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Ethnomathematics in the Maguindanaon Context: Exploring the Cultural Dimensions of Students' Struggles in Mathematics in Lambayong District

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ABSTRACT

Mathematics is a fundamental discipline that develops logical reasoning and problem-solving skills, yet learners from culturally diverse backgrounds often experience difficulties when formal instruction is disconnected from their indigenous knowledge systems. This study explored the mathematical struggles of Maguindanaon students in Lambayong District through an ethnomathematical lens during the school year 2025–2026. It aimed to understand how cultural contexts influence students' engagement with mathematical concepts and to identify the sources of their learning challenges. A qualitative research design, specifically a phenomenological approach, was employed to capture the lived experiences of Maguindanaon learners. Participants were purposively selected students from selected schools in the district. Data were gathered through in-depth interviews and reflective narratives, allowing participants to describe their experiences in learning mathematics, their perceptions of difficulty, and the cultural factors affecting their understanding. Thematic analysis was used to identify recurring themes and interpret the data. Findings revealed that students experienced difficulties in mathematics due to language barriers, abstract presentation of concepts, and limited connection between mathematical content and their cultural practices. Many participants expressed that lessons were often detached from their everyday experiences, making it challenging to comprehend and apply mathematical ideas. Additionally, differences in communication styles and unfamiliar instructional approaches contributed to confusion and reduced confidence. Despite these challenges, students showed potential for improved understanding when instruction incorporated familiar cultural contexts, real-life applications, and interactive teaching strategies. Ethnomathematical approaches that integrate local knowledge, traditions, and practices were found to enhance engagement and comprehension. The study concludes that aligning mathematics instruction with students' cultural backgrounds can help bridge learning gaps and improve understanding, highlighting the importance of culturally responsive pedagogy in mathematics education.

Keywords: *cultural context, mathematical comprehension, indigenous knowledge, learner engagement*



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INTRODUCTION

Background of Study

Mathematics is a fundamental discipline that shapes logical reasoning and problem-solving skills. However, students from diverse cultural backgrounds, particularly Indigenous communities, often struggle with mathematical concepts due to a misalignment between formal education and their cultural knowledge systems. Ethnomathematics, which explores the relationship between mathematics and culture, offers a framework for understanding how Indigenous knowledge influences mathematical learning. In the Maguindanaon context, traditional beliefs, linguistic structures, and ways of thinking may impact students' ability to grasp mathematical concepts.

Globally, ethnomathematics has gained recognition for its role in making mathematics more inclusive and culturally relevant. Research by D'Ambrosio (2019) highlights how Indigenous communities develop unique mathematical systems rooted in their daily practices, such as counting, measuring, and spatial reasoning. However, mainstream education often overlooks these cultural foundations, resulting in disengagement and poor mathematical performance among Indigenous students (Gerdes, 2020). Studies from Australia and Canada emphasize that culturally responsive mathematics education improves student engagement and learning outcomes (Matthews, Cooper, & Baturo, 2021). Despite these findings, a gap exists in understanding how specific Indigenous cultures, such as the Maguindanaon, influence students' mathematical struggles.

In the Philippines, mathematics education remains a challenge for many Indigenous learners due to linguistic barriers and culturally disconnected curricula. Studies show that Indigenous Peoples' (IP) students score lower in mathematics assessments than their non-IP peers, partly due to differences in numeracy practices and conceptual understandings (Reyes, 2020). The Department of Education (DepEd) has implemented the Indigenous Peoples Education (IPEd) Program, advocating for culturally contextualized teaching approaches (DepEd, 2019). However, despite these efforts, gaps remain in implementing culturally responsive pedagogies in mathematics classrooms, especially in Muslim-dominated Indigenous communities such as the Maguindanaon.

South Central Mindanao is home to diverse Indigenous and Moro communities, including the Maguindanaon, who have rich mathematical traditions embedded in their weaving, trading, and daily practices (Macalandong & Tamayo, 2021). However, studies indicate that Maguindanaon students struggle with mathematics due to language differences, traditional belief systems, and limited culturally relevant instructional materials (Buisan et al., 2022).



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While some schools have adopted localized teaching strategies, a significant gap persists in understanding how Maguindanaon culture specifically influences students' mathematical learning and what strategies can bridge the gap between formal mathematics and cultural knowledge.

In Sultan Kudarat, particularly in Lambayong District, Maguindanaon students face unique challenges in mathematics education due to socio-cultural and economic factors. Limited access to quality education, traditional beliefs about numeracy, and the influence of Islamic education on learning approaches contribute to their struggles (Lidasan, 2023). While some initiatives have aimed to integrate Indigenous knowledge into the curriculum, there is still a lack of empirical research focusing on Maguindanaon learners' specific difficulties and how ethnomathematical approaches can enhance their mathematical competencies.

Despite the growing body of research on ethnomathematics, few studies have specifically examined how Maguindanaon students conceptualize and struggle with mathematics within their cultural context. While international and national studies emphasize the importance of culturally responsive mathematics instruction, there remains a gap in localized research addressing the interplay between Maguindanaon beliefs, traditions, and mathematics learning.

This study aims to fill this gap by exploring the cultural dimensions of students' mathematical struggles in Lambayong District. This study aligns with SDG 4: Quality Education, which emphasizes inclusive and equitable education for all learners, including Indigenous and culturally diverse communities (United Nations, 2022). By identifying culturally responsive strategies for teaching mathematics to Maguindanaon students, the study contributes to the goal of reducing educational disparities and promoting lifelong learning opportunities.

The primary goal of this study is to explore the mathematical struggles of Maguindanaon students in Lambayong District through an ethnomathematical lens. It aims to analyze the cultural factors influencing their mathematical learning, identify gaps in existing instructional approaches, and propose interventions that integrate Maguindanaon cultural knowledge into mathematics education. The findings will serve as a basis for developing culturally responsive teaching strategies that enhance the mathematical competencies of Indigenous learners.

Theoretical Frameworks

To provide a strong theoretical foundation for this study, the following three theories are relevant: These three theoretical frameworks provide a strong foundation for understanding the struggles of Maguindanaon students in mathematics.

Ethnomathematics Theory underscores the importance of integrating cultural mathematical practices, Sociocultural Theory highlights the influence of language and learning interactions, and Funds of Knowledge Theory emphasizes the value of students' community-based knowledge.

Together, these theories guide the development of culturally relevant interventions to improve mathematics learning in Lambayong District.



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Ethnomathematics Theory (D'Ambrosio, 1985). D'Ambrosio's Ethnomathematics Theory highlights the idea that mathematical concepts are embedded in cultural practices and traditions (D'Ambrosio, 1985). In the Maguindanaon context, students may struggle with conventional mathematics instruction if it does not align with their cultural ways of understanding numbers, measurement, and problem-solving. This theory supports the integration of culturally relevant mathematical instruction, incorporating indigenous knowledge systems to make learning more relatable and effective.

Sociocultural Theory (Vygotsky, 1978). Vygotsky's Sociocultural Theory emphasizes the role of culture, language, and social interactions in shaping cognitive development (Vygotsky, 1978). Maguindanaon students' mathematical struggles may stem from a disconnect between their cultural environment and the formal school curriculum. The Zone of Proximal Development (ZPD) suggests that students need appropriate scaffolding and culturally relevant teaching strategies to bridge this gap. This theory justifies the need for incorporating collaborative learning, oral traditions, and real-world applications in mathematics instruction for Maguindanaon students. Funds of Knowledge Theory (Moll et al., 1992). The Funds of Knowledge Theory suggests that students bring valuable cultural knowledge from their homes and communities that can enhance learning (Moll et al., 1992).

In the case of Maguindanaon students, their mathematical understanding is shaped by everyday experiences such as trading, farming, and traditional measurements. If these community-based knowledge systems are not integrated into formal mathematics instruction, students may struggle to see the relevance of mathematical concepts. This theory advocates for culturally responsive pedagogy that incorporates students' lived experiences into classroom learning.

Research Questions

This study aims to explore the mathematical struggles of Maguindanaon students in Lambayong District through an ethnomathematical lens for school year 2025-2026.

Specifically, this study aims to answer the following questions:

- 1.) How do Maguindanaon students describe their experiences in learning mathematics within the context of their cultural beliefs and traditions?
- 2.) What cultural factors contribute to the challenges faced by Maguindanaon students in mathematics learning?
- 3.) How do Maguindanaon students' everyday practices and traditional knowledge relate to their mathematical understanding?
- 4.) What culturally responsive instructional strategies can be developed to enhance Maguindanaon students' learning experiences in mathematics?



METHODOLOGY

Research Design

In this study, a qualitative research, specifically the phenomenological approach, will be employed to explore the mathematical struggles of Maguindanaon students in Lambayong District through an ethnomathematical lens for school year 2025-2026.

Phenomenological research is a method that aims to delve into individuals' lived experiences to gain deeper insights into how they interpret these experiences. It operates under the assumption that individuals employ a universal structure or essence to derive meaning from their encounters.

This research involves the interpretation of participants' emotions, perceptions, and beliefs to shed light on the fundamental essence of the phenomenon under investigation. An essential aspect of the phenomenological research design is the researcher's obligation to set aside any preconceived assumptions about the experience or phenomenon (Delve & Limpaecher, 2012).

Participants of the Study

The participants of this study consisted of fifteen (15) identified Mathematics teachers from Lambayong District, Sultan Kudarat division, for school year 2025-2026, who will qualify the inclusion criteria set by the researcher.

Table 1. Participants' Inclusion Criteria

Qualifications
<i>Participants: 15 Mathematics Teachers</i>
Currently Teaching Mathematics in the District Participants must be full-time elementary or secondary mathematics teachers assigned in Lambayong District during the school year 2025–2026 to ensure their direct involvement in mathematics instruction.
With Teaching Experience in Indigenous or Multicultural Settings Teachers should have at least two years of teaching experience, preferably with Maguindanaon learners or in culturally diverse classrooms, to provide relevant insights into students' struggles in mathematics within the ethnomathematical context.
Familiarity with Maguindanaon Culture and Practices Participants must demonstrate awareness or engagement with Maguindanaon cultural traditions, community practices, or indigenous knowledge systems that may influence mathematics learning.
Willingness to Participate and Share Experiences Teachers should voluntarily agree to be part of the study, openly sharing their perspectives,



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classroom practices, and observations to contribute to a meaningful exploration of students' struggles in mathematics.

Sampling Technique

During the conduct of this study, a Purposive Sampling Technique was intentionally utilized to carefully select fifteen fifteen (15) identified Mathematics teachers from Lambayong District, Sultan Kudarat division, for school year 2025-2026, who qualified the inclusion criteria set by the researcher, who meet the specific inclusion criteria established by the researcher.

Purposive sampling, alternately referred to as judgmental, selective, or subjective sampling, constitutes a variant of non-probability sampling. Within this approach, researchers exercise their own judgment and discretionary acumen in the selection of individuals from the population to partake in their survey endeavors (Alchemer, 2021). This method of sampling mandates that researchers possess prior knowledge of the objectives underpinning their study so as to effectively pinpoint and make contact with eligible participants through online survey platforms like Alchemer. Researchers resort to purposive sampling in order to secure access to a distinct subgroup of individuals, whereby all survey respondents are meticulously chosen based on their alignment with a specific demographic or criterion.

Locale of the Study

This research was conducted within carefully selected elementary and integrated schools in Lambayong District, Sultan Kudarat Division, for the school year 2025–2026. Conducting the study in this setting is appropriate because the district is home to a significant number of Maguindanaon learners whose cultural backgrounds directly influence their educational experiences, particularly in mathematics. Place-based research emphasizes that selecting local contexts allows for an authentic understanding of learners' struggles and supports the integration of community knowledge into academic inquiry (Creswell & Poth, 2018). By situating the study within the schools where Maguindanaon students are enrolled, the research ensures that the findings will be grounded in lived realities, reflecting both cultural dimensions and educational challenges.

Moreover, focusing on elementary and integrated schools provides a comprehensive view of the learning continuum, as these institutions represent critical stages where foundational mathematical concepts are introduced and reinforced. Studies highlight that contextualizing research in local school environments allows researchers to capture diverse perspectives, address relevant educational issues, and contribute to more meaningful and sustainable interventions (Merriam & Tisdell, 2016). Thus, the Lambayong District serves as an ideal site for exploring ethnomathematics in the Maguindanaon context, ensuring the study's relevance and applicability to both local and broader educational settings.



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Research Instruments

In this study, a semi-structured interview functioned as an exploratory instrument during both in-depth interviews and Focus Group Discussions (FGDs) to uncover the mathematical struggles of Maguindanaon students in Lambayong District through an ethnomathematical lens for school year 2025-2026.

The validity and appropriateness of this tool was substantiated through a rigorous evaluation process conducted by a panel of experts who possess expertise in the development of relevant research instruments.

Data Gathering Procedure

To ensure the research's reliability, the researcher maintained strict adherence to a predefined set of procedures.

The primary objective of this study was to explore the mathematical struggles of Maguindanaon students in Lambayong District through an ethnomathematical lens for School Year 2025–2026.

In the initial phase, the researcher diligently sought formal authorization from both the Superintendent of DepEd-Sultan Kudarat and the Dean of the College of Graduate Studies (CGS). This authorization was essential in obtaining the necessary permissions for the conduct of the study and emphasized the importance of ethical considerations.

Following this, a secondary authorization letter was sent to the District Supervisor, explicitly requesting access to the specific data required for the research. A meticulously crafted survey questionnaire was developed, subjected to rigorous evaluation, and subsequently administered to the targeted participants.

The researcher employed a Purposive Sampling Technique to carefully select secondary school teachers as participants in the study. Assuming strict adherence to the established EWMCI-Research Ethics Committee guidelines, the researcher proceeded with conducting interviews and facilitating Focus Group Discussions (FGDs), all of which were conducted through face-to-face interactions.

Ultimately, the data collected from interviews and FGDs were systematically organized, subjected to comprehensive analysis, and interpreted using the thematic analysis approach. This approach provided a deeper understanding of the issues under investigation.



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In this study centered on exploring the mathematical struggles of Maguindanaon students in Lambayong District through an ethnomathematical lens for School Year 2025–2026, a content or thematic analysis approach was employed to examine the collected data. This methodology, as described by Flick (2014), Ngag (2023), and Braun (2009), involved the systematic categorization of textual components, including statements, phrases, and words, into organized groupings or categories. These categories were either derived from established frameworks or custom-developed to align with the study's specific objectives.

To execute this analytical process, a series of essential steps were diligently followed.

Initially, all data sources, such as interview transcripts, notes from Focus Group Discussions (FGDs), and relevant documents, were meticulously organized and prepared for analysis. This phase ensured the systematic arrangement and accessibility of the data.

Subsequently, the researcher deeply engaged with the data by conducting a thorough review of interview transcripts and FGD notes. This immersive process aided in gaining a comprehensive understanding of the content and context embedded within the collected information.

The third step involved initiating a systematic coding process. Initial codes were generated by identifying meaningful segments or patterns within the data. These codes captured essential concepts, ideas, or themes related to the narratives of the teachers regarding their professional development and its outcomes in their teaching effectiveness.

Following coding, the identified codes were grouped into preliminary themes based on shared meaning or relevance. This step aimed to establish an initial structure for organizing the data.

Next, the emerging themes and their corresponding codes underwent a process of review and refinement. The researchers ensured the consistency and clarity of these themes and made necessary adjustments. Each refined theme was assigned a descriptive name that succinctly represented the content it encapsulated, facilitating easy identification and interpretation.

Relevant data excerpts, such as quotes or segments extracted from interviews and FGDs, were selected and associated with the respective themes. These excerpts served as supporting evidence for the identified themes.

Finally, the thematic analysis extended beyond surface-level identification. The researchers interpreted the meaning and implications of each theme within the context of the study's objectives. They sought patterns, connections, and variations within the themes to provide a comprehensive understanding of the narratives of the teachers. This meticulous and structured process of thematic analysis enabled the researchers to systematically explore and comprehend



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the mathematical struggles of Maguindanaon students in Lambayong District through an ethnomathematical lens for School Year 2025–2026.

Ethical Considerations

In preparation for the conduct of this study, all the aforementioned plans and recommendations were presented to East-West Mindanao Colleges Inc. to ensure compliance with prescribed procedures and protocols.

Within the context of the research focused on examining the mathematical struggles of Maguindanaon students in Lambayong District through an ethnomathematical lens for School Year 2025–2026, it was imperative to emphasize the paramount importance of ethical considerations. Prior to commencing the study, the following ethical principles were highlighted.

Informed Consent: Before participation, explicit and informed consent was diligently obtained from all school heads involved in the study. It was imperative that they possessed a comprehensive understanding of the study's objectives, methodologies, potential risks, and benefits. Furthermore, participation remained entirely voluntary, affording participants the autonomy to withdraw from the study at any stage without encountering any adverse consequences.

Anonymity and Confidentiality: To safeguard the identities and responses of the teachers, rigorous measures were enacted to ensure anonymity and confidentiality. Rather than using actual names, pseudonyms or codes were employed to uphold the privacy of the participants. The collected data were securely stored, with access restricted solely to the research team.

Avoiding Harm: Delicate subjects, such as the challenges inherent in their roles, were discussed with meticulous consideration for the potential emotional and psychological impact on the participants. Strategies were implemented to minimize distress, and a support system was made readily available to assist participants should the need arise.

Researcher–Participant Relationship: The researcher maintained a professional and respectful rapport when engaging with the school heads. Any actions that could exploit or cause harm to the participants were scrupulously avoided, ensuring their utmost dignity and respect throughout the research process.



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Data Protection: Adherence to data protection regulations and laws was unwaveringly observed to safeguard the personal information of the participants. Stringent measures were employed to ensure the secure storage and transmission of data.

Voluntary Participation: Participants were assured that their involvement in the study was wholly voluntary and free from any form of coercion or external pressure.

Researcher Bias: The researcher remained vigilant regarding potential biases that might influence data collection and analysis, upholding objectivity and transparency throughout the research endeavor.

Institutional Approval: Before initiating the study, the researcher diligently sought ethical clearance from the pertinent institutional review boards or ethics committees.

Honesty and Integrity: The research findings were reported truthfully and accurately, devoid of any manipulation or distortion intended to align with preconceived notions or biases.

Beneficence: The potential benefits of the research to educational practices and policies were thoughtfully considered, ensuring that the study positively contributed to the enhancement of the education system.

Cultural Sensitivity: The researcher displayed cultural sensitivity by respecting local customs, beliefs, and practices within the research setting, refraining from imposing external values on the participants.

Inclusion and Diversity: The study's structure prioritized inclusivity and diversity by encompassing a wide spectrum of perspectives related to the mathematical struggles of Maguindanaon students in Lambayong District through an ethnomathematical lens for School Year 2025–2026.

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Declaration AI Tools Utilization

I do hereby declare the use AI tools, such as Chat GPT and Grammarly for grammar checking and sentence organization purposes only.

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