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# Influence of Practice and Repetition on College Students' Mastery of Geometry Basics

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**Abstract.** This study investigates the influence of practice and repetition on the mastery and retention of fundamental plane and solid geometry skills among first-year college students engaged in a Bachelor of Secondary Education Mathematics program during the academic year 2024-2025. The research addresses the gap in understanding how different types of practice affect students' learning outcomes in geometry. Using a descriptive-correlational research design, data were collected from all 32 students through tailor-made questionnaires and assessments. Additionally, the study employed Total Enumeration sampling, ensuring comprehensive participation and minimizing sampling bias. This approach provided a complete dataset, allowing a more accurate representation of the group's characteristics and insights. Two researcher-made survey questionnaires and a 50-item assessment questionnaire were used to gather data. Results indicate that students frequently participated in structured and guided practice but struggled with independent practice, leading to an overall average mastery score classified as "Fair." The lack of independent practice may have hindered their ability to internalize concepts, apply knowledge autonomously, and develop higher-order thinking skills. Pearson correlation analysis revealed a non-significant relationship between practice frequency and mastery levels, highlighting the need for additional factors in learning outcomes. The study also identified key challenges such as insufficient foundational knowledge, visualization difficulties, misconceptions, and learning anxiety, which significantly impact retention. Based on these findings, the study emphasizes the necessity for targeted interventions and an enhancement program focusing on independent practice, feedback mechanisms, remedial instruction, interactive teaching methods, and confidence-building strategies to improve students' overall proficiency in geometry and long-term academic success.

**Keywords:** Practice and repetition; Mastery and retention; Plane and solid geometry.

## 1.0 Introduction

Mastery of fundamental geometry is essential for academic success and practical daily tasks, yet many college students struggle to retain these vital skills over time. Despite previous research emphasizing the significance of spatial reasoning and geometric understanding in advanced studies and STEM-related careers (Ramful et al., 2016; Prihandika et al., 2021), various studies reveal that retention of these skills often diminishes after initial learning. For instance, research conducted by Lishchynska et al. (2023) indicates that first-year college students frequently demonstrate lower performance in mathematics, which may be attributed to inadequate foundational knowledge and motivation toward geometry. While structured practice methods, including guided instruction and immediate feedback, enhance students' learning experiences, independent practice remains inconsistent among many students, leading to gaps in proficiency and confidence.

This inconsistency in practice and the lack of effective retention strategies reveal a need for further investigation into how specific types of practice influence students' mastery of geometric concepts. Additionally, while existing literature has addressed broader aspects of mathematics education, few studies have focused on the particular nuances of practice and repetition about geometry. As such, this research aims to examine the correlation between students' extent of practice and their mastery and retention of plane and solid geometry fundamentals. By identifying effective instructional strategies rooted in practice and repetition, this study seeks to propose targeted interventions that can enhance students' understanding, retention, and confidence in geometry, ultimately contributing to their overall academic growth in mathematics.

## 2.0 Methodology

### 2.1 Research Design

This study employs a descriptive-correlational research design to explore the relationship between practice and repetition and the mastery and retention of fundamental plane and solid geometry skills among first-year Bachelor of Secondary Education (BSED) Mathematics students. According to Creswell (2014), descriptive research is a method that involves observing and documenting aspects of a phenomenon without influencing or manipulating it. According to Creswell, descriptive research is often used in quantitative studies to provide a systematic and factual account of a situation. It aims to answer "what" questions rather than exploring causal relationships. This approach is commonly applied in survey research, observational studies, and case studies, where researchers collect numerical data to describe trends, attitudes, or behaviors within a population.

### 2.2 Research Locale

The study was conducted in Ramon Magsaysay Memorial Colleges (RMMC), strategically positioned at the bustling intersection of Pioneer Avenue and Roxas Avenue in General Santos City. As a distinguished private, nonsectarian educational institution, RMMC remains steadfast in its dedication to enhancing students' academic capabilities with the goal of global competitiveness in the teaching-learning experience. This commitment is evident in consistently delivering high-quality education, meticulously overseen by experienced school administrators, devoted educators, and engaged stakeholders. At the core of its mission is an unwavering commitment to providing students with access to both affordable and exceptionally high-standard education.

### 2.3 Research Participants

The sample comprised all 32 first-year BSED Mathematics students enrolled at Ramon Magsaysay Memorial Colleges (RMMC), General Santos City, during the 2024-2025 academic year. This population was strategically chosen due to their recent exposure to the Plane and Solid Geometry subject. A study by Lishchynska et al. (2023) found that motivation and prior mathematical background significantly impact first-year students' success in mathematics courses.

### 2.4 Research Instrument

Data were collected using two researcher-made survey questionnaires and a 50-item assessment questionnaire. The survey questionnaires assessed the extent of practice and repetition, incorporating frequency, duration, progressive complexity, and feedback mechanisms. The assessment questionnaire evaluated students' mastery of geometric fundamentals, encompassing key topics like definitions, properties, theorems, and introductory trigonometry.

### 2.5 Data Gathering Procedure

The research protocol was approved by the Institutional Ethics Committee at RMMC (approval date: [01/23/25]). Prior to data collection, informed consent was obtained from all participants, ensuring confidentiality and the right to withdraw from the study at any time. Researchers administered the instruments in a controlled environment, allowing for comprehensive participation and minimizing potential biases.

### 2.6 Data Analysis

Descriptive statistics were employed to summarize participant responses, including means and standard deviations for the extent of practice and student mastery scores. A Pearson correlation analysis was conducted to examine the relationship between the extent of practice and retention with mastery of fundamental geometry skills, allowing for identifying significant patterns and trends.

### 2.7 Ethical Considerations

This study adhered to ethical guidelines, ensuring participant rights were upheld throughout the research process. Informed consent forms detailed the study's purpose, procedures, potential risks, and benefits. All collected data were stored securely to protect participant anonymity, and no identifiable information was disclosed in the analysis or reporting stages.

## 3.0 Results and Discussion

### 3.1 Extent of Practice and Repetition on Retention

Table 1 presents the frequency of practice and repetition among students. The overall mean is 2.90, indicating frequent engagement in structured practice. The minimal standard deviation (0.21) suggests consistent participation across respondents, implying that instructional methods promote uniform involvement.

**Table 1.** *Extent of Practice and Repetition on the Retention*

| Indicators | Mean | SD | Description |
|---|---|---|---|
| Frequency of Practice | 2.69 | 0.34 | Frequent |
| Duration of Practice | 2.78 | 0.38 | Frequent |
| Progressive Complexity | 3.02 | 0.42 | Frequent |
| Feedback Mechanism | 3.13 | 0.44 | Frequent |
| **Grand Mean** | **2.90** | **0.21** | **Frequent** |

The findings suggest that students rely on practice and repetition for retention, strongly emphasizing feedback and progressive complexity. This indicates that structured guidance and increasingly challenging tasks reinforce learning. However, there is less consistency in the frequency and duration of practice, suggesting that students may not engage in practice regularly or for sufficient time. This imbalance highlights areas for improvement, particularly in maintaining steady and sustained practice. As Amo (2017) describes, retention is "holding onto" or "keeping in place," ensuring consistent practice can enhance students' ability to recall and apply learned concepts, ultimately leading to better performance.

### 3.2 Mastery of the Fundamentals in Plane and Solid Geometry

Table 2 reveals an average mastery score of 19.91, classified as Fair. This indicates basic comprehension but insufficient proficiency in fundamental concepts. Most students scored between 11 and 30, reinforcing the need for targeted interventions.

**Table 2.** *Frequency and Percentage Distribution of the Respondents' Mastery of the Fundamentals in Plane and Solid Geometry*

| Scores | Frequency | Percentage (%) | Description |
|---|---|---|---|
| 41 - 50 | 0 | 0.00 | Excellent |
| 31 - 40 | 1 | 3.13 | Above Average |
| 21 - 30 | 12 | 37.50 | Average |
| 11 - 20 | 17 | 53.12 | Fair |
| 10 and below | 2 | 6.25 | Poor |
| **Total** | **32** | **100** | |
| **Average Score** | **19.91** | | **Fair** |

The findings indicate that a significant portion of respondents struggle with trigonometry fundamentals, with 25% demonstrating limited understanding and 28.13% lacking foundational knowledge. While 31.25% show moderate mastery, only 15.63% exhibit strong proficiency with minor errors. These results suggest a need for targeted instructional interventions to strengthen students' foundational skills and bridge learning gaps. Providing structured practice, step-by-step reinforcement, and frequent assessments can help enhance comprehension and mastery. As Fergus and Smith (2022) suggest, continuous evaluations allow students to reassess their understanding, identify weaknesses, and reinforce learning before progressing to more advanced concepts, ultimately leading to improved performance.

### 3.3 Relationship between Mastery and Extent of Practice and Repetition on the Fundamentals of Plane and Solid Geometry

The Pearson-r analysis (Table 3) indicates a weak positive but statistically insignificant correlation ($r = 0.035$, $p = 0.8486$) between practice and mastery, leading to the acceptance of the null hypothesis.

**Table 3.** *Pearson-r Analysis between the Respondents' Mastery and Extent of Practice and Repetition on the Retention of the Fundamentals of Plane and Solid Geometry*

| Indicators | Correlation Coefficient (r) | P-value | Decision | Remarks |
|---|---|---|---|---|
| Extent of Practice and Repetition on the Retention<br><br>Mastery of the Fundamentals in Plane and Solid Geometry | .03 | .848 | Accept the Null Hypothesis | Non-Significant<br><br>Very Weak Positive Relationship |

**Significance at the 0.05 level.*

The findings indicate that the extent of practice and repetition does not significantly impact students' mastery of fundamental Plane and Solid Geometry. The weak positive relationship observed is statistically insignificant, as reflected in the p-value of 0.8486, much higher than the 0.05 significance level. This leads to accepting the null hypothesis, suggesting that frequent practice alone is insufficient to ensure mastery. Instead, other factors such as effective instructional methods, problem-solving strategies, and conceptual understanding may play a more substantial role in learning retention. These results highlight the need for educators to adopt diverse teaching approaches that go beyond repetition, incorporating methods that promote deep comprehension and critical thinking. As Fergus and Smith (2022) explain, mastery learning involves continuous assessments like quizzes, peer reviews, and self-reflections, which allow students to identify gaps, reinforce learning, and develop a firmer grasp of concepts before advancing to more complex topics.

### 3.4 Challenges Encountered in Learning Plane and Solid Geometry among the Respondents

As shown in Table 4, the overall mean of 2.63, categorized as "Challenged," indicates that respondents generally face difficulties in learning Plane and Solid Geometry. This suggests that students encounter various obstacles, such as conceptual misunderstandings, difficulties with spatial reasoning, problem-solving struggles, and instructional challenges. While some aspects of learning geometry may be more manageable, the overall perception reflects a need for improved teaching strategies, enhanced instructional materials, and additional support to help students overcome these difficulties and develop a stronger understanding of geometric concepts.

**Table 4.** *Challenges Encountered in Learning Plane and Solid Geometry among the Respondents*

| | Indicators | Mean | SD | Description |
|---|---|---|---|---|
| 1 | I find it challenging to understand basic geometric concepts due to insufficient foundational knowledge. | 3.09 | .53 | Challenged |
| 2 | Misconceptions about geometric properties often prevent me from solving geometry problems accurately. | 3.84 | .57 | Challenged |
| 3 | I find it challenging to keep up with my teachers' discussion pace. | 2.72 | .73 | Challenged |
| 4 | My limited spatial reasoning skills hinder my ability to solve geometry problems. | 2.88 | .75 | Challenged |
| 5 | I have difficulty visualizing geometric shapes and their transformations in three-dimensional space. | 2.66 | .87 | Challenged |
| 6 | Solving problems is hard without a formula list because I often forget them. | 2.97 | .82 | Challenged |
| 7 | The teaching methods in geometry classes do not help me build on my foundational knowledge. | 2.03 | .86 | Less Challenged |
| 8 | There is insufficient use of hands-on activities or manipulatives in geometry lessons. | 2.25 | .72 | Less Challenged |
| 9 | The examples and exercises provided in class are insufficient to enhance my understanding. | 2.25 | .92 | Less Challenged |
| 10 | My teachers do not address my specific challenges in solving geometry problems. | 1.84 | .88 | Less Challenged |
| 11 | My fear of making mistakes discourages me from attempting to solve geometry problems. | 2.69 | .86 | Challenged |
| 12 | I feel anxious when faced with complex geometry tasks. | 2.72 | .77 | Challenged |
| 13 | My lack of confidence in my foundational geometry knowledge makes solving problems more difficult. | 3.06 | .62 | Challenged |
| 14 | I often feel overwhelmed by the steps involved in solving geometry problems. | 2.84 | .68 | Challenged |
| 15 | I struggle to use theoretical geometry concepts to solve real-world or abstract problems, especially when presented in new or unfamiliar formats. | 3.09 | .69 | Challenged |
| 16 | The instructional materials provided do not effectively reinforce my foundational knowledge in geometry. | 2.22 | .66 | Less Challenged |
| 17 | I lack access to visual aids or digital tools that could help me better understand geometry concepts. | 2.31 | .78 | Less Challenged |
| 18 | I find it challenging to construct or understand geometric proofs because they demand strong logical reasoning and a thorough grasp of axioms, theorems, and their applications. | 2.88 | .75 | Challenged |
| 19 | The resources available for learning geometry do not address my specific learning needs. | 2.25 | .88 | Less Challenged |
| 20 | I find it hard to learn effectively when teachers emphasize theoretical explanations but provide limited visual aids, practical examples, or interactive activities to support geometric concepts. | 2.94 | .62 | Challenged |
| **Overall Mean** | | **2.63** | **.36** | **Challenged** |

The findings suggest that students face significant challenges in Plane and Solid Geometry, particularly due to insufficient foundational knowledge and difficulty applying theoretical concepts to real-world or abstract problems. These difficulties indicate that many students struggle with understanding basic geometric principles and transferring their knowledge to unfamiliar contexts. Meanwhile, students only occasionally feel that their teachers do not address their specific learning difficulties, suggesting that instructional support is present but may not always be fully effective. These results highlight the need for stronger foundational instruction, more practical applications, and adaptive teaching strategies to help students bridge conceptual gaps. As Olaniyan et al. (2015)

suggest, psychological factors often influence mathematical difficulties, emphasizing the importance of building confidence and reducing anxiety to enhance learning outcomes.

### 3.5 Proposed Enhancement Program

Table 5 presents a proposed enhancement program designed to improve the teaching and learning of Plane and Solid Geometry by addressing key challenges students face. The program focuses on four key areas: strengthening foundational knowledge, enhancing feedback and assessment, increasing the quality and duration of practice, and reducing learning anxiety while building confidence. Each area includes specific objectives, activities, and justifications to help students develop a deeper understanding of geometric concepts, improve problem-solving skills, and create a more supportive and engaging learning environment.

**Table 5.** *Proposed Enhancement Program*

| Key Results Area | Objectives | Activities | Justification |
|---|---|---|---|
| Strengthening Foundational Knowledge | Improve students' basic understanding of geometric concepts and address misconceptions. | Conduct remedial tutorials and hands-on review sessions using visual aids and manipulatives. Develop targeted modules to clarify key foundational concepts. | Addressing gaps in basic concepts helps correct misconceptions and improve understanding. |
| Enhancing Feedback and Assessment | Provide timely, constructive feedback to help students track progress and correct errors. | Implement regular formative assessments. Organize peer review sessions and one-on-one feedback meetings. | Timely feedback helps students identify errors, track progress, and refine problem-solving skills. |
| Increasing Quality and Duration of Practice | Enhance structured and prolonged practice sessions to reinforce retention and mastery of concepts. | Establish structured practice schedules tailored to topic complexity. Create online platforms or resource centers for additional problem sets and self-paced practice. | Structured and sustained practice reinforces retention and mastery of geometric concepts. |
| Reducing Learning Anxiety and Building Confidence | Address students' anxiety and lack of confidence in geometry to promote a positive learning environment. | Organize study groups and problem-solving workshops. Provide counseling and motivational sessions to build confidence and reduce the fear of mistakes. | A supportive environment reduces fear, boosts confidence, and enhances learning outcomes. |

The proposed enhancement program is designed to improve students' learning experiences in Plane and Solid Geometry by addressing key difficulties identified in the study. It targets five crucial areas: strengthening foundational knowledge, enhancing feedback and assessment, improving instructional strategies, increasing quality and duration of practice, and reducing learning anxiety. The program incorporates remedial tutorials, interactive teaching approaches, structured practice sessions, regular assessments, and confidence-building activities to achieve these objectives. Collaboration among teachers, academic coordinators, school administrators, and counselors ensures the program is effectively implemented. By integrating these strategies, the program aims to enhance students' understanding, retention, and mastery of geometric concepts while fostering a supportive and engaging learning environment that encourages academic growth. Recent research, such as Assuah et al. (2022), has shown that inquiry-based learning significantly improves students' understanding and performance in geometry compared to traditional methods. Additionally, Adams et al. (2022) demonstrated that spatial reasoning interventions helped enhance students' skills in measurement and geometry, highlighting the critical role of spatial abilities in mathematics achievement. Furthermore, Shi et al. (2023) suggested that hands-on learning experiences positively affected middle school students' geometric problem-solving abilities, aligning with the study's structured, interactive learning recommendation.

## 4.0 Conclusion

This study highlights that while students frequently practice to retain basic geometry concepts, their practice lacks consistency, depth, and structure. Although they dedicate more time to challenging topics and follow a learning progression, independent, structured practice routines are often absent. Feedback is actively sought and positively impacts retention, but its role in closing knowledge gaps remains unclear. The assessment results show that most students only demonstrate a fair understanding of plane and solid geometry, with many struggling with foundational concepts. Only a small portion of students achieve strong mastery. This underscores the need for strategies reinforcing fundamental concepts and encouraging deeper cognitive engagement. Pearson's correlation analysis reveals that practice and repetition have a negligible impact on students' mastery of geometry. This

suggests that other factors, like conceptual understanding and instructional quality, may play a more significant role in learning. Thus, frequent repetition alone is not enough for retention, and diverse instructional strategies are crucial.

Students face challenges due to gaps in foundational knowledge, misconceptions, limited spatial reasoning, and anxiety. While instructional support exists, it may not always effectively address individual learning needs. These challenges indicate the need for structured interventions such as scaffolded instruction, problem-based learning, and interactive methods. The study recommends an enhancement program to address learning gaps in geometry by reinforcing foundational knowledge, improving feedback with assessments and personalized guidance, and enhancing practice through structured activities and online resources. It also emphasizes reducing anxiety and fostering a student-centered classroom. Successful implementation requires collaboration among educators and curriculum designers to integrate technology and real-world applications, ensuring better student engagement and understanding.

Future research should explore alternative teaching methods like adaptive learning technologies, gamified environments, and interdisciplinary approaches. Longitudinal studies could offer insights into the long-term effectiveness of these strategies. Additionally, exploring psychological factors like math anxiety, self-efficacy, and motivation could improve student outcomes in geometry. Educators can bridge knowledge gaps and improve students' geometry mastery by refining instructional practices and implementing targeted interventions.

## 5.0 Contributions of Authors

Rosebelle O. Malagamba – drafting, editing, data analysis, encoding, writing; Allan Jay S. Cajandig – supervising, editing


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## 7.0 Conflict of Interests

The authors declare no conflict of interest.

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