

Meranaw Culture-Based Instruction on the Conceptual Understanding of Grade 9 Students in Mathematics

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Abstract This study determined the effectiveness of Meranaw Culture-Based Instruction integrated with the 5I's Learning Path in improving the conceptual understanding of Grade 9 students in Mathematics. An explanatory sequential mixed-methods design was employed. The quantitative phase utilized a quasi-experimental pretest-posttest control group design involving 90 Grade 9 students divided equally into experimental and control groups. The experimental group received Meranaw culture-based instruction while the control group received conventional instruction. A researcher-developed Conceptual Understanding Test measured students' achievement, while interviews, classroom observations, and reflection journals were conducted to explain the quantitative results. Descriptive statistics and Analysis of Covariance (ANCOVA) were used to analyze the quantitative data, whereas thematic analysis was used to analyze the qualitative findings. Results revealed that the experimental group achieved significantly higher conceptual understanding than the control group after controlling for pretest scores ($F = 1137.51$, $p < .001$). Four major themes emerged from the qualitative data: (1) traditional instruction was perceived as abstract; (2) culture-based instruction improved conceptual understanding; (3) cultural contexts made mathematics meaningful; and (4) students became more engaged during instruction. The integration of both quantitative and qualitative findings confirms that Meranaw Culture-Based Instruction significantly enhances conceptual understanding by connecting mathematical concepts with learners' cultural experiences. The study recommends the integration of indigenous cultural knowledge into mathematics instruction to promote meaningful and contextualized learning.

Keywords: Meranaw culture-based instruction, conceptual understanding, culturally responsive teaching, mathematics education, 5I's Learning Path, mixed methods

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1. Introduction

Conceptual understanding remains one of the major goals of mathematics education because it enables learners to explain, connect, and apply mathematical concepts rather than merely memorizing procedures [1,2]. However, many learners continue to experience difficulty in understanding abstract mathematical ideas due to traditional instructional approaches that emphasize procedural knowledge [3].

Culture-based instruction has emerged as a learner-centered approach that contextualizes mathematical concepts using learners' indigenous knowledge, language, traditions, and daily experiences [4]. For Meranaw learners, integrating familiar cultural practices into mathematics instruction may strengthen conceptual understanding while simultaneously preserving cultural identity [5].

This study investigated the effectiveness of Meranaw Culture-Based Instruction integrated with the 5I's Learning Path (Impress, Identify, Inspire, Inspect, and Invoke) in improving the conceptual understanding of Grade 9 students in Mathematics [6].

2. Methodology

Research Design

The study employed an explanatory sequential mixed-methods design [7]. The quantitative phase utilized a quasi-experimental pretest-posttest control group design, while the qualitative phase explored students' learning experiences through interviews, classroom observations, and reflection journals.

Participants

The participants were 90 Grade 9 students from Mindanao State University–University Training Center during School Year 2026–2027. Forty-five students composed the experimental group, while another forty-five students served as the control group.

Research Instruments

The quantitative instrument was a researcher-developed 9-item Conceptual Understanding Test validated by experts and pilot-tested with a Cronbach's Alpha coefficient of 0.86. Qualitative data were collected through semi-structured interviews, classroom observation

checklists, and student reflection journals.

Data Analysis

Means and standard deviations described students' performance, while Analysis of Covariance (ANCOVA) determined the effectiveness of the intervention. Qualitative data were analyzed using thematic analysis and integrated with the quantitative findings.

3. Results and Discussion

The pretest results showed that both groups had comparable conceptual understanding before the intervention. Following the implementation of Meranaw Culture-Based Instruction, the experimental group obtained a substantially higher posttest mean score (86.20) than the control group (72.30). Likewise, the experimental group achieved a mean gain of 20.10 compared with only 5.80 for the control group.

ANCOVA revealed a statistically significant difference between the two groups after controlling for pretest scores ($F = 1137.51$, $p < .001$), indicating that Meranaw Culture-Based Instruction significantly improved students' conceptual understanding.

Qualitative findings generated four major themes:

- Traditional mathematics instruction was difficult and abstract.
- Meranaw culture-based instruction improved conceptual understanding.
- Cultural contexts made mathematics meaningful.
- Students became more engaged during mathematics learning.

The integration of quantitative and qualitative findings demonstrated convergence. Students who participated in culture-based instruction not only obtained significantly higher conceptual understanding scores but also described mathematics as more meaningful, understandable, and relevant to their daily experiences. These findings support culturally responsive teaching [4] and constructivist

learning [8], emphasizing that learners construct deeper understanding when instruction is connected to their cultural context [9].

4. Conclusion and Recommendations

Meranaw Culture-Based Instruction integrated with the 5I's Learning Path, significantly improved the conceptual understanding of Grade 9 students in Mathematics. The findings indicate that contextualizing mathematics using indigenous cultural knowledge enhances students' comprehension, engagement, and appreciation of mathematical concepts. The study recommends that mathematics teachers incorporate Meranaw cultural contexts into classroom instruction and that curriculum developers strengthen the integration of indigenous knowledge in mathematics education. Future studies may investigate the effectiveness of culture-based instruction across different mathematical competencies and educational settings [4,5,10].

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