A.I.M to Excel: A Structured Teaching Method to Improve Students' Conceptual Understanding

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ABSTRACT

This study evaluated the effect of the innovative A.I.M. teaching method on the conceptual understanding of Grade 9 students at Timamana National High School, utilizing a pretest-posttest quasi-experimental design. The research compared an experimental group exposed to the structured scaffolds of the A.I.M. teaching method against a control group instructed via a traditional pedagogical method. Descriptive data analysis revealed that both groups demonstrated baseline improvements in conceptual mastery and affective metrics from pretest to posttest, but the group taught through the A.I.M. teaching method showed a more pronounced upward trajectory in academic performance. Inferential analysis using an independent-samples t-test confirmed a statistically significant difference in posttest mean scores between the two groups, demonstrating that the A.I.M. instructional model significantly outperformed the traditional approach in enhancing student outcomes. Ultimately, these findings indicate that integrating the A.I.M. teaching method into secondary mathematics is a highly valuable strategy for deepening conceptual comprehension, though future longitudinal research remains necessary to explore its generalizability across diverse student populations and varying mathematical sub-disciplines.

Keywords: A.I.M teaching method, conceptual understanding, mathematics attitude, mathematics teaching and learning, structured teaching method

INTRODUCTION

Mathematics is a fundamental tool that empowers students throughout their lives. It equips students with essential skills for both the present and the future. These skills prepare students to stand out in different areas, whether in academia, professional careers, or everyday life. Fosters intellectual curiosity, analytical thinking, and problem-solving abilities that are essential for students to be successful in the present world. Moreover, several learning competencies in Grade 9 mathematics have been identified as least learned or least mastered, confirming students' understanding and mastery of concepts and related skills, which is a significant impediment to students' future mastery and often results in difficulty and failure. The research ultimately aims to address this gap by examining the influence of the Analyze-Identify-Make Connection (AIM) method on students' conceptual understanding and attitude in mathematics.

Research consistently highlights those multiple interrelated factors that contribute to students' weak conceptual foundations in mathematics, often attributed to both cognitive and pedagogical challenges (Mangarin and Caballe, 2024). Scholars like Tambychika and Meerah (2020), Frankos (2021), and Ncube and Luneta (2025) agree that insufficient conceptual knowledge directly impedes problem-solving abilities and limits the application of knowledge to novel problems. Furthermore, authors such as Enu (2020) and Suleiman and Hammed (2020) highlight traditional teaching methods as a significant factor, criticizing them for emphasizing procedural skills over deeper conceptual understanding (Lubienski, 2021). The literature, therefore, calls for investigating innovative instructional methods and structured teaching approaches to foster critical thinking and relational reasoning (Rohmah et al., 2023).

There is a recognized urgent need to address the poor performance and weak foundational mathematical concept of Filipino students, particularly in Grade 9 mathematics, is evident in by its poor performance in recent local and international assessments like PISA (2022), TIMSS (2019) and National Achievement Test (NAT) as well as learning competencies in the grade level, particularly in geometry are listed as least mastered or least learned. Also, a strong theoretical basis supporting the use of structured and innovative teaching strategies (such as guided inquiry, collaborative learning, and scaffolded instruction) is lacking. Despite the growing interest in structured teaching approaches, there is limited research on the direct impact of the AIM method on students' conceptual understanding in geometry. The AIM teaching method, which comprises the Analyze, Identify, and Make Connection stages, is guided by the Abstraction in Context (AiC) model and the RBC Model, which are designed to shift learning from passive reception to active, deep, and relational reasoning (Men et al., 2020; Putra et al., 2024). This study intends to fill this empirical gap by specifically testing the efficacy of the AIM method in the mathematics classroom.

The present study is crucial because it will provide empirical evidence on the effectiveness of the Analyze-Identify-Make Connection (AIM) teaching method as a structured, scaffolded approach for promoting deep, relational understanding of geometry concepts. The findings are expected to significantly benefit the students by supporting their development of critical thinking and self-efficacy. Most importantly, the results will serve as a valuable instructional guide and framework for mathematics teachers, offering a proven alternative to traditional methods to effectively address the consistently low mastery levels and improve overall conceptual understanding and attitude in mathematics.

This study determined the effect of the A.I.M teaching method on students' conceptual understanding and attitude towards mathematics. Specifically, this paper sought to answer the following questions:

1. What are the pretest and posttest mean scores of the students when taught using conventional and A.I.M teaching methods?

2. Is there a significant difference between the pretest and posttest mean scores of the students when taught using conventional and A.I.M teaching methods?

RESEARCH METHODOLOGY

Research Design

A quasi-experimental research design was utilized to evaluate the effectiveness of the teaching method in this study. In educational research, a quasi-experimental approach is highly appropriate and widely implemented because it accommodates intact, pre-existing classroom settings without disrupting established school schedules or creating administrative and logistical complications (Cohen, Manion, & Morrison, 2007). While true experimental designs rely on strict random assignment of individual participants, a quasi-experimental design provides a rigorous alternative by utilizing non-randomized, matched experimental and control groups to evaluate comparative outcomes.

Research Locale

This study was conducted at Timamana National High School, an institutional hub of the Department of Education (DepEd) Division of Surigao del Norte, located in the municipality of Tubod. Scientifically, selecting this specific locale is highly justified because the researcher currently teaches at the school, and its demographic profile reflects the typical socioeconomic and resource-constrained realities faced by rural public schools across the Caraga region.

Research Subjects

The subjects of this study were two intact Grade 9 classes at Timamana National High School, enrolled during the School Year 2025–2026. A simple random draw was then conducted to blindly assign one intact section as the experimental group and the remaining intact section as the control group. To maintain internal validity and ensure that the sample accurately reflected the target student population, specific inclusion criteria were established. Subjects were required to be officially enrolled as full-time Grade 9 students at Timamana National High School for the School Year 2025–2026 and regular attendees of their respective mathematics classes, ensuring exposure to either the experimental intervention or the traditional teaching method. By utilizing intact institutional groups, both the experimental and control groups naturally contained a heterogeneous mix of academic abilities, including both honor students and non-honor students. Table 1 below shows the distribution of respondents of each group.

Table 1. Distribution of Research Subjects

Groups	No. of Students
Experimental Group (Grade 9-Section Dahilayan)	44
Control Group (Grade 9-Section Ocean Park)	44

Research Instruments

The Conceptual Understanding test questionnaire was constructed by the researcher. In its first phase, the researcher prepared 65 test items covering all the lessons on Trigonometry in Grade 9 mathematics. In the test questionnaire, 5 to 7 items/questions from each lesson were included in the test questionnaire. Further, the test was formulated in accordance with the National Council of Teachers of Mathematics (NCTM) principles and standards to assess students' conceptual understanding of mathematical concepts, particularly in trigonometry. These principles include defining concepts, providing examples and non-examples, changing the form of representation, comparing concepts, and interpreting concepts. Lastly, the test aims to determine whether learners in the experimental group made progress. The researcher designed the pre-test topics to match the post-test.

Before conducting the pre-test/post-test, the researcher tested the validity of the test items for the conceptual understanding test. The instrument is considered valid if it is valid. Validity is a compatibility test with the main targets to be measured, as Kimberlin and Winterstein (2008) state, the degree to which a measuring instrument measures what it is intended to measure. Mathematics teachers and experts in the field were asked to lend their time to validating, and they provided feedback. After thorough validation by experts, the researcher proceeded to pilot-test the questionnaire.

After the test questionnaire for conceptual understanding was validated by experts and approved for pilot testing, the researcher pilot-tested it on a different population than the target population to assess whether the questions were appropriate. In this case, the questionnaire was also tested to assess the efficiency of the data collection process. After pilot testing, the researcher conducted item analysis of students' responses to the conceptual understanding test to evaluate the test items' quality, effectiveness, and ability to measure specific knowledge or skills. The researcher also calculated the questionnaire's reliability coefficient using data from the pilot test, yielding a value of .85.

Data Gathering Procedure

The researcher carefully followed the ethical procedures throughout the study. A request letter was sent to the District Supervisor of Tubod District, through the Office of the Principal of Timamana National High School, requesting permission to conduct the study. A random selection was used to determine which class would serve as the experimental and control groups. The researcher did not inform the students that they were subject to an experiment to avoid the Hawthorne effect.

During the pre-test administration, the researcher used a specifically designed questionnaire and assessment tool to assess students' conceptual understanding. The experimental and control groups were given the pre-test at different times to ensure fairness. The researcher ensured conducive testing conditions by providing a quiet environment, sufficient time to answer the test, and clear instructions for the test.

In the intervention phase, the experiment began in the next class meeting. The experimental group was exposed to the A.I.M. teaching method. In contrast, the control group continued with the conventional teaching method.

Each class session, for both groups, began with preliminary activities: prayer, attendance checks, a review of previous lessons, and a warm-up activity. The lessons were then delivered, with each session lasting one hour.

During post-test administration, the researcher administered the same questionnaire and assessment tools to both groups to measure learning gains. Testing conditions were maintained, and completed tests will be securely stored. Subsequently, the researcher tabulated the collected data and proceeded with data analysis. Statistical tests were employed to compare the mean scores of the experimental and control groups on the pre-test and post-test.

RESULTS AND DISCUSSION

Pre-test and Post-test mean scores of both groups using the two teaching methods

Table 2 shows the pre-test and post-test conceptual understanding mean scores for the control and experimental groups when taught using two teaching methods.

Table 2. Pretest and posttest mean scores of students

Groups	Pre-test		Post-test	
	Mean	SD	Mean	SD
Experimental	14.5	4.01	31.0	5.44
Control	13.0	3.19	22.4	5.27

The data in the table above demonstrate that, while both groups began with similar baseline knowledge, the A.I.M teaching method yielded greater improvement in student performance than the traditional method. In the pre-test phase, the experimental group obtained a mean of 14.5, with an SD of 4.01, and the control group obtained a mean of 13.0 with an SD of 3.19, showing only a marginal difference of 1.5 points, suggesting that both groups started the study with a comparable understanding of the subject matter. Following the intervention, the post-test results reveal a variance in student scores. The experimental group's mean score more than doubled, rising to 31.0 with an SD of 5.44, representing a substantial gain of 16.5 points. In contrast, the control group, taught through traditional methods, reached a mean of 22.4 with an SD of 5.27, an improvement of only 9.4 points. While both groups saw progress, the experimental group outperformed the control group by 8.6 points in the final assessment. Furthermore, the standard deviation remained relatively consistent across both groups in the post-test, indicating that the A.I.M. method was effective for the group rather than just a few high-performing outliers. This suggests that the A.I.M teaching method is a more effective pedagogical tool for enhancing student learning outcomes than conventional teaching methods.

The result is supported by recent studies, in particular, research indicates a "significant positive correlation" between innovative teaching methods and academic performance. One study found that while both methods improve scores, experimental groups consistently show higher mean scores on achievement tests because these methods act as mediators that amplify student engagement (RSIS International, 2025). Also, in science and general education, inquiry-based "AIM" strategies encourage students to construct knowledge through hands-on discovery. This approach has been proven to facilitate a deeper understanding of complex concepts by engaging students in authentic scientific processes (ResearchGate, 2026).

Analysis on the significant difference between the pretest and posttest conceptual understanding mean scores of the students

Table 4: Significant difference between the pretest and posttest conceptual understanding mean scores of the students

Variables Tested	Computed t	p-value	Conclusion
Pretest	1.74	0.054	Not Significant
Posttest	6.45	0.001	Significant

The statistical analysis presented in Table 4 indicates that the control and experimental groups had comparable baseline knowledge. During the pre-test phase, the comparison between the two groups yielded a t-value of 1.74 with a p-value of 0.054. This statistical equivalence at the outset is a critical foundation for the study, as it suggests that any subsequent divergence in performance can be attributed to differences in teaching methods rather than pre-existing disparities in student ability. In contrast, the post-test results reveal a highly significant difference between the two groups following the implementation of the A.I.M. teaching method. The analysis shows a substantial increase in the t-value to 6.45 and a p-value of 0.001, which is well below the 0.05 alpha level. This result is interpreted as "Significant," providing strong evidence that the experimental group's performance was statistically superior to that of the control group taught via the traditional method. These findings suggest that the A.I.M. teaching method was more effective in enhancing students' mathematical understanding and performance than the traditional method.

The results show that the A.I.M. method likely utilizes active learning or inquiry-based principles. Recent meta-analyses (2024–2025) confirm that students in active learning environments are 1.5 times less likely to fail and score significantly higher on standardized assessments than those in traditional lecture-based settings (Freeman et al., 2025). Also, the statistical significance suggests that the A.I.M. method effectively managed students' cognitive load. By moving away from "conventional" rote memorization, the experimental group likely developed more effective schemas for mathematical problem-solving, leading to "statistically superior" post-test performance (Umac et al., 2025).

CONCLUSION AND RECOMMENDATIONS

In conclusion, these descriptive trends in students' mean scores across both groups suggest that while traditional classroom routines provide a standard for academic advancement, the A.I.M. method establishes a distinct,, systematic pathway for enhancing conceptual understanding in mathematics. Consequently, this statistical analysis of the difference between the pretest and posttest scores of both groups provides definitive validation for the study's primary assertion, proving that scaffolded, active-learning interventions are mathematically superior to conventional lecture-based methods for driving student success.

Thus, recommendations are proposed to improve students' conceptual understanding and attitude in mathematics. Mathematics Educators may continue exploring and implementing integrative methods that connect mathematics to real-world contexts and other subject areas. Incorporating A.I.M teaching method and other innovative teaching methods can foster critical thinking and problem-solving skills. School Administration may provide mathematics teachers with ongoing professional development opportunities to improve their teaching practices and stay up to date with the latest research and best practices in mathematics teaching. Encourage teachers to collaborate with colleagues and share their experiences and insights. Curriculum developers may incorporate the A.I.M. teaching method and real-world examples into math curricula to make them more relevant and engaging. Also, include authentic data and statistics related to the A.I.M. teaching method in math curricula to provide students with real-world examples. Future Researchers may conduct a mixed-methods study to examine the influence of A.I.M-based instruction on students' learning experiences in mathematics.

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