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Exploratory Survey of Teachers' and Students' Perceptions of Etnomatematics in Traditional Games

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Abstract

Ethnomathematics has emerged as one such strategy, offering an approach that connects mathematical concepts with cultural practices, traditions, and local wisdom. This study investigates teachers' and students' perceptions of using the traditional games engklek and congklak in mathematics learning at MTsN 2 Kota Tangerang. The research employed a qualitative exploratory survey involving five mathematics teachers and sixty students selected through purposive sampling. Data were collected using open-ended questionnaires, semi-structured interviews, classroom observations, and documentation, and analyzed through thematic analysis. The results show that both teachers and students perceive traditional games as effective tools for supporting mathematical understanding. Engklek helps students visualize geometric concepts such as lines, angles, and shapes, while congklak strengthens number sense, arithmetic operations, and strategic thinking. Students reported higher motivation, enjoyment, and clarity during game-based learning activities. Teachers also noted that traditional games make abstract concepts easier to understand and more connected to students' cultural experiences. Despite these benefits, challenges were identified, including limited structured teaching materials and the need for teacher training. Overall, the integration of ethnomathematics through traditional games aligns with the goals of the Merdeka Curriculum and offers a practical approach to making mathematics more engaging and culturally relevant.

Keywords: Ethnomathematics, Traditional Games, Mathematics Learning

Abstrak

Etnomatematika telah muncul sebagai salah satu strategi, menawarkan pendekatan yang menghubungkan konsep matematika dengan praktik budaya, tradisi, dan kebijaksanaan lokal. Penelitian ini dilakukan dengan tujuan untuk mengkaji persepsi guru dan siswa tentang penggunaan permainan tradisional engklek dan congklak dalam pembelajaran matematika di MTsN 2 Kota Tangerang. Penelitian ini menggunakan survei eksploratif kualitatif yang melibatkan lima guru matematika dan enam puluh siswa yang dipilih melalui pengambilan sampel bertujuan. Data dikumpulkan menggunakan kuesioner terbuka, wawancara semi-terstruktur, observasi kelas, dan dokumentasi, dan dianalisis melalui analisis tematik. Hasil penelitian menunjukkan bahwa baik guru maupun siswa menganggap permainan tradisional sebagai alat yang efektif untuk mendukung pemahaman matematika. Engklek membantu siswa memvisualisasikan konsep geometris seperti garis, sudut, dan bentuk, sedangkan congklak memperkuat pemahaman angka, operasi aritmatika, dan pemikiran strategis. Siswa melaporkan motivasi, kesenangan, dan kejelasan yang lebih tinggi selama kegiatan pembelajaran berbasis permainan. Guru juga mencatat bahwa permainan tradisional membuat konsep abstrak lebih mudah dipahami dan lebih terhubung dengan pengalaman budaya siswa. Terlepas dari manfaat tersebut, tantangan juga diidentifikasi, termasuk keterbatasan materi pengajaran terstruktur dan kebutuhan akan pelatihan guru. Secara keseluruhan, integrasi etnomatematika melalui permainan tradisional sejalan dengan tujuan Kurikulum Merdeka dan menawarkan pendekatan praktis untuk membuat matematika lebih menarik dan relevan secara budaya.

Kata kunci: Etnomatematika, Permainan Tradisional, Pembelajaran Matematika

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INTRODUCTION

Mathematics education worldwide continues to encounter persistent challenges related to student disengagement and difficulties in connecting abstract concepts with real-life contexts.

International research highlights that students often perceive mathematics as detached from their cultural experiences, limiting their ability to internalize and apply mathematical ideas meaningfully (Karina et al., 2021). In response, culturally grounded approaches, such as ethnomathematics, have been increasingly promoted as effective pedagogical alternatives capable of fostering relevance, motivation, and deeper conceptual understanding across diverse learning environments (NCTM, 2014).

Similar concerns are evident within the Indonesian educational context, where mathematics learning still tends to be dominated by teacher-centered instruction and procedural orientation. Studies have shown that many students struggle to relate mathematical concepts to the cultural and social realities of their everyday lives (Mawaddah, 2025). This gap between mathematical abstraction and meaningful experience contributes to low interest, reduced engagement, and limited problem-solving abilities among students (Muslimin & Rahim, 2021). As a result, educational researchers and policymakers are calling for innovative strategies that strengthen contextual and cultural relevance in mathematics classrooms (Sarwoedi et al., 2018).

Ethnomathematics has emerged as one such strategy, offering an approach that links mathematical ideas with cultural practices, traditions, and local wisdom. Scholars argue that ethnomathematics does not merely contextualize mathematics but also enhances students' appreciation of their cultural identity (Muslimin & Rahim, 2021). Through this approach, mathematics is not presented as a foreign, abstract discipline but as one deeply embedded within the cultural heritage and daily activities of communities (Setiyadi, 2021). This aligns with global trends advocating culturally responsive pedagogy as an inclusive framework for mathematics education (Puspadewi & Putra, 2014).

Within ethnomathematics research, traditional games have gained considerable attention due to their rich mathematical content and their potential to support joyful, experiential learning. Empirical studies demonstrate that Indonesian traditional games, such as engklek, congklak, and other indigenous activities, contain elements of geometry, arithmetic, measurement, spatial reasoning, and pattern recognition ((NCTM, 2014). More specifically, Harahap and Jaelani (2022) found that the engklek game promotes geometric reasoning, while Puspadewi and Putra (2014) showed mathematical structures embedded in Balinese woven crafts. These findings affirm that cultural games can function as meaningful mathematical learning tools.

The pedagogical strength of traditional games lies not only in their mathematical content but also in their ability to foster critical thinking, collaboration, and motivation. Studies by Karina et al. (Novitasari et al., 2023) revealed that the use of traditional games in school settings enhances students' engagement and supports the development of higher-order thinking skills. Moreover, Rahmadani and Elfi (2022) emphasized that integrating traditional games helps students construct mathematical understanding through exploration and cultural familiarity (Widyaningrum & Prihastari, 2021). These insights highlight the multidimensional value of ethnomathematics in instructional practices.

Although numerous studies have explored mathematical elements within cultural practices or examined the instructional benefits of ethnomathematics, much of the prior research focuses primarily on identifying cultural-mathematical structures or evaluating student learning outcomes (Simanjuntak & Sihombing, 2020). Fewer studies have investigated perceptions particularly those of both teachers and students regarding the feasibility, relevance, and practicality of ethnomathematics-based instruction through traditional games. This creates an important research gap, especially considering that perceptions significantly influence how innovations are adopted and sustained within educational institutions (Puspadewi & Putra, 2014). The theoretical framework of this study is also grounded in perspectives on qualitative inquiry and didactical research design. Creswell and Creswell (2017) underscore the importance of exploratory qualitative approaches in understanding human perceptions, beliefs, and contextual factors. Meanwhile, Suryadi (2018) emphasizes the necessity of examining the ontological and epistemological foundations of mathematics learning to ensure that instructional innovations are pedagogically sound. Additionally, cultural-based mathematics research, such as that of Mawaddah (S. Sihombing & Tambunan, 2021), illustrates how traditions contain embedded mathematical knowledge that can inform meaningful learning activities (Mendoca et al., 2021).

This study focuses on MTsN 2 Kota Tangerang, an Islamic secondary school situated in a culturally rich urban environment (Qomaria & Wulandari, 2022). The school implements the Merdeka Curriculum, which encourages contextual, inquiry-based, and culturally relevant learning experiences (Rosa & Orey, 2011). Given its diverse student population and its openness to integrating cultural values, MTsN 2 presents an ideal setting for exploring how teachers and students perceive the adoption of ethnomathematics-based instruction through traditional games (Listari et al., 2024). Understanding these perceptions is critical, as they influence instructional choices, adoption of learning innovations, and the alignment of school practices with national curriculum goals (Rahmadani & Elfi, 2022).

Therefore, this research aims to explore and describe the perceptions of teachers and students regarding the integration of ethnomathematics through traditional games in mathematics learning at MTsN 2 Kota Tangerang. By examining their experiences, beliefs, and interpretations, this study seeks to fill the existing research gap and contribute to a deeper understanding of the cultural, pedagogical, and contextual dimensions that influence mathematics education. The findings are expected to offer insights that support the development of culturally grounded teaching practices, inform curriculum development, and strengthen the implementation of ethnomathematics within Indonesian schools.

METHODS

This study used a qualitative exploratory survey design to investigate teachers' and students' perceptions of ethnomathematics via traditional games at MTsN 2 Kota Tangerang. The exploratory design was chosen because the research aimed to uncover meanings, attitudes, and lived experiences rather than test hypotheses (Nasution, 2023). Participants were selected through purposive sampling and comprised five mathematics teachers and sixty students from grades VII to IX who had

experienced mathematics learning involving traditional games. All participants had provided informed consent prior to data collection (Sarwoedi et al., 2018).

Data were collected using three instruments: (1) an open-ended questionnaire aimed at capturing participants' perceptions and prior experience with cultural games in mathematics learning; (2) semi-structured interviews with a subset of participants to deepen understanding of their views; and (3) documentation, including class observations, lesson plans, and photographs when traditional games were used in class (Andriono, 2021). All instruments were developed and validated by two experts in mathematics education to ensure clarity and relevance. The data collection process comprised: distributing questionnaires, conducting interviews, observing selected lessons, and collecting documentation. The data collection occurred over a three-week period under conditions approved by the school administration (Creswell & Creswell, 2017).

Data were analyzed using thematic analysis. First, all textual data from questionnaires and interview transcripts were read and re-read for familiarization. Next, initial codes were generated based on recurring ideas. Codes were then grouped into categories and higher-order themes related to perceptions of usefulness, cultural relevance, challenges, and opportunities. Finally, themes were interpreted in light of theoretical frameworks and previous research. To ensure trustworthiness, the research applied triangulation across data sources (questionnaire, interview, and documentation), member checking with selected participants to confirm interpretations, and an audit trail documenting each step of data collection and analysis (Azka, 2019).

RESULTS AND DISCUSION

Results

The exploratory survey revealed a comprehensive and in-depth portrayal of teachers' and students' perceptions regarding the integration of ethnomathematics through traditional games pecifically engklek and congklak in mathematics learning at MTsN 2 Kota Tangerang. The combination of descriptive data and thematic qualitative analysis allowed the study to capture not only general attitudes but also the subtle ways in which cultural games shape learning experiences. Teachers and students consistently indicated that these games offer a familiar and culturally meaningful entry point for exploring mathematical concepts, thus making the learning environment more relatable and engaging (Basri et al., 2024).

The findings further showed that engklek and congklak play a significant role in supporting conceptual understanding by linking abstract mathematical ideas to concrete cultural practices. Teachers perceived that integrating these games encourages active participation, strengthens reasoning abilities, and fosters collaborative problem-solving, while students expressed that learning through traditional games feels enjoyable, less intimidating, and more meaningful. The convergence of these perspectives highlights the pedagogical value of ethnomathematics in bridging everyday cultural

knowledge with formal mathematical instruction, enhancing both cognitive development and classroom interaction (D'Ambrosio, 2017).

Overall, the results strongly align with the theoretical claims presented in ethnomathematics literature, particularly the idea that mathematics becomes more accessible and meaningful when contextualized within learners' cultural environments, as emphasized by D'Ambrosio (2017). Likewise, the study supports Rosa and Orey's (Harahap & Jaelani, 2022) assertion that contextualized learning fosters deeper engagement and promotes the development of mathematical reasoning grounded in real-life experiences. By demonstrating how engklek and congklak naturally embody mathematical structures and strategies, this exploratory survey reinforces the broader view that culturally responsive pedagogies enrich mathematical learning and empower students through the validation of their cultural identity.

Teachers' Perceptions of Ethnomathematics Integration

Five mathematics teachers participated in the exploratory survey. Overall, the majority demonstrated highly positive perceptions of incorporating engklek and congklak into learning. Table 1 summarizes teachers' responses (Setiyadi, 2021).

Table 1. Teachers' Perception of Ethnomathematics Integration Games (n=5)

Indicator	**Agree (%)**	**Neutral (%)**	**Disagree(%)**
Traditional games hel contextualize mathematics	100	0	0
Engkle helps teach geometry concepts	80	20	0
Congklak strengthens number sense and operations	100	0	0
Ethnomathematics increases student engagement	80	20	0
Implementation is feasible in the classroom	60	20	20
Availability of structured teaching materials	40	20	40

Teachers consistently emphasized that engklek supports geometric instruction by providing visual-spatial experiences aligned with concepts such as lines, angles, shapes, and symmetry. This directly supports findings by Harahap and Jaelani (2022) and Basri et al. (2024), who identified strong geometric structures embedded in engklek. Likewise, all teachers recognized that congklak supports number operations, pattern recognition, and strategic reasoning, echoing insights from Andriono (2021) and Muslimin and Rahim (2021).

Interview results showed that teachers perceived ethnomathematics as a culturally grounded yet pedagogically powerful approach. One teacher stated:

"Students understand faster because congklak makes them count repeatedly without pressure it feels natural."

Another teacher highlighted:

"Engklek makes geometry real. They see the shapes on the ground, not only in a book."

However, teachers also acknowledged challenges, including limited teaching materials, insufficient examples in textbooks, and the need for teacher training issues also noted in Setiyadi (Siregar, 2024). Despite these obstacles, teachers agreed that the benefits outweigh the constraints.

Students' Perceptions of Learning Through Traditional Games

A total of 60 students from Grades VII–IX participated in the survey. Students expressed overwhelmingly positive perceptions of ethnomathematics-based learning. Results are presented in Table 2.

Table 2. Students' Perceptions of Through Engklek and Congklak (n=60)

Indicator	**Agree (%)**	**Neutral (%)**	**Disagree(%)**
Traditional games make mathematics more enjoyable	88	12	0
Engkle helps undestand geometric concepts	82	18	0
Congklak improves number sense	85	15	0
Learning feels more relevant to cultural identity	80	20	0
Students prefer contextual learning using cultural games	83	17	20

Students consistently reported that learning felt "more fun," "less stressful," and "easier to understand" when connected with traditional games. This confirms previous findings from Novitasari et al. (2023), who observed increased motivation and critical thinking when traditional games are used in instruction. Students also described that congklak helped them practice counting and number combinations, while engklek helped them visualize geometric shapes and angles similar to the conclusions of Karina (Suryadi, 2018).

Several students expressed that the games made learning "feel closer to everyday life," affirming statements from Widyaningrum and Prihastari (2021) about the importance of cultural relevance in fostering meaningful learning experiences.

Thematic Findings from Interviews and Documentatio

Three main themes emerged from the thematic analysis.

Theme 1: Tradaitional Games as Cultural-Mathematical Learning Resouces

Both teachers and students interpreted engklek and congklak as cultural artifacts containing rich mathematical structures. This echoes seminal ethnomathematics theory by D'Ambrosio (2017), who argues that cultural practices naturally encode mathematical ideas. Documentation analysis showed that teachers occasionally included such games in RPP, although not consistently or systematically.

Theme 2: Enchaced Engagement and Conceptual Understanding

Learning through traditional games increased student participation and helped them grasp concepts more concretely. Observation data showed students demonstrating higher involvement during game-based activities compared to textbook-based lessons. These results are supported by

research from Karina et al. (Widyaningrum & Prihastari, 2021), who reported similar increases in engagement and understanding when cultural elements were incorporated.

Theme 3: Barriers to implementation

Despite strong positive perceptions, challenges emerged. Teachers mentioned the lack of structured teaching materials, time constraints, and the need for clearer guidelines. These challenges mirror those identified by Setiyadi (Rambe et al., 2024)who found that the successful integration of ethnomathematics requires teacher readiness and supportive learning tools.

Visual Data Representation

To strengthen the descriptive findings, two visual representations were prepared.

Figure 1**.** Student Interviews During the Implementation of Ethnomathematics

Figure 2. Teacher Interviews During Ethnomathematics Implementation

Summary of Results

1. Both teachers and students hold highly positive perceptions of using engklek and congklak as

mathematical learning tools.

2. Traditional games support understanding of geometry, arithmetic, patterns, and logical reasoning, consistent with prior ethnomathematics research.
3. Students exhibit greater motivation, enjoyment, and conceptual clarity when cultural games are included.
4. Challenges include limited instructional materials and the need for teacher training but these do not diminish the overall perceived benefits.
5. Ethnomathematics aligns strongly with the Merdeka Curriculum, which emphasizes contextual and culturally relevant learning.

Discusion

The findings of this study reveal a strong alignment between teachers' and students' perceptions and the theoretical foundations of ethnomathematics as established by D'Ambrosio (2017) and Rosa and Orey (D. I. Sihombing, 2022). Both groups recognized that traditional games such as *engklek* and *congklak* are rich cultural practices containing embedded mathematical ideas that can support conceptual learning in geometry, number sense, arithmetic operations, spatial reasoning, and pattern recognition. The positive perception reported in this study reflects the central premise of ethnomathematics: that mathematical knowledge is not isolated from culture but is a natural part of daily activities, traditions, and problem-solving within communities (Manik, 2021).

A key pattern emerging from this research is the convergence between quantitative descriptive data and qualitative perception data. Students reported increased motivation, enjoyment, and confidence when cultural games were incorporated into mathematics lessons, reinforcing prior findings by Karina et al. (Qadry et al., 2021) , who documented the motivational and cognitive benefits of using traditional games in learning. Similarly, teachers acknowledged that using *engklek* in geometry instruction helps students visualize and internalize abstract mathematical structures through concrete experiences consistent with the empirical insights of Basri et al. (2024) and Harahap and Jaelani (2022). Meanwhile, *congklak* was perceived as a tool that naturally enhances number sense, sequencing, and strategic reasoning, confirming the work of Muslimin and Rahim (2021) and (Mawaddah, 2025).

The study also exposes several challenges affecting implementation, such as limited teaching resources, insufficient instructional guidelines, and constrained classroom time. These issues closely mirror the findings of (Andriono, 2021) who argues that ethnomathematics implementation requires deliberate planning, structured learning materials, and teacher preparedness. Mawaddah (2025) similarly emphasizes that the integration of cultural practices requires didactical refinement to ensure that learning activities remain mathematically rigorous and culturally meaningful (Karina et al., 2021).

The consistency between the present findings and previous literature strengthens the validity of ethnomathematics as a pedagogical approach. Yet, the study also contributes novel insights by examining perceptions from both teachers and students in the same institutional context a gap rarely

addressed in earlier studies, which tended to focus either on cultural analysis of games or on student learning outcomes alone. By exploring perceptions, this study highlights readiness factors, cultural relevance, and pedagogical feasibility elements crucial for sustainable adoption in classrooms (Harahap & Jaelani, 2022).

Another significant implication is the alignment of ethnomathematics with the Merdeka Curriculum, which emphasizes contextual, student-centered, and culturally responsive learning. The positive reception at MTsN 2 Kota Tangerang indicates strong institutional compatibility. Nevertheless, to fully realize the potential of ethnomathematics, systemic support is required, including curriculum alignment, professional development, and the development of structured modules that integrate traditional games into mathematical instruction (Basri et al., 2024).

In summary, the results support and extend ethnomathematics scholarship, confirming its cognitive, cultural, and pedagogical relevance. At the same time, the findings articulate the practical considerations necessary to scale up ethnomathematics-based instruction across Indonesian schools. This combination of empirical evidence, theoretical grounding, and practical insight marks the distinctive contribution of the present study.

CONCLUSION

This study concludes that the integration of ethnomathematics through traditional games specifically *engklek* and *congklak* is perceived highly positively by teachers and students at MTsN 2 Kota Tangerang. Both groups recognized that traditional games provide meaningful cultural contexts that support mathematics learning by connecting abstract concepts with real-life experiences. Students reported increased enjoyment, engagement, and clarity in understanding mathematical ideas, while teachers observed improvements in conceptual comprehension, motivation, and cultural appreciation. These findings affirm theoretical perspectives from D'Ambrosio (2017), Rosa and Orey (2011), and NCTM (2014), as well as empirical studies by Karina et al. (2021), Basri et al. (2024), and Novitasari et al. (2023).

Traditional games were shown to effectively support the development of geometric reasoning, number sense, and pattern recognition. *Engklek* provided direct representations of lines, angles, and shapes, while *congklak* strengthened arithmetic operations and sequencing—patterns consistent with research by Harahap and Jaelani (2022) and Muslimin and Rahim (2021). These results demonstrate that cultural games offer intuitive, embodied learning experiences that help students transition from concrete to abstract understanding.

However, challenges were also identified, including limited learning materials, insufficient teacher training, and implementation constraints in classroom settings. These findings echo the work of Setiyadi (2021) and Mawaddah (2025), emphasizing the need for structured didactical design, pedagogical support, and institutional readiness. Therefore, while ethnomathematics holds strong

pedagogical promise, its effective application requires coordinated efforts among teachers, schools, and curriculum developers.

The overall findings highlight the importance of culturally grounded mathematics instruction in enhancing learning outcomes, supporting cultural identity, and fulfilling the goals of the Merdeka Curriculum. This study contributes novel insights by examining both teacher and student perceptions within a single educational setting, offering a holistic understanding of ethnomathematics implementation. Future research is recommended to develop instructional modules, conduct classroom interventions, and explore other traditional games across Indonesia to expand the applicability and impact of ethnomathematics in diverse contexts.

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Conflicts of Interest

The authors declare that there is no conflict of interest regarding the publication of this manuscript. All ethical considerations related to the research and publication process have been fully addressed, including issues of plagiarism, research misconduct, data fabrication or falsification, duplicate publication or submission, and redundant publication. The authors affirm that the study was conducted and reported with honesty, transparency, and adherence to academic integrity standards.

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