful learning (Ministry of Education, 2017; Cai et al., 2015a; Ellerton et al., 2015; Carrillo & Cruz, 2015). At the national level, mathematics curricula emphasize the importance of developing mathematical connections, higher-order thinking, and metacognitive skills. Likewise, Alismail and McGuire (2015) emphasized that twenty-first century curricula should foster critical thinking, creativity, collaboration, and problem-solving skills, which are consistent with learner-centered mathematics instruction. The Singapore Ministry of Education Mathematics Syllabus (2012) and the Singapore Mathematics Curriculum Framework (Ministry of Education, 2012) advocate instructional strategies that encourage students to connect mathematical ideas, construct meaningful understanding, and strengthen mathematical reasoning through authentic learning experiences. These goals are supported by problem-posing activities that require learners to integrate mathematical concepts while demonstrating their understanding of relationships among ideas. Within classroom settings, problem posing provides opportunities for students to create meaningful mathematical tasks based on real-life contexts while encouraging creativity, ownership of learning, and confidence in mathematics. Providing learners with authentic contexts has likewise been shown to enhance students' creativity and originality in generating mathematical problems (Passarella, 2022). Teachers contribute to this process by providing varied mathematical experiences, maintaining supportive learning environments, and designing developmentally appropriate challenges that allow students to explain their reasoning, collaborate with peers, and refine their mathematical understanding (Lowrie, 2002; Calabrese & Capraro, in press; English, 2020; Fennema et al., 1996; Leikin & Elgrably, 2020; Gavin & Casa, 2012; Carpenter et al., 2015).

1.4 Theoretical and Conceptual Basis of Problem Posing and Problem-Solving Menu Activities

The study is conceptually anchored on problem-posing instruction as a learner-centered approach that encourages students to construct mathematical knowledge through active participation. This perspective is also supported by Chua (2011), who demonstrated that secondary students' approaches to problem posing reveal important aspects of their geometric reasoning and conceptual understanding. Effective problem posing requires teachers to facilitate learning environments where students engage with authentic mathematical experiences using real-life situations, educational games, visual representations, diagrams, stories, graphs, and other contextual materials that support conceptual understanding and creative thinking (Chang et al., 2011; Charalambous, Kyriakides, & Philippou, 2003; Chapman, 2006; Quintero, 2004; Silver & Cai, 2005). Research consistently demonstrates that problem posing strengthens students' problem-solving abilities, mathematical confidence, creativity, and engagement while providing teachers with valuable diagnostic information about students' conceptual understanding. Student-generated problems reveal misconceptions, alternative conceptions, and learning gaps, enabling teachers to design appropriate instructional interventions. Despite these documented benefits, problem-posing practices remain underutilized in mathematics classrooms because of limitations in instructional implementation and teacher preparation (Cifarelli, 2015; English, 2020; Silver & Cai, 1996; Kilic, 2017; Chang et al., 2011; Huinker & Bill, 2017; Xu et al., 2019). Hands-on learning further complements problem-posing instruction by allowing students to manipulate concrete materials that support visualization and understanding of abstract mathematical concepts. Technology-supported collaborative problem-posing environments have likewise been found to enhance students' engagement and learning outcomes (Sung, Hwang, & Chang, 2016). The use of manipulatives promotes conceptual development, critical thinking, and meaningful connections between physical representations and mathematical ideas, making mathematics more accessible to diverse learners (Clark & Clark, 2020; Holstermann, Grube, & Bogeholz, 2010; Lebuffe, 1994; Carbonneau, Marley, & Selig, 2013; Bruner, 1964; Chowrira et al., 2019; Haury & Rillero, 1994; National Research Council, 2001). Problem-posing activities may be implemented through free, semi-structured, or structured approaches, with semi-structured problem posing providing guided opportunities for students to create meaningful mathematical problems using open-ended contexts and established evaluation criteria (Kuzle, Gebel, and Rott, 2018; Kilic, 2013; Stoyanova and Ellerton, 1996; Christou et al., 2005; Ulusoy and Kepceoğlu, 2018; Cai et al., 2013).

1.5 Research Gaps and Rationale on the Relationship among Problem Posing, Setting Up Situations, Asking Questions, and Problem-Solving Menu Activities

Although numerous studies have established the educational value of problem posing, problem-solving, and hands-on mathematics instruction, existing literature continues to identify several gaps in their classroom implementation. Research indicates a need to better understand how task variables, particularly the situations presented and the prompts used during problem-posing activities, influence students' responses and the achievement of intended instructional objectives (e.g., Cai et al., 2023). Moreover, despite strong recommendations from mathematics education researchers, problem posing remains insufficiently implemented in many classrooms, limiting opportunities to develop students' creativity, mathematical reasoning, and conceptual understanding (English, 2020). The literature further emphasizes that mathematics education should move beyond isolated content instruction toward developing mathematical literacy through authentic, real-world learning experiences. Contemporary educational perspectives recognize that effective mathematics instruction should cultivate critical thinking, creativity, inquiry, communication, reflection, and the ability to formulate as well as solve mathematical problems. Instructional approaches that integrate problem posing with structured problem-solving strategies have been shown to strengthen students' mathematical reasoning and learning processes (Emre-Akdoğan & Argün, 2016; Mishra & Iyer, 2013). However, previous research has focused predominantly on problem solving, while comparatively less attention has been given to understanding how problem posing contributes to mathematical literacy and meaningful learning in classroom settings. This study is further grounded in Experiential Learning Theory (Kolb, 1984), which views learning as a continuous process of transforming experience through concrete experience, reflective observation, abstract conceptualization, and active experimentation. The theory emphasizes that meaningful learning occurs when learners actively construct knowledge by integrating prior experiences with new learning opportunities rather than passively receiving information. It likewise recognizes individual differences in learning styles and highlights the teacher's role in facilitating environments that support reflection, experimentation, and knowledge construction (Kolb, 1984; Dewey 1897). Building on these perspectives, the present study investigates the relationship among posing problems, setting up situations, and asking questions through problem-solving menu activities. Specifically, it examines teachers' assessments of these instructional components, determines whether significant differences exist according to respondents' profiles, and uses the findings to formulate instructional steps that can better help students interact with mathematical ideas. The study also interprets these relationships through the constructivist perspective of Vygotsky, emphasizing that knowledge is actively constructed through meaningful interaction and learning experiences.

1.6 Alignment of Problem-Posing and Problem-Solving Menu Activities with Relevant Sustainable Development Goals (SDGs)

The study aligns primarily with SDG 4 – Quality Education by promoting learner-centered instructional approaches that strengthen conceptual understanding, critical thinking, creativity, problem-solving, and mathematical literacy. This emphasis is consistent with the mathematics learning competencies outlined by Canavarro et al. (2021), which promote meaningful mathematical learning, reasoning, and active learner participation. These approaches encourage active participation, meaningful learning and the development of higher-order thinking skills that support quality mathematics education and lifelong learning (English, 2020; Cai et al., 2015; Xu et al., 2020; Kolb, 1984). The study also supports SDG

8 – Decent Work and Economic Growth by fostering competencies such as critical thinking, creativity, communication, analytical reasoning, and problem-solving, which are recognized as essential skills for lifelong learning, workforce readiness, and responsible participation in society. Developing these competencies through meaningful mathematics instruction equips learners with transferable skills applicable beyond the classroom. Furthermore, the study is consistent with SDG 9 – Industry, Innovation and Infrastructure by encouraging innovative instructional practices that promote inquiry, creativity, and knowledge construction. Problem posing enables students to generate original ideas, investigate authentic situations, and develop innovative approaches to mathematical thinking, thereby supporting educational innovation and the cultivation of creative problem solvers (Cai et al., 2015a; Brown and Walter, 1993; English, 2020).

1.7 Importance of Problem-Posing and Problem-Solving Menu Activities to Multidisciplinary Sustainability

This study contributes primarily to educational sustainability by providing evidence on instructional approaches that promote meaningful mathematics learning through problem posing, problem-solving menu activities, and experiential learning. Strengthening students' conceptual understanding, mathematical reasoning, creativity, and engagement supports continuous improvement in teaching and learning practices while encouraging active learner participation. The study also contributes to innovation and knowledge sustainability by encouraging classroom practices that integrate inquiry, creativity, reflection, and authentic problem solving. These approaches foster adaptable learners capable of generating ideas, analyzing situations, and applying mathematical concepts to real-world contexts. Helping students recognize meaningful mathematical problems in everyday situations further strengthens mathematical literacy and informed decision-making (Piedade & Reis, 2019). In addition, the findings may contribute to institutional and community sustainability by providing educators with evidence-based insights into the relationships among posing problems, setting up situations, and asking questions through problem-solving menu activities. These insights may guide instructional improvement, strengthen mathematics teaching practices, and support learning environments that cultivate independent, reflective, and mathematically literate learners.

2. Material and methods

2.1 Research Design

The study employed a quantitative research approach using comparative and correlational research designs to examine the relationships among posing problems, setting-up situations, asking questions, problem-solving menu activities, and the steps in helping students interact with one or more mathematical ideas, including selected demographic variables. Quantitative research was appropriate because it enabled the collection and analysis of numerical data to objectively examine relationships, test hypotheses, and generate reliable conclusions (Creswell & Creswell, 2017). This approach also ensured standardized data collection and supported statistical analysis to determine the strength and significance of the relationships among the variables (Bryman, 2016).

2.2 Locale of the Study

The study was conducted among selected secondary schools in the Province of Cavite. These educational institutions have been established since 1902 and serve a population consisting of approximately 50 Master Teachers and 170,000 students.

2.3 Respondents of the Study

The respondents of the study were Master Teachers from different secondary schools in the Province of Cavite. They provided the information needed to assess the relationships among posing problems, setting-up situations, asking questions, and problem-solving menu activities in helping students interact with mathematical ideas.

2.4 Sample and Sampling Procedure

The respondents were selected through random sampling to provide each qualified Master Teacher an equal opportunity to participate in the study, thereby promoting representative and unbiased data collection.

2.5 Research Instrument

The study utilized a researcher-made questionnaire developed from the literature review. The instrument consisted of three sections: the first gathered respondents' demographic information; the second measured the independent variables through statements rated using a Likert scale ranging from "Strongly Disagree" to "Strongly Agree"; and the third measured the dependent variable using the same response scale. The questionnaire underwent validation by at least three experts before administration. It was also subjected to field testing using try-out respondents. Reliability analysis yielded a Cronbach's Alpha of 0.858, indicating that the instrument was statistically reliable and demonstrated very consistent results across all items. The questionnaire was designed to be user-friendly to facilitate accurate and convenient responses.

2.6 Data Gathering Procedure

Data collection was conducted through face-to-face administration of the validated questionnaire. After the instrument was finalized and validated, it was administered to the selected respondents within a specified period. The researcher monitored the completion of the questionnaires and checked all accomplished forms to ensure completeness before encoding the data. The collected data were encoded in Microsoft Excel and processed using the Statistical Package for the Social Sciences (SPSS). Prior to analysis, the data were organized, cleaned, and examined for incomplete or inconsistent responses to ensure the accuracy of the statistical results.

2.7 Data Analysis Techniques

Descriptive and inferential statistical techniques were employed to analyze the collected data. Frequency counts and percentages were used to describe the respondents' demographic profiles, while the mean and standard deviation summarized the responses to the independent and dependent variables. Mean scores were interpreted using the following descriptive scale: 1.00–1.50 as Not Evident, 1.51–2.50 as Slightly Evident, 2.51–3.50 as Evident, and 3.51–4.00 as Highly Evident. Independent t-tests and one-way ANOVA were used to determine significant differences among groups, while Pearson's correlation coefficient (Pearson r) examined the relationships between the independent and dependent variables.

2.8 Ethical Considerations

The study observed established ethical principles throughout the research process. Respondents were informed of the study's objectives, procedures, potential risks, and benefits before providing informed consent. Participation was entirely voluntary, and respondents could decline or withdraw from the study at any time without consequences. Confidentiality and anonymity were maintained by assigning codes or pseudonyms instead of revealing participants' identities or school affiliations. Electronic and printed data were securely stored and accessed only by authorized researchers. Privacy was observed during data collection, and all research activities were conducted in accordance with institutional ethical standards following approval from the appropriate ethics review committee. The researcher maintained transparency regarding the study's purpose, scope, and objectives, disclosed any potential conflicts of interest, and ensured that the research maximized its potential benefits while minimizing possible risks to all participants.

3. Results and Discussion

3.1 Profile of the Teacher Respondents

3.1.1 Demographic Profile of the Teacher Respondents

The respondents were predominantly 46–55 years old, had 16–20 years of teaching experience, held master's degrees, occupied the position of Master Teacher I, and were mostly assigned to Grade 10. Overall, the respondents represented experienced and academically qualified mathematics teachers with extensive classroom responsibilities. These findings indicate that the respondents possess substantial professional experience and advanced academic preparation, suggesting that they are well-equipped to implement mathematics instruction and problem-solving strategies. Their extensive teaching experience, graduate education, and senior teaching positions provide a strong foundation for delivering effective classroom practices and facilitating students' mathematical learning.

3.2 Assessment of Teacher Respondents on Posing Problems of Problem-Solving Menus

3.2.1 Posing Problems of Problem-Solving Menus

The respondents generally assessed the implementation of posing problems in problem-solving menu activities as Evident, with a composite mean of 3.36. The highest-rated practices were encouraging students to break free from limited ways of thinking, recognize multiple possible solutions through brainstorming, and make informed decisions by understanding the consequences of their choices, all of which were rated Highly Evident. The lowest-rated practices were establishing a positive therapeutic relationship that promotes optimism and teaching strategies to reduce impulsive and avoidance tendencies, although these remained Evident. Overall, the findings indicate that teachers consistently employ problem-posing strategies that develop students' critical thinking, decision-making, and problem-solving skills. The findings suggest that teachers effectively integrate problem-posing strategies into mathematics instruction by promoting higher-order thinking, flexibility, brainstorming, and reflective decision-making. These practices encourage students to explore multiple solutions and apply structured approaches to solving mathematical problems. Although all indicators were evident, comparatively lower ratings on establishing supportive relationships and addressing impulsive behaviors indicate opportunities to strengthen motivational and self-regulation strategies. Overall, the results demonstrate that teachers maintain a balanced and effective approach to problem-solving instruction while recognizing areas that could further enhance students' learning experiences.

3.3 Assessment of Teacher Respondents on Setting Up Situations of Problem-Solving Menus

3.3.1 Setting Up Situations of Problem-Solving Menus

The respondents generally rated the teachers' practices in setting up situations for problem-solving menus as Evident, with a composite mean of 3.35. The highest-rated practice was fostering students' ability to apply rational problem-solving skills, while decreasing negative orientation received the lowest rating, although it remained evident. Overall, the findings indicate that teachers consistently create learning situations that encourage logical reasoning, critical thinking, and effective problem-solving among students. The results indicate that teachers effectively design classroom situations that help students analyze problems systematically and apply rational decision-making strategies. Their instructional practices support students' cognitive development by encouraging logical thinking and structured approaches to mathematical problem-solving. Although reducing students' negative orientation toward problem-solving received the lowest assessment, it remained evident, suggesting that greater emphasis on building confidence, resilience, and positive attitudes toward challenging mathematical tasks could further strengthen classroom instruction. Overall, the findings demonstrate that teachers successfully balance cognitive and affective aspects of learning while continuously promoting effective problem-solving experiences.

3.4 Assessment of Teacher Respondents on Asking Questions of Problem-Solving Menus

3.4.1 Asking Questions of Problem-Solving Menus

The respondents assessed teachers' practices in asking questions during problem-solving menu activities as Evident, with a composite mean of 3.43. The highest-rated practices were incorporating real-world problems and providing constructive feedback, both interpreted as Highly Evident. Creating a question-friendly environment and using open-ended questions received the lowest ratings, although both remained Evident. Overall, the findings indicate that teachers consistently employ questioning strategies that enhance student engagement, connect mathematics to authentic situations, and support reflective learning. The findings suggest that teachers effectively use questioning techniques to promote meaningful mathematics learning by relating lessons to real-life contexts and providing constructive feedback that helps students improve their problem-solving processes. These instructional practices encourage critical thinking, reflection, and active participation in learning. While creating an inquiry-rich classroom environment and using open-ended questions were rated comparatively lower, they remained evident, indicating opportunities to further strengthen students' curiosity, independent thinking, and higher-order reasoning. Overall, the results demonstrate that teachers consistently integrate questioning strategies that support analytical thinking and meaningful engagement in problem-solving activities.

3.5 Differences in the Assessment of Teacher Respondents According to Profile

3.5.1 Differences in the Assessment of Posing Problems of Problem-Solving Menus

The analysis revealed no significant differences in the respondents' assessment of posing problems in problem-solving menus when grouped according to age, years in service, educational attainment, position/rank, and grade level assignment. In all profile variables, the null hypothesis was accepted, indicating that the respondents consistently rated teachers' practices as Evident regardless of their demographic characteristics. The findings indicate that teachers demonstrate a common and consistent approach to posing mathematical problems regardless of their age, teaching experience, academic qualifications, professional rank, or grade level assignment. This uniformity suggests that effective problem-posing practices are widely implemented among the respondents, reflecting shared instructional standards and commitment to developing students' mathematical reasoning.

3.5.2 Differences in the Assessment of Setting Up Situations of Problem-Solving Menus

The results likewise showed no significant differences in the assessment of setting up situations for problem-solving menus when respondents were grouped according to age, years in service, educational attainment, position/rank, and grade level assignment. The null hypothesis was accepted across all profile variables, indicating that teachers consistently demonstrated Evident practices in creating learning situations that support problem-solving. The findings imply that teachers, regardless of their demographic characteristics, employ similar strategies in organizing classroom situations that encourage analytical thinking and mathematical problem-solving. The consistency across all groups reflects a shared understanding of effective instructional practices and suggests that teachers maintain comparable competence in facilitating problem-based learning experiences.

3.5.3 Differences in the Assessment of Asking Questions of Problem-Solving Menus

The findings further revealed no significant differences in the assessment of asking questions in problem-solving menus when grouped according to age, years in service, educational attainment, position/rank, and grade level assignment. All computed significance values resulted in the acceptance of the null hypothesis, indicating that teachers consistently practiced questioning strategies regardless of their profile. The results suggest that questioning strategies are consistently integrated into mathematics instruction across all respondent groups. Although slight variations in mean scores were observed, these differences were not statistically significant, indicating that teachers maintain comparable practices in using questioning techniques to stimulate student engagement, reasoning, and problem-solving regardless of their personal or professional characteristics.

3.6 Relationship among Posing Problems, Setting Up Situations, and Asking Questions of Problem-Solving Menus

3.6.1 Relationship among the Components of Problem-Solving Menus

The analysis revealed significant positive relationships among the three components of problem-solving menus. Posing problems was significantly correlated with setting up situations ($r = .619$, Sig. = .000) and asking questions ($r = .375$, Sig. = .041). Likewise, setting up situations showed a significant positive relationship with asking questions ($r = .581$, Sig. = .001). Overall, the three components demonstrated very strong positive relationships, with overall correlation coefficients of .771, .896, and .809, all having significance values of .000, resulting in the rejection of the null hypothesis. These findings indicate that improvements in one component are associated with improvements in the others. The findings indicate that posing problems, setting up situations, and asking questions function as interconnected components of effective mathematics instruction. Teachers who demonstrate strong competence in one area also tend to perform well in the others, showing that these practices complement one another in facilitating problem-solving. Their significant positive relationships suggest that integrating these instructional strategies strengthens students' higher-order thinking, analytical reasoning, and active engagement in mathematics learning, forming a cohesive framework for effective problem-solving instruction.

4. Conclusion & Recommendations

The study found that most teacher respondents were experienced Master Teacher I educators, aged 46–55 years, with 16–20 years of teaching experience, master's degrees, and Grade 10 teaching assignments. Teachers demonstrated evident competence in posing problems, setting up problem-solving situations, and asking questions that promote critical thinking, rational reasoning, student engagement, and decision-making. No significant differences were found in these practices when respondents were grouped according to age, years in service, educational attainment, position or rank, and grade level assignment. However, significant positive relationships existed among posing problems, setting up situations, and asking questions, indicating that these instructional practices function together to strengthen mathematics instruction and students' problem-solving abilities.

Teachers should participate in professional development programs that strengthen problem-posing, questioning, and problem-solving strategies while integrating motivational techniques, self-regulation, collaborative learning, real-world applications, and constructive feedback into mathematics instruction. Schools should encourage peer mentoring, regular classroom observations, and supportive learning environments that promote inquiry, reflection, multiple solution strategies, and positive attitudes toward mathematical problem-solving.

The study was limited to Master Teacher respondents from selected secondary schools in the Province of Cavite and focused only on the assessment of posing problems, setting up situations, and asking questions in problem-solving menu activities. The findings are therefore confined to the respondents and variables included in the study.

Compliance with ethical standards

This study was conducted in accordance with established ethical principles and institutional ethical standards. Ethical considerations were observed throughout the research process to ensure voluntary participation, informed consent, confidentiality, anonymity, privacy, transparency, and the responsible handling of research data while protecting the rights and welfare of all participants.

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