



## A Comparative Study of Contextual and Traditional Teaching on General Mathematics Performance among Grade 11 EIM Students at Angelo L. Loyola Senior High School

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### Article Info

ISSN (online): 2582-7138

Volume: 06

Issue: 03

March-April 2025

Received: 20-03-2025

Accepted: 25-04-2025

Page No: 547-551

### Abstract

This study aimed to compare the effects of contextual and traditional teaching methods on the General Mathematics performance of Grade 11 Electrical Installation and Maintenance (EIM) NC II students at Angelo L. Loyola Senior High School. Employing a quasi-experimental design, specifically a non-equivalent control group pre-test and post-test design, the research examined differences in performance between two groups: the experimental group taught using contextual teaching and the control group taught using traditional methods. A total of 34 students participated in the study, with pre-test and post-test assessments used to measure learning gains. The results revealed a significant difference in General Mathematics performance between the two teaching methods. The contextual teaching group exhibited greater improvement, with a mean score difference of 1.82 ( $p = 0.000$ ), compared to the traditional teaching group, which showed a smaller improvement (mean difference of 0.47,  $p = 0.191$ ). Statistical analysis, including the Two-Sample Independent T-Test and paired sample t-test, confirmed that contextual teaching was more effective in enhancing student performance. Based on these findings, the study recommends the adoption of contextual teaching strategies in General Mathematics education, along with professional development for educators to ensure effective implementation. Further research is also suggested to explore the long-term impacts and applicability of contextual teaching across various subjects and grade levels.

DOI: <https://doi.org/10.54660/IJMRGE.2025.6.3.547-551>

**Keywords:** Contextual Teaching, Traditional Teaching, Comparative Study, General Mathematics, Philippines

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### 1. Introduction

General Mathematics plays a crucial role in the academic development of students, particularly in technical-vocational education programs like Electrical Installation and Maintenance (EIM) NC II. However, the challenge of effectively teaching mathematical concepts remains, as traditional teaching methods often fail to engage students and enhance their understanding of abstract concepts. Traditional approaches, characterized by lectures and procedural exercises, have been widely used in many educational settings, but studies suggest that they may not foster the critical thinking and problem-solving skills required for real-world applications (Annong-Aksan, 2024)<sup>[2]</sup>. In contrast, contextual teaching, which connects academic content to real-life situations, has gained attention for its potential to improve student engagement, comprehension, and retention (Mughtar *et al.*, 2023)<sup>[33]</sup>. This study explores the impact of contextual teaching on General Mathematics performance, comparing it to traditional methods in the context of Grade 11 EIM students.

While existing literature has shown the effectiveness of contextual teaching in various subjects, limited studies have focused on its impact on General Mathematics, particularly for EIM students. Moreover, most studies have not compared contextual teaching with traditional methods in terms of measurable academic outcomes, such as performance improvements in pre-test and post-test scores (Libo-On & Perez, 2022; Tadios, 2023)<sup>[28, 47]</sup>.

This gap in the research highlights the need for a comprehensive comparison of these teaching methods to better understand their effectiveness in enhancing student performance in mathematical subjects.

The present study addresses this gap by conducting a quasi-experimental comparison between contextual and traditional teaching methods on the General Mathematics performance of Grade 11 EIM students at Angelo L. Loyola Senior High School. Specifically, the study aims to assess whether there is a significant difference in student performance between the two methods, to compare pre-test and post-test score improvements, and to determine which teaching method leads to greater improvements. By using a pre-test and post-test assessment design and statistical analysis (Two-Sample Independent T-Test, paired sample t-test), this study will contribute valuable insights into the practical application of contextual teaching in vocational education. Furthermore, the findings could inform future pedagogical strategies, potentially shifting the approach to teaching General Mathematics in similar educational settings.

This research will therefore provide important evidence on how teaching methodologies can impact student outcomes, offering actionable recommendations for improving instructional strategies in vocational education.

## 2. Methods

This study employed a quasi-experimental research design, specifically a non-equivalent control group pre-test and post-test design, to compare the effects of contextual and traditional teaching methods on the General Mathematics performance of Grade 11 Electrical Installation and Maintenance (EIM) NC II students at Angelo L. Loyola Senior High School. This design was deemed appropriate as it allowed the measurement of instructional impact despite the absence of random assignment, in line with established quasi-experimental practices in educational research (Cook & Campbell, 1979; Shadish *et al.*, 2002) <sup>[11, 45]</sup>.

The experimental group received instruction through the contextual teaching method, which integrates mathematical concepts with real-life applications. This approach is supported by previous studies indicating that contextualization enhances student engagement, comprehension, and critical thinking skills (Dayta, 2022; Pescuela & Goyena, 2020; Muchtar *et al.*, 2023) <sup>[13, 37, 33]</sup>. Conversely, the control group was taught using the traditional method, which focuses on lectures and procedural exercises. While effective in building procedural knowledge, traditional teaching is often less successful in promoting higher-order thinking skills (Annong-Aksan, 2024; Reyes *et al.*, 2019) <sup>[2, 41]</sup>. Pre-test and post-test assessments were used to provide a quantitative basis for evaluating student learning gains, a strategy widely validated in pedagogical research (Libo-On & Perez, 2022; Tadios, 2023) <sup>[28, 47]</sup>.

The primary source of data for the study was the Grade 11 EIM NC II students enrolled at Angelo L. Loyola Senior High School in Carmona, Cavite. The study population consisted of 34 students, who were divided into control and experimental groups for the intervention. To assess the students' performance, the researcher developed a self-made pre-test and post-test focusing on core areas of General Mathematics—Algebra, Geometry, and Trigonometry—with an emphasis on practical applications relevant to the EIM specialization. The pre-test measured the students' baseline knowledge prior to instruction, while the post-test was

administered after the intervention to assess performance changes. Both tests were designed to ensure content equivalency and consistency in difficulty level.

Instrument validation was conducted through expert review and test-retest reliability. Master teachers from the Mathematics department, Industrial Arts section, and Technical-Vocational-Livelihood department reviewed the instruments to ensure alignment with the curriculum and to verify the relevance and clarity of each item. A test-retest reliability procedure was carried out with a small group of Grade 11 EIM students, confirming the reliability of the instruments through a strong correlation between test administrations.

Scoring for the pre-test and post-test was based on dichotomous evaluation, with one point assigned for each correct response and zero for incorrect ones. Each instrument consisted of 12 items distributed evenly across the three mathematical domains: Algebra (4 items), Geometry (4 items), and Trigonometry (4 items), for a total maximum score of 12 points.

The researcher personally administered both the pre-test and post-test. Prior to data collection, approval from the school administration and ethical clearance were secured. The researcher introduced himself to the participants, explained the purpose of the study, and detailed the testing procedures while assuring the respondents of confidentiality. The pre-test responses were collected immediately after completion, then tallied, analyzed, and interpreted. Participants were subsequently informed of their group assignments. The experimental group received instruction through contextual methods, while the control group followed traditional instruction. Following a quarter of intervention, the same test was administered as the post-test, and the resulting data were similarly processed for analysis.

For statistical analysis, several tests were employed. The Two-Sample Independent T-Test was used to determine whether a significant difference existed in General Mathematics performance between students exposed to contextual versus traditional teaching methods. Additionally, paired sample t-tests and calculations of mean and standard deviation were applied to compare pre-test and post-test score improvements within each group. Finally, the independent sample t-test was utilized to evaluate the difference in mean performance gains between the two groups, providing insights into which instructional approach led to greater improvement.

## 3. Results and Discussions

Difference in General Mathematics Performance Between Contextual and Traditional Teaching Methods

**Table 1:** Two-Sample Independent t-Test Comparing Experimental and Control Groups

Groups	<i>t</i>	<i>p</i> -value	Decision	Interpretation
Experimental vs. Control	2.365	.024*	H <sub>0</sub> rejected	Significant

\*Significant at  $p < .05$

The results in Table 1 show a significant difference in General Mathematics performance between students taught using contextual teaching and those taught using traditional methods. With a *t*-value of 2.365 and a *p*-value of .024 (less than the .05 significance level), the null hypothesis (H<sub>0</sub>) is rejected. This confirms that contextual teaching had a significantly greater impact on students' academic

performance in General Mathematics compared to traditional methods. This finding aligns with Muchtar *et al.* (2023) [33], who reported that contextual learning strategies that relate mathematical concepts to real-world contexts significantly improve learners' critical thinking and engagement. Similarly, Dayta (2022) [13] emphasized that contextual teaching bridges abstract concepts and practical application,

enhancing retention and understanding.

### Improvement in Pre-Test and Post-Test Scores by Group

As shown in Table 2, the experimental group exhibited a statistically significant increase in their General Mathematics scores, from a pre-test mean of 6.35 to a post-test mean of 8.53 ( $t = -5.266, p = .000$ ).

**Table 2:** Paired Sample t-Test for Pre- and Post-Test Scores

Group	Test	Mean	Mean Difference	SD	<i>t</i>	<i>p</i> -value	Decision	Interpretation
Experimental	Pre	6.35	2.18	2.344	-5.266	.000*	H <sub>0</sub> rejected	Significant
	Post	8.53		2.294				
Control	Pre	6.24	0.47	2.412	-1.367	.191	Failed to reject H <sub>0</sub>	Not significant
	Post	6.71		2.201				

\*Significant at  $p < .05$

This result indicates the effectiveness of contextual teaching in fostering learning improvement. On the other hand, the control group's performance did not show a significant difference between the pre-test and post-test scores ( $t = -1.367, p = .191$ ).

The findings confirm the value of contextual instruction as an intervention that positively influences academic outcomes. According to Libo-On and Perez (2022) [28], contextual strategies help learners connect with the subject matter more meaningfully, thereby promoting better performance and long-term retention. Similarly, Tadios (2023) [47] found that the integration of real-world applications in math instruction significantly enhances learners' motivation and understanding.

### Teaching Method That Leads to Greater Improvement

**Table 3:** Descriptive Comparison of Post-Test Scores

Group	Mean Score ( $\bar{x}$ )	Mean Difference	Standard Deviation
Experimental	8.53	1.82	2.201
Control	6.71	—	2.294

Table 3 illustrates that the experimental group, which received contextual teaching, achieved a higher post-test mean score ( $\bar{x} = 8.53$ ) than the control group ( $\bar{x} = 6.71$ ). The mean difference of 1.82 indicates a more substantial improvement among students who experienced contextual instruction.

These results reinforce previous findings by Pescuela and Goyena (2020) [37], who highlighted that contextualization enhances learners' ability to transfer knowledge to practical situations—particularly important in technical-vocational tracks such as Electrical Installation and Maintenance. The higher performance observed in the contextual group may be attributed to increased relevance and learner engagement, key characteristics of the contextual approach.

The analysis of the results provides compelling evidence that contextual teaching methods significantly enhance students' performance in General Mathematics. Students exposed to real-world applications of math concepts outperformed those taught using traditional methods, both in terms of overall performance and gains from pre- to post-test. These findings suggest that educational practices, especially in technical-vocational tracks, should incorporate contextual strategies to maximize learning outcomes.

### 4. Conclusions

This study sought to examine the effectiveness of contextual

teaching in enhancing the General Mathematics performance of Grade 11 students in the Electrical Installation and Maintenance (EIM) strand, compared with traditional teaching methods. The results of the independent and paired sample t-tests revealed statistically significant differences in the performance of students exposed to contextual instruction. Specifically, the experimental group demonstrated greater gains in both pre- and post-test comparisons and in overall mean achievement, as compared to the control group taught using conventional approaches. The findings validate that contextual teaching provides a meaningful and practical framework for learning, wherein students are able to relate mathematical concepts to real-life and occupational situations. This instructional method not only improves cognitive outcomes but also fosters deeper engagement and comprehension. The results affirm existing literature emphasizing the importance of contextualization in promoting academic achievement, particularly in technical-vocational education settings. Thus, the study concludes that contextual teaching is a significantly more effective strategy than traditional methods in enhancing students' General Mathematics performance.

### 5. Recommendations

Based on the findings of this study, it is recommended that contextual teaching be more widely integrated into the instructional practices of Senior High School educators, particularly those teaching technical-vocational strands such as Electrical Installation and Maintenance (EIM). Contextual teaching connects academic content to real-life applications, enabling students to relate mathematical concepts to their future careers, thus fostering improved comprehension, retention, and engagement. Teachers should be provided with targeted training and professional development programs to effectively design and implement contextualized lesson plans that reflect the practical realities of students' chosen fields. Additionally, the Department of Education and school administrators are encouraged to support the institutionalization of contextual teaching strategies through the development of instructional modules and learning materials that align with industry standards. Policy frameworks should recognize contextualization as a valid and effective teaching strategy, and schools should be encouraged to allocate resources for its proper implementation. Assessment practices should also evolve to measure not just procedural knowledge but also students' ability to apply mathematical principles in real-world contexts. Authentic assessment tools such as performance tasks, situational

problem-solving, and project-based evaluations may serve as appropriate complements to contextualized instruction.

Finally, further research should be undertaken to explore the broader impact of contextual teaching on other learning domains, such as problem-solving, critical thinking, and long-term retention. Future studies could also examine its effectiveness across other strands and subject areas to determine the scalability and adaptability of the approach. Through sustained implementation and continuous research, contextual teaching may serve as a transformative instructional method that enhances both academic performance and real-world readiness among Senior High School students.

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