

## The Role of Ethnomathematics in South-East Asian Learning: A Perspective of Indonesian and Thailand Educators

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*The ethnomathematics field plays a crucial role in understanding how students can comprehend, express, manipulate, and apply mathematical concepts. However, it is acknowledged as a complex concept, particularly in Asian countries like Indonesia and Thailand, requiring a comprehensive understanding. This study aims to bridge this gap by exploring the cross-cultural perspectives of mathematics educators in Indonesia and Thailand and examining the differences in ethnomathematics application between the two countries. Participants included lecturers, teachers, and pre-service teachers, and data was collected through questionnaires and interviews. Before the questionnaire is distributed, comprehensive learning is carried out in the involved schools and universities to provide a direct experience of ethnomathematics education for educators and students. The analytical process involved data reduction, presentation, drawing conclusions or verification, and ensuring data validity. Positive responses from mathematics educators from the teaching and learning activity, supported with the questionnaire average scores in Indonesia at 4.77 and Thailand at 4.57. This study emphasizes the significance of integrating ethnomathematics into education, highlighting its connection to cultural growth. It notes differences in ethnomathematics application between Indonesia and Thailand, shaped by cultural, educational, and institutional contexts. The authors recommend math educators consider integrating cultural aspects into teaching for enhanced inclusivity and longevity.*

Keywords: Ethnomathematics, Perspectives, Difference, Educators, Teaching and Learning Activity

### INTRODUCTION

In addition to its connection with the progress of science, mathematics holds a vital role in cultural advancement. The emergence of ethnomathematics, a form of culture-based mathematics, has gained prominence in contemporary mathematics education. Ethnomathematics involves studying mathematical practices within diverse cultural groups, encompassing urban and rural communities, labor groups, specific age groups of children, and indigenous communities (Rodríguez-Nieto & Alsina, 2022).

Indonesia and Thailand, recognized for their cultural richness in Southeast Asia, have embraced ethnomathematics within their educational landscapes. Prahmana and D'Ambrosio (2020) found that in Indonesia, ethnomathematics is integrated into the formal mathematics education curriculum, going beyond mere exploration. Examples include the study of modulo in the Balinese naming system (Suryanatha & Apsari, 2022) and the examination of ethnomathematics in Balinese weaving crafts (Puspawati & Putra, 2014), showcasing how mathematical concepts can be derived from cultural practices.

Similarly, in Thailand, the exploration of ethnomathematics has extended into school education. Suryana et al. (2022) explored ethnomathematics in the five tones of the Thai language, revealing its applicability to topics such as curves and functions in mathematics learning. Despite the evident potential, the implementation of ethnomathematics in education faces various challenges. Concerns expressed by Sari and Yüce (2020) highlight issues such as the lack of inclusion in classroom materials, inadequate teacher training, and the perceived conflict with traditional curriculum expectations, affecting its successful integration into mainstream education.

The challenges in implementing ethnomathematics have led to suboptimal learning experiences for students, impacting academic achievement. However, ethnomathematics remains integral to enhancing students' mathematical abilities. Ricardo's research (2016) emphasizes that integrating ethnomathematics into mathematics education expands learning beyond the classroom, incorporating real-world experiences and cultural interactions. In the context of the fourth industrial revolution, ethnomathematics serves as a vital bridge between technological advancements and the preservation of cultural heritage (Setiana, 2020).

Recognizing the importance of ethnomathematics in education and the challenges in its implementation, researchers argue for an intercultural perspective on its role, particularly in culturally rich countries like Indonesia and Thailand (Fouze & Amit, 2023). This research aims to fill the gap by conducting a comprehensive study on the perspectives of educators from both nations regarding the significance and implementation of ethnomathematics. While previous studies have acknowledged the presence and potential of ethnomathematics in these countries, this research uniquely focuses on the viewpoints of educators.

Through an exploration of the intercultural perspective on the importance of ethnomathematics learning (Meaney et al., 2021). The study aims to understand the cultural nuances shaping the reception and application of ethnomathematics in educational settings. The novelty of this research lies in its explicit focus on educators' perspectives, offering insights into challenges, opportunities, and potential strategies for integrating ethnomathematics into the curriculum, thus promoting more effective and culturally responsive practices within mathematics education.

The subsequent sections delve into the methodology employed in this research, outlining the research location and participants, research design and procedure, data collection techniques, and data analysis techniques. Subsequently, the outcomes of the teaching and learning activity,

questionnaire score analysis, and comprehensive interviews with representative respondents are discussed in the third section, revealing their responses to the role of ethnomathematics in learning, along with diverse opinions and inputs. Finally, the conclusion summarizes the research findings, acknowledges limitations, and suggests avenues for future studies.

## **LITERATURE REVIEW**

### **Ethnomathematics Learning**

The term ethnomathematics was introduced by D'Ambrosio, a Brazilian mathematician, in 1997. Linguistically, ethnomathematics originates from the prefix "ethno," which broadly refers to socio-cultural aspects, including language, jargon, ethical codes, myths, and symbols. The base word "mathema" means to know, explain, understand, and engage in activities such as measuring, classifying, modeling, and drawing conclusions. The suffix "tics" comes from the word *techne*, meaning technique. D'Ambrosio (1985) define ethnomathematics as mathematics that practiced within cultural groups, such as national communities, tribes, labor groups, children from specific age groups, and professional classes.

The field of ethnomathematics is relatively new but holds the potential to revolutionize how students learn mathematics by introducing them to different cultures. By interacting with local cultures outside the classroom and using mathematics as a medium, ethnomathematics can create a new environment where mathematics learning is not confined to the classroom. Consequently, the learning process, teaching strategies, and learning materials can all center around ethnomathematics. Aprilianingsih & Rusdiana (2019) stated that the topics studied in ethnomathematics are diverse, including: a) Symbols, concepts, principles, and mathematical abilities present in a community; b) Mathematical differences or similarities within a community and the factors contributing to those differences or similarities; c) Specific and interesting aspects within a particular group, such as language use, attitudes, thinking patterns, etc., relevant to mathematics; and d) Various aspects of societal life related to mathematics, such as social, economic, cultural, and political conditions.

### **Realistic Mathematics Education**

In the context of realistic mathematics education, the learning process starts with something tangible or related to students' real-life experiences. "Realistic" here doesn't just mean something concrete or physically present but can also refer to something that can be imagined by students (Afriansyah, 2016). In the teaching and learning activities, things that students can imagine related to the learned concepts can be utilized to enhance the learning process (Febrian & Perdana, 2017). Therefore, students can meaningfully engage in learning and attribute significance to what they are studying.

Soedjadi (2014) explains that Realistic Mathematics Education (RME) is an innovation in mathematics education aligned with constructivist theory. RME focuses more on the potential that students possess, which should be developed. The teacher's belief in this potential will influence how they manage mathematics teaching. This, in turn, will impact how students cultivate habits aligned with their abilities. Both of these factors will influence the teaching culture of educators and how the learning culture of students should be shaped. Thus, this mathematics education

innovation will not only change the understanding of mathematical concepts and their connections but will also transform the learning culture into a more dynamic yet ethically grounded framework.

## **METHOD**

### **Research Location and Participants**

The research was conducted at Mahasaraswati University Denpasar and Bansomdejchaopraya Rajabhat University, Thailand, along with secondary schools affiliated with both institutions. The research took place during the Even Semester of the Academic Year 2022/2023. The participants in this research were mathematics educators consist of: lecturer, high school teachers, secondary school teachers, and pre-service teachers from Indonesia (138 participants) Thailand (145 participants).

### **Research Design and Procedure**

#### 1) Research Design

This study employed a descriptive qualitative research method aiming to provide a more detailed perspective on the intercultural aspects of mathematics educators concerning the significance of ethnomathematics in mathematics education. Qualitative research is intended to understand phenomena such as the experiences of research subjects, including behaviors, perceptions, motivations, actions, and more (Semiawan, 2010). The qualitative approach was chosen to reveal a deeper understanding of the intercultural perspective of mathematics educators regarding the significance of ethnomathematics in mathematics education. The study will employ a qualitative descriptive research approach, gathering data directly from questionnaire responses and interviews.

#### 2) Research Procedure

The research procedure encompasses the activities designed by the researchers to be implemented during the research. The steps involved in this research procedure are as follows: a) Determining the research steps through a focus group discussion with partner institutions, b) Selecting research participants from both institutions, b) Establishing the analysis procedures for examining the participants' perspectives, d) Preparing research instruments such as questionnaires and interview guidelines, e) Consulting research instruments with the research team and experts, f) Conducting instrument pilot tests to ensure their validity and reliability, g) Implementing the research by distributing instruments and conducting interviews, h) Examining and analyzing the acquired data, and i) Drawing conclusions from the data analysis.

### **Data Collection Techniques**

Several data collection methods were utilized in this research, including the following:

#### 1) Teaching Acitivity

Learning takes place prior to the collection of other data with the aim of introducing ethnomathematics to both teachers and students. This introductory phase is essential in laying the foundation for understanding and engaging with ethnomathematics concepts within the

educational setting. Through these early learning sessions, the intention is to familiarize educators and students with the principles, applications, and cultural contexts associated with ethnomathematics. This initial exposure creates a conducive environment for subsequent data collection, ensuring that participants have a basic understanding of the subject matter and are better equipped to provide informed insights during the research process. The emphasis is on establishing a solid groundwork that facilitates a more meaningful and effective exploration of ethnomathematics within the educational context.

## 2) Questionnaire Technique

Sugiyono (2014) stated that a questionnaire is a data collection technique where the researcher provides a list of written questions or statements to be answered by respondents. In this study, a questionnaire was used to obtain intercultural perspectives on the role of ethnomathematics learning among educators from Indonesia and Thailand. The questionnaire, consisting of 20 questions with score 1-5 from Strongly Disagree to Strongly Agree, specifically designed to assess educators' perspectives, was created using Google Forms and distributed through WhatsApp and Line. The points of questionnaire were: 1) The ethnomathematics approach can help students understand mathematical concepts in a more real and relevant way, 2) The use of ethnomathematics in learning mathematics can increase students' interest and motivation towards mathematics subject, 3) Ethnomathematics helps students understand that mathematics can be found in various cultures and contexts of everyday life, 4) Ethnomathematics integration in learning can help increase inclusion and respect for cultural diversity in the classroom, 5) Using ethnomathematics in learning mathematics can help students develop broader and creative problem-solving skills, 6) Ethnomathematics helps broaden students' views of mathematics and see it as something more than formulas and calculations, 7) I believe that the use of ethnomathematics in learning can help reduce cultural disparities and increase equity in mathematics education, 8) The integration of ethnomathematics in mathematics learning provides opportunities to enrich students' learning experiences and make them more interesting and relevant, 9) Ethnomathematics helps students understand and appreciate the various ways of thinking and approaches to mathematics that exist in various cultures, 10) The integration of ethnomathematics in learning mathematics can help students see the relevance of mathematics in life, 11) The use of ethnomathematics in learning can motivate students to develop critical and analytical thinking skills, 12) Ethnomathematics helps to dispel negative stereotypes related to mathematics and opens opportunities for all students to achieve success in this subject, 13) The integration of ethnomathematics in learning mathematics can help students build a deeper and abstract understanding of mathematical concepts, 14) I believe that the use of ethnomathematics in learning mathematics can help students develop an appreciation of the cultural diversity around them, 15) Ethnomathematics helps students relate mathematical concepts to real-world situations and reinforces their understanding of the relevance of mathematics in everyday life, 16) The integration of ethnomathematics in learning mathematics can help increase students' confidence in facing the challenges of mathematics, 17) I believe that ethnomathematics can help overcome cultural and language barriers experienced by students in learning mathematics, 18) The use of ethnomathematics in learning mathematics helps students gain a deeper understanding of cultural values related to mathematics, 19) The integration of ethnomathematics in learning mathematics can help students gain a global perspective and understand how mathematics is applied in various cultural contexts, and 20) I believe that ethnomathematics can help develop social awareness and teach students about fairness, equality, and respect for differences in mathematical contexts.

### 3) Interview Technique

Interviews involve obtaining information or data for research purposes through a question-and-answer process, conducted face-to-face between the interviewer and the respondent using an interview guide (Taherdoost, 2022). Interviews, conducted as part of this research, involved engaging 8 participants, including middle school teachers, high school teachers, mathematics education lecturers, and pre-service teachers from Indonesia and Thailand. The selection criteria for participants ensured representation, focusing on individuals with a strong understanding of ethnomathematics and culture-based mathematics learning, as evidenced by their responses to preliminary questionnaires. Employing an unstructured interview format, the discussions aimed to explore deeply the perspectives of mathematics educators regarding the significance of integrating cultural elements into mathematics education. The interview point of questions was: 1) What do you know about ethnomathematics? 2) Name and explain one of the ethnomathematics concepts that you know according to your culture and your environmental situation! 3) In your opinion, how can the use of ethnomathematics help students to develop their understanding of abstract mathematical concepts? 4) In your opinion, can the ethnomathematics approach help connect mathematics with students' daily lives? and 5) Do you consider it significant to include ethnomathematics that based on local culture and local wisdom in learning mathematics? Why? Throughout the interview, detailed notes were taken to capture the nuances of the discussions, providing valuable insights into the perceptions and beliefs of educators. These insights contributed significantly to the research objectives, shedding light on the role of culture in mathematics learning.

### 4) Documentation

Documentation encompasses the gathering of data on variables from diverse sources, including records, transcripts, books, student grade lists, attendance records, and more (Lambert & Lambert, 2013). Specifically, in this study, the documentation method was employed to collect data on the implementation of ethnomathematics teaching in the participating institutions. This involved gathering the results of students' worksheets and documentation on how students reacted to ethnomathematics. These documents provide valuable insights into the effectiveness of ethnomathematics teaching, students' comprehension of the concepts, and their engagement with the material, thereby contributing significantly to the research objectives.

## Data Analysis Technique

The research employed a qualitative descriptive data analysis technique, with the following steps:

### 1) Data Reduction

Data reduction involves sharpening, categorizing, directing, discarding unnecessary data, and organizing the remaining data to draw and verify final conclusions. This process includes selecting, focusing, simplifying, and abstracting the raw data written in field notes. The data reduction steps in this research were as follows: a) Examining the questionnaire results and grouping them based on participant responses, b) Transforming the questionnaire data obtained from the participants into notes for use in the interviews, c) Simplifying the conducted interview

results into a well-structured and organized form, and then transforming them into notes. In grouping the questionnaire results, positive responses were obtained from an average of agree and strongly agree responses with a score of 4-5.

## 2) Data Presentation

Data presentation involves organizing a set of structured information that allows for drawing conclusions and taking action. In this stage, the questionnaire results were organized according to the participants.

## 3) Drawing Conclusions or Verification

Verification is part of a comprehensive configuration activity that can answer research questions and objectives. Comparing the questionnaire results with the interview outcomes can lead to conclusions about the educators' perspectives.

## 4) Data Validity Check

After analyzing the available data to find answers to the research problem, the next step involves examining the validity of the findings. To determine the validity of the findings, a verification technique is required. In this research, data validity checking employed the triangulation technique. The type of triangulation used in this research was source triangulation, comparing and cross-checking the degrees of belief of information obtained through different times and methods in the qualitative approach. The source triangulation stage conducted in this research involved comparing the results of the questionnaire with the interview outcomes.

# RESULTS AND DISCUSSION

## Results

The research results describe how the researcher analyzed the outcomes obtained from teaching activities, questionnaires, and interviews. From various presentations, specific perspectives of educators regarding ethnomathematics education were obtained.

### 1) Teaching Activity Results

Before the questionnaire providing insights from mathematics educators is distributed, two learning sessions are conducted at each level using ethnomathematics-based instruction. The content utilized in the lessons varies depending on the distribution of topics at each level, but generally revolves around geometry. The following are explanations for each learning session conducted. Learning is conducted in a limited manner due to various constraints such as permissions, effectiveness, time, and other factors. Education in Indonesia is focused on the Middle School (SMP) and Senior High School (SMA) levels, while in Thailand, education is concentrated at the university level. This choice of educational focus may be influenced by educational policies, national curricula, and local conditions and needs in each country. Despite the limited scope of learning, efforts to understand and apply ethnomathematics principles at different educational levels remain a positive step in enhancing the understanding of mathematical concepts through cultural contexts and local environments.

The measurement and validation of the effectiveness of teaching activities in ethnomathematics education involve employing various assessment methods to ensure the robustness of the instructional approach. For instance, before distributing questionnaires to gather

insights from mathematics educators, two learning sessions are conducted at each level - middle school and high school in Indonesia, and university-level in Thailand - utilizing ethnomathematics-based instruction. The content of these sessions varies but generally focuses on geometry, such as calculating the area and perimeter of plane figures or analyzing architectural elements in traditional Balinese houses. During these sessions, students engage in Problems Based Learning (PBL), where they analyze problems, construct solutions, present their answers, and discuss results with peers. The effectiveness of these activities is measured through the students' ability to comprehend and apply mathematical concepts within cultural contexts, as demonstrated by their learning outcomes and participation in discussions (Fouze & Amit, 2023).

Although the teaching activity was conducted at the college level in Thailand, it still provides valuable background information for participants in the research who are high school, middle school teachers, and pre-service teachers. The college-level teaching in Thailand offers insights into advanced math concepts and teaching methods. High school and middle school teachers can learn from these approaches to better prepare their students. Pre-service teachers can also gain ideas for culturally responsive teaching. Understanding how ethnomathematics is used at college level can help all teachers promote cultural inclusivity in math education (Meaney et al., 2021).

Moreover, the learning activities provide valuable background information for participants who are not students (Tremblay et al., 2012). For example, the exploration of ethnomathematics at the high school and middle school levels in Indonesia offers insights into how cultural elements are integrated into mathematics education at different educational stages. Similarly, the university-level learning activities in Thailand demonstrate the adaptability of mathematical concepts to diverse linguistic structures, highlighting the importance of integrating cultural and linguistic elements into the learning process. By elucidating these learning activities and their outcomes, participants gain a deeper understanding of how ethnomathematics is implemented in educational settings and its impact on students' mathematical learning experiences.

#### *Learning at the Middle School Level in Indonesia*

At the middle school level, ethnomathematics instruction focuses on the concepts of area and perimeter of plane figures. During this stage, students engage in Problems Based Learning (PBL) where the general steps they follow are: 1) Analyzing the problems provided by the teacher, 2) Constructing solutions to the problems, 3) Presenting the obtained answers, 4) Discussing the results with their friends.

The problem presented by the teacher involves calculating the area of a square in Taledan, which is one of the places of worship for Balinese Hindus. In practice, students are tasked with measuring the area of the Taledan to determine how many Janur (coconut's leaves) are needed to create the Taledan. Following this, students are asked to express their opinions and share what they have learned in discovering the area of a square using the Taledan.





Figure 1. Taledan

The learning outcomes indicate that students not only can calculate the area of the square region in Taledan but also comprehend the structure of Taledan, formed by several rectangles arranged in a meaningful manner. As a result, students are able to calculate the square's area based on the total area of the arrangement of rectangles. Without complex calculations, students can determine the length of Janur needed to create one Taledan. This demonstrates that ethnomathematics instruction enables students to connect various mathematical concepts, leading to a deeper understanding (Rodríguez-Nieto & Alsina, 2022).

#### *Learning at High School Level in Indonesia*

At the high school level, the curriculum emphasizes mathematical modeling and geometric positioning, specifically in relation to Sikut Satak, an architectural element found in traditional Balinese houses. In this context, teachers utilize Problems Based Learning (PBL) and introduce challenges related to organizing traditional Balinese Sanggah buildings, sacred places for Balinese Hindus, to adhere to the guidelines of Sikut Satak. In this scenario, students are tasked with placing the designated buildings and developing their mathematical models.

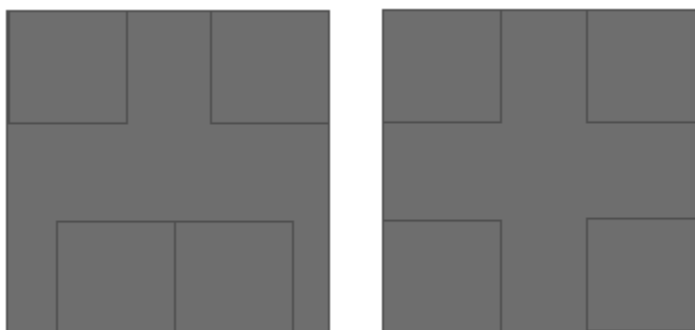


Figure 2. Ground Plan in Sikut Satak

The results of this learning experience indicate that students are proficient in creating the desired mathematical models, displaying enthusiasm for the lessons as they are highly relevant to their own homes. However, students from urban areas, accustomed to living with limited space,

may face some challenges in constructing mathematical models. This is because urban buildings typically employ simplified Balinese designs.

The teaching process highlights the close connection between ethnomathematics instruction and Realistic Mathematics Education (RME). Ethnomathematics proves effective in helping students understand mathematical concepts through their surrounding environment. This is because ethnomathematics emphasizes the understanding of mathematics through real-world contexts, specifically cultural elements that are deeply rooted in the students' own experiences. (Nasir, 2021)

#### *Learning at University Level in Thailand*

In Thailand, the learning process takes place at the university level, where students are presented with challenges to analyze the concepts of lines and curves within the framework of the Thai Tonal Language. In this academic setting, students exhibit the capability to discern various mathematical concepts such as upward and downward functions, quadratic curves, gradients, and more, all expressed through the intricacies of the Thailand Tonal Language. The exercises provided to students engage them in identifying and applying mathematical principles within the unique linguistic context, highlighting the adaptability of mathematical concepts to diverse linguistic structures.



Figure 3. Concept of Line and Curve in Thailand Tonal Language

This approach not only enhances students' mathematical skills but also emphasizes the importance of integrating cultural and linguistic elements into the learning process. By exploring mathematical concepts within the specific linguistic nuances of the Thai Tonal Language, this university-level education contributes to a more holistic understanding of mathematics, fostering a deeper connection between language and mathematical reasoning. The results showcase the effectiveness of this pedagogical approach in bridging mathematical concepts with the linguistic intricacies of the Thai context (Suryana et al., 2022).

#### *The Difference of Ethnomathematics Application Between Indonesia and Thailand*

The observed differences in the application of ethnomathematics between Indonesia and Thailand can be attributed to several factors, including cultural, educational, and institutional differences. One possible reason for these variations is the unique cultural contexts and historical backgrounds of each country (Cimen, 2014). Indonesia, with its diverse cultural heritage and rich traditions, may approach ethnomathematics with a focus on traditional Balinese culture and Hindu influences, as evidenced by the teaching activities involving Taledan and Sikut Satak. On the other hand, Thailand's ethnomathematics application may be influenced by its distinct cultural practices and linguistic nuances, as seen in the exercises related to the Thailand Tonal Language.

Additionally, differences in educational policies, curricula, and teaching methodologies between Indonesia and Thailand can also shape the application of ethnomathematics. For instance, Indonesia's emphasis on Problems Based Learning (PBL) at middle school and high school levels

reflects a pedagogical approach aimed at fostering critical thinking and problem-solving skills among students within the context of ethnomathematics. In contrast, Thailand's university-level education may prioritize theoretical concepts and mathematical modeling, incorporating ethnomathematics through linguistic analysis and cultural interpretation. Moreover, institutional support and resources dedicated to ethnomathematics education may vary between Indonesia and Thailand, influencing the depth and breadth of its integration into the curriculum. Differences in teacher training programs and professional development opportunities related to ethnomathematics could also contribute to disparities in its implementation across educational settings (Machaba & Dhlamini, 2021).

The implications of these variations for the broader field of ethnomathematics are significant (Setiana, 2020). Firstly, they highlight the need for culturally responsive teaching practices that are sensitive to the unique cultural and linguistic backgrounds of students. Educators must recognize and embrace cultural diversity in their instructional approaches to ensure equitable learning experiences for all students. Secondly, the observed differences underscore the importance of cross-cultural collaboration and exchange in ethnomathematics research and practice. By sharing insights, experiences, and best practices across borders, scholars and educators can enrich the field and promote global understanding and appreciation of ethnomathematics (Ogunkunle et al., 2015). Lastly, these variations emphasize the dynamic nature of ethnomathematics as it evolves and adapts to different cultural, social, and educational contexts. Continued research and dialogue are essential for advancing ethnomathematics as a transformative force in mathematics education worldwide.

## 2) Questionnaire Results

The questionnaire was distributed among a diverse group of respondents, including university lecturers, high school teachers, middle school teachers, and pre-service teachers across educational institutions in Indonesia and Thailand. Upon collecting and analyzing the questionnaire responses, a comprehensive score recapitulation was compiled. This recapitulation highlights the perspectives of educators from both countries concerning the significance of ethnomathematics in the learning process.

Table 1. Recapitulation of Average Scores of Indonesian Respondents

No	Respondent	Indonesia			Thailand		
		Number of Respondent	Score	Criteria	Number of Respondent	Score	Criteria
1	Lecturer	30	4,90	Positive	10	4,75	Positive
2	High School Teacher	55	4,53	Positive	50	4,62	Positive
3	Middle School Teacher	40	4,78	Positive	28	4,10	Positive

4	Pre-Service Teacher	20	4,85	Positive	50	4,80	Positive
<b>Total</b>		<b>145</b>	<b>Average</b>		<b>138</b>	<b>Average</b>	
			<b>= 4,77</b>			<b>= 4,57</b>	

Table 1 provides a comprehensive summary of average scores derived from Indonesian respondents, including 30 lecturers, 55 high school teachers, 40 middle school teachers, and 20 pre-service teachers. The data indicates a notably high average score of 4.77, signifying a robust recognition of the importance of ethnomathematics within the Indonesian educational framework. These scores suggest a positive outlook and a clear acknowledgment of the value of incorporating cultural aspects into mathematics education. This trend is consistent across all respondent categories, emphasizing a strong endorsement of the integration of cultural elements in fostering a deeper understanding of mathematical concepts. These findings align with contemporary research advocating for the advantages of incorporating ethnomathematics into diverse educational contexts, promoting a richer comprehension of mathematical concepts through a culturally relevant lens (Machaba & Dhlamini, 2021).

In a similar vein, Table 1 presents the average scores from Thai respondents, encompassing 10 lecturers, 50 high school teachers, 28 middle school teachers, and 50 pre-service teachers. The table reveals a slightly lower overall average score of 4.57, indicating a comparable yet marginally more reserved stance towards the incorporation of ethnomathematics within the Thai educational setting. Although the scores still reflect a high level of acknowledgment, subtle variations in the averages suggest differing perspectives on the degree to which cultural elements should be integrated into mathematics education. Recent research underscores the importance of considering cultural context in mathematics instruction, emphasizing the potential for enhanced student engagement, and understanding through culturally relevant pedagogical practices (Owan, 2019). These nuances highlight the need for ongoing research and collaborative initiatives to bridge the gap between cultural diversity and mathematical education, fostering inclusive learning environments that cater to the diverse needs of students within varied sociocultural contexts.

### 3) Interview Results

To delve deeper into these perspectives, interviews were conducted with one representative from each respondent group. The outcomes of these interviews with Indonesian and Thai educators reveal strikingly similar perceptions regarding the significance of ethnomathematics in the learning process. The following excerpt is from an interview with a representative middle school teacher.

The points of interview show positive attitude of the teacher towards ethnomathematics. the interview section provided valuable insights into the significance of ethnomathematics in contemporary education. The exchange between the researcher and the teacher highlighted the acknowledgment of ethnomathematics as a crucial component in today's learning environment, facilitating a deeper understanding of diverse cultures and fostering inclusivity among students. The discussion also underscored the pivotal role of ethnomathematics in connecting theoretical mathematical concepts with real-world applications, thus enriching students' learning experiences. Moreover, the teacher's reflections on the transformative potential of ethnomathematics

emphasized its capacity to shape the future of mathematics education by revolutionizing teaching practices and engaging students on a meaningful level. Overall, the interview concluded on a positive note, with the researcher expressing gratitude for the teacher's valuable insights and expertise in the field of ethnomathematics.

The insights shared by the lecturer resource person provide a compelling perspective on the enduring significance of ethnomathematics in contemporary learning environments. The interviewee emphasizes that the dynamic nature of culture necessitates the integration of ethnomathematics as a crucial component of the educational process. This viewpoint underscores the evolving nature of cultural contexts, highlighting the importance for educators to incorporate diverse cultural perspectives into mathematical instruction. These insights align with recent scholarly literature, which emphasizes the crucial role of culturally responsive pedagogy in enhancing students' engagement and understanding of mathematical concepts within diverse societal frameworks (Caingcoy, 2023). The lecturer's assertion further underscores the role of ethnomathematics in fostering a deeper appreciation of cultural diversity, thereby paving the way for inclusive educational practices that resonate with students from various cultural backgrounds.

## **Discussion**

The perspectives shared by high school educators illuminate the intricate challenges associated with incorporating ethnomathematics into complex curricula. While they recognize its significance in enhancing problem-solving skills, concerns arise about seamlessly integrating ethnomathematics into advanced material. This echoes recent research emphasizing the delicate balance needed to harmonize cultural perspectives with complex mathematical concepts in the high school context (d'Entremont, 2015; Yılmaz, 2020). Educators stress the need for comprehensive strategies to integrate ethnomathematics effectively, aligning it with the demanding requirements of high school mathematics education.

Middle-school educators highlight the interconnected nature of ethnomathematics and realistic mathematics learning. They emphasize how ethnomathematics aids students in understanding mathematical concepts within real-world contexts. This echoes contemporary research emphasizing the importance of real-life applications in fostering conceptual understanding and problem-solving skills in mathematics (Kaitera & Harmoinen, 2022). Feedback from middle school educators emphasizes the potential of ethnomathematics as a catalyst for promoting authentic learning experiences, nurturing students' ability to recognize the practical relevance of mathematical concepts in their surroundings. This underscores the transformative potential of ethnomathematics in cultivating students' holistic mathematical understanding within the middle school curriculum.

The viewpoint of pre-service teachers sheds light on the promising role of ethnomathematics as a catalyst for meaningful mathematics learning. Their endorsement underscores the transformative potential of culturally responsive pedagogical practices, aligning with recent research emphasizing the role of culturally relevant teaching approaches in fostering students' intrinsic motivation and interest in mathematics (Kenan, 2018). The optimistic outlook on ethnomathematics among pre-service teachers highlights its capacity to stimulate students' curiosity and engagement, fostering a positive learning environment that nurtures their appreciation for the cultural diversity embedded within mathematical concepts. This underscores the need for educators to adopt innovative pedagogical strategies, integrating ethnomathematics

and fostering a dynamic learning ecosystem that aligns with students' evolving educational needs and aspirations.

Interview findings also reveal differences in the application of ethnomathematics in the educational context between Indonesia and Thailand. While both countries recognize its significant role in fostering cultural inclusivity and enhancing students' understanding of mathematical concepts, interviews with respondents from Thailand suggest a limited integration of ethnomathematics within the learning process. The Thai educational landscape appears to demonstrate a relatively lower prevalence of ethnomathematics in instructional practices, consistent with recent research emphasizing the challenges of implementing ethnomathematics in diverse educational settings, particularly where traditional pedagogical approaches are prevalent (Jun-on & Suparatulorn, 2023). In contrast, interviews with Indonesian respondents reflect a more proactive approach to integrating ethnomathematics, emphasizing its relevance and practical application within the Indonesian educational framework (Mania & Alam, 2021). This discrepancy underscores the need for tailored educational policies and collaborative efforts to promote the effective integration of ethnomathematics in diverse cultural contexts, fostering inclusive learning environments that cater to the multifaceted needs of students within the Southeast Asian region.

This research also points out the differences in how ethnomathematics is applied in Indonesia and Thailand are influenced by cultural, educational, and institutional factors. For example, Indonesia focuses on its rich cultural heritage, while Thailand emphasizes linguistic nuances. Educational policies, teaching methods, and support also play a role. These differences highlight the need for teaching practices that respect cultural diversity and encourage collaboration between countries. Overall, ethnomathematics is evolving to fit various contexts, emphasizing the importance of ongoing research and discussion in shaping mathematics education globally (Nur et al., 2020).

In conclusion, discussions with various educational stakeholders underscore the potential of integrating ethnomathematics within the educational framework to foster a culturally inclusive and engaging learning environment. While underscoring the importance of embracing diverse cultural perspectives in mathematics education (Hill & Hunter, 2023), the discussions also highlight the challenges associated with seamlessly integrating ethnomathematics into advanced high school curricula (Freire & McCray, 2020). Furthermore, insights underscore the transformative potential of ethnomathematics in promoting authentic learning experiences, fostering a deeper connection between theoretical knowledge and practical applications within the middle school curriculum (Ogunkunle et al., 2015). By adopting culturally relevant teaching practices, ethnomathematics has the potential to stimulate students' curiosity, engagement, and appreciation for the cultural diversity embedded within mathematical concepts, envisioning a more inclusive and dynamic educational landscape (Nasir, 2021).

## CONCLUSIONS

The findings of this research highlight positive responses from mathematics educators regarding the significance of ethnomathematics in education. The average scores of respondents in Indonesia and Thailand, at 4.77 and 4.57 respectively, indicate a strong acknowledgment of the importance of ethnomathematics, particularly in the Indonesian educational context. Despite challenges in material integration, especially at higher levels, the study concludes that

ethnomathematics, in incorporating culture into the teaching of mathematics in Indonesia and Thailand, holds great potential to enhance students' understanding of mathematical concepts in everyday life. These positive outcomes can lay the groundwork for the development of a culturally-based ethnomathematics curriculum that is suitable and applicable across all levels of education. Additionally, this research also found that the differences in the application of ethnomathematics between Indonesia and Thailand stem from unique cultural, educational, and institutional contexts, shaping teaching methods and priorities in mathematics education. This will materialize meaningful mathematics teaching and learning activity and enhance students' abilities in understanding concepts, mathematical thinking, and problem-solving.

However, it is important to acknowledge the primary limitation of this research, which is the restricted number of respondents and participating institutions. The study focused on educational institutions in Bali, its surrounding regions, and Thailand, with a notable emphasis on affiliated or collaboratively associated institutions with the research entity. This limitation may impact the generalizability and broader applicability of the study's findings. Future research endeavors are encouraged to involve a more extensive and diverse pool of respondents from various cultural backgrounds. This expansion is expected to enhance the understanding of different cultural contexts related to mathematics education, allowing for the identification of diverse cultural patterns in the comprehension and application of mathematical concepts. Consequently, such research initiatives will contribute significantly to underscoring the importance of cultural integration in an inclusive and sustainable approach to mathematics education.

Considering these conclusions, the authors encourage mathematics educators to consider about integrating their teaching methods with cultural aspects in math education, making it more inclusive and sustainable. By adding diverse cultural views into math lessons, teachers can make learning more interesting and relevant for students from different backgrounds. This can help students understand math concepts better and see how they relate to the real world. It also encourages critical thinking and problem-solving skills by letting students explore math through different cultural perspectives. Plus, when teachers respect and appreciate students' cultures, it creates a supportive and welcoming learning environment where everyone feels valued. Overall, including cultural elements in math education can make learning more enjoyable and meaningful for students, helping them succeed academically and personally.

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