

The Mathematical Literacy Task Using the Context of the Traditional Games "Engklek" and "Congklak"

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Received: February 2026 | Revised: March 2026 | Accepted: April 2026 | Published: April 2026

Abstract:

The low level of mathematical literacy among Indonesian students remains a significant challenge, as evidenced by PISA and national assessment results. Although ethnomathematics has been widely recognized as a promising approach to contextualize mathematics learning, studies that specifically develop mathematical literacy tasks based on traditional games and examine their validity, practicality, and effectiveness are still limited. In particular, the integration of traditional games such as "Engklek" and "Congklak" into mathematical literacy task design has not been extensively explored. This study aims to develop mathematical literacy tasks using the context of the traditional games "Engklek" and "Congklak" that meet the criteria of validity, practicality, and effectiveness. Employing a design research methodology with a development study approach, this study adopted a formative evaluation model consisting of self-evaluation, expert review, one-to-one, small-group, and field test stages. The subjects were junior high school students in Bandar Lampung. Data were collected through walkthroughs, documentation, observations, interviews, and tests, then analyzed using descriptive qualitative methods. The results show that the developed tasks achieved a high level of validity based on expert judgment, with consistent agreement across content, construct, and language aspects. The tasks were also found to be practical, as indicated by students' positive responses and their ability to engage with the tasks during trials. Furthermore, the field test revealed an improvement in students' mathematical literacy performance, particularly in formulating, employing, and interpreting mathematical problems within real-life contexts. Therefore, it can be concluded that the ethnomathematics-based mathematical literacy tasks developed in this study are valid, practical, and effective, and suitable for supporting students' development of mathematical literacy.

Keywords: congklak, engklek, ethnomathematics, mathematical literacy, traditional games

Introduction

Ethnomathematics refers to the study of the relationship between mathematics and culture, highlighting how mathematical ideas are understood and practiced within specific cultural contexts (D'Ambrosio, 2006). Rather than viewing mathematics as purely abstract, this perspective emphasizes its connection to real-life activities and cultural practices. In line with this view, integrating local culture into mathematics learning is considered important, as it influences both the content and the ways students learn mathematics (Bishop, 1988; Anderson-Pence, 2013). Previous



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studies also suggest that ethnomathematics can serve as a meaningful context for learning formal mathematical concepts and can be integrated into curriculum materials and teacher education (Orey & Rosa, 2007; Rosa & Orey, 2013). However, while ethnomathematics provides meaningful cultural contexts for learning mathematics, it also needs to be aligned with broader educational goals, particularly the development of students' mathematical literacy.

In this regard, mathematical literacy has become a crucial issue in mathematics education, especially in Indonesia. Mathematical literacy refers to an individual's ability to formulate, apply, and interpret mathematics in various contexts (Afriyanti, 2018). However, Indonesian students' mathematical literacy remains relatively low, as indicated by PISA results from 2000 to 2018, which consistently fall below the international average (Zulkardi & Putri, 2020). Although there was a slight improvement in the 2022 PISA cycle, Indonesia still ranks in the lower group. Similarly, results from the Minimum Competency Assessment (AKM) show that students' numeracy achievement remains below 50% (Center for Education Assessment, 2022). Given this condition, there is a need for instructional approaches that not only connect mathematics to students' cultural backgrounds but also support the development of mathematical literacy skills.

In addition, preliminary observations and informal discussions with teachers indicate that students often experience difficulties in solving contextual mathematical problems, particularly those requiring interpretation and reasoning. Classroom practices still tend to emphasize procedural tasks rather than non-routine problems related to real-life situations. As a result, students are less accustomed to engaging with mathematical literacy tasks that involve meaningful contexts. These findings highlight the need for the development of contextual and culturally relevant mathematical tasks that can better support students' mathematical literacy.

One potential approach is integrating ethnomathematics into mathematical literacy tasks, particularly by using familiar cultural contexts such as traditional games. Task design plays a crucial role in supporting students' understanding and engagement, as well-designed tasks can bridge abstract mathematical concepts with meaningful real-world situations (Khairunnisa, 2018; Maslihah et al., 2020). To understand how this integration has been explored, it is important to review previous studies related to ethnomathematics and mathematical literacy in various contexts.

Many researchers in Indonesia have examined ethnomathematics embedded in community practices. A review conducted by Wahyudi & Putra (2022) of 14 journal articles and conference proceedings published between 2015 and 2021 revealed that ethnomathematics in societal activities has been applied across various contexts, such as farming activities, traditional games, wedding ceremonies, fabric motif design, searching for lost objects, circumcision rituals, and fishing activities. Each of these activities involves various mathematical concepts, including counting, algebra, geometry, and others.

With regard to traditional games, several ethnomathematics-related studies have been conducted, including research on marbles and hide-and-seek games (Pratiwi & Pujiastuti, 2020; Berlin et al., 2024), engklek (Harahap & Jaelani, 2022; Maulida, 2020), as well as other traditional games (Merliza, 2021; Karina et al., 2021). Meanwhile, the development of mathematical literacy-based problems or tasks, particularly those using traditional contexts, has also been explored, such as traditional foods (Gustiningsi et al., 2023), traditional clothing and kite games (Murtiyasa et al., 2018), and the traditional game egrang (Ahyan et al., 2014). Specifically, for the traditional games engklek and congklak, several studies have examined their mathematical connections (Wahyuningsih & Astuti, 2023; Taus et al., 2022) as well as their use in improving mathematical literacy (Sasmito, 2023; Permatasari et al., 2023).

Despite these efforts, there is still a lack of studies that systematically develop mathematical literacy tasks based on the contexts of engklek and congklak and evaluate them in terms of validity, practicality, and effectiveness. This gap highlights the need for research that not only explores cultural contexts but also translates them into well-designed and empirically tested learning tasks.

Engklek is one of the traditional games commonly played by children in Indonesia. The game can be played by a minimum of two players. Before the game begins, a layout of squares must be created as the playing medium. The layout is designed in the form of squares divided into several sections (Supriyono, 2018). Meanwhile, congklak is a traditional game played on a board with 16 holes. Each player controls one side of the congklak board consisting of eight holes, which are divided into seven small holes and one large hole (Supriyono, 2018).



<https://regional.kompas.com/>



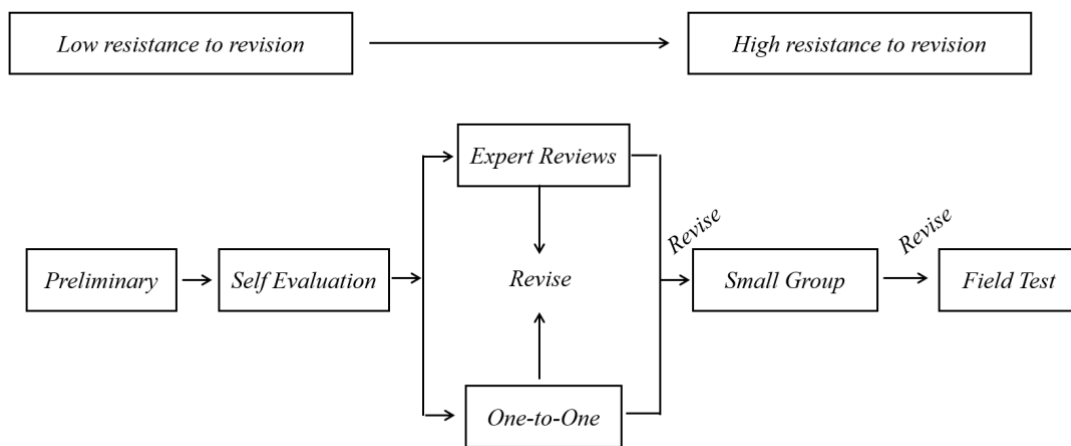
<https://tgrcampaign.com/read/78/manfaat-permainan-congklak>

Picture 1. Engklek and Congklak Traditional Games

Therefore, this study aims to address the identified gap by developing mathematical literacy tasks using the contexts of the traditional games engklek and congklak and evaluating their validity, practicality, and effectiveness.

Research Methods

This study employed a design research methodology with a development study approach (Zulkardi, 2002), in line with the objective of developing valid mathematical literacy tasks using the context of traditional games, namely *engklek* and *congklak*, and examining their potential effect on students' mathematical literacy. The tasks were designed to support students' abilities in formulating, applying, and interpreting mathematical problems. The research was conducted in two stages, namely the preliminary stage and the formative evaluation stage.



Picture 2. Research Development Procedure Using Design Research (Source: Ridwan et al., 2016; Tessmer, 1993)

In the preliminary stage, the researchers prepared the research setting, selected the participants, conducted a literature review, developed research instruments. The instruments used in this study included: (1) documentation guidelines, used to analyze students' needs, curriculum requirements, and relevant contexts in the preliminary stage; (2) validation sheets, used by experts to assess the content, construct, and language validity of the developed tasks; (3) student response questionnaires, used to evaluate the practicality of the tasks; and (4) interview guidelines, used to explore students' reasoning, understanding, and difficulties in solving the tasks.

The formative evaluation stage consisted of iterative cycles of self-evaluation, expert review, one-to-one evaluation, small-group evaluation, and field testing (Tessmer, 1993; Zulkardi et al., 2020). In the formative evaluation stage, the initial prototype was first analyzed through self-evaluation. The expert review involved several experts who evaluated the tasks based on validity criteria. The one-to-one evaluation involved 2 students to identify readability and initial difficulties in understanding the tasks. The small-group evaluation involved 6 students, aiming to examine the practicality of the tasks in terms of clarity, ease of use, and students'

responses. The field test (large group) involved 20 junior high school students in Bandar Lampung, Indonesia, who were selected based on characteristics aligned with the target population of mathematical literacy assessment (OECD, 2019). This stage aimed to examine the potential effect of the developed tasks.

Data were collected using documentation, questionnaires, interviews and analysis of student answers. Data were collected using documentation, questionnaires, interviews, and analysis of students' written responses. Documentation was used in the preliminary stage to analyze students' needs, curriculum requirements, and relevant contexts. Questionnaires were administered to experts to assess the validity of the developed tasks and to six students in the small-group stage to evaluate the practicality of the tasks. Interviews were conducted with students to explore their reasoning, understanding, and difficulties in solving the tasks. In addition, the analysis of students' written responses was carried out to examine their performance and to identify the potential effect of the developed tasks on students' mathematical literacy. Data analysis was conducted using descriptive qualitative methods supported by quantitative analysis.

The validity of the tasks was determined using expert judgment and quantified using Aiken's V index, calculated as:

$$V = \frac{\sum s}{n(c - 1)}$$

where $s = r - l_0$, r is the expert rating score, l_0 is the lowest score, c is the highest score, and n is the number of experts.

The practicality of the tasks was analyzed using students' response questionnaires and observation results, calculated using the percentage formula:

$$P = \frac{f}{N} \times 100\%$$

where f is the obtained score and N is the maximum score.

The test data from the field test were analyzed using a scoring rubric based on mathematical literacy indicators (formulate, apply, interpret). Each student's score was calculated and then categorized into levels of mathematical literacy. The percentage of students in each category was calculated using:

$$\text{Percentage} = \frac{\text{number of students in category}}{\text{total students}} \times 100\%$$


The potential effect of the developed tasks was identified based on students' performance improvement and the quality of their responses in solving contextual problems.

Results and Discussions

Results

The preliminary design activities included determining the research site, which was conducted at a junior high school in Bandar Lampung, Indonesia. In addition, a literature review related to the traditional games engklek and congklak was carried out. Subsequently, the formative evaluation design stage was implemented. First, an analysis of students' characteristics, the curriculum, and the content materials was conducted. After completing the analysis stage, the design stage was carried out by developing mathematical literacy problems based on the traditional games engklek and congklak. The initial form of the developed problems is presented as follows.

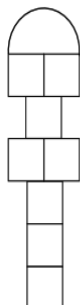
Table 1. The Initial Prototype of the Developed Tasks

Original Item (Indonesian)	English Translation
<div style="border: 1px solid black; padding: 10px;"> <p style="text-align: center;">ENKLEK</p> <p>Engklek atau yang dikenal juga dengan dampu merupakan salah satu permainan tradisional yang menyenangkan sekaligus menyehatkan. Pemain hanya perlu melempar trengkal/gacoan yang terbuat dari pecahan genteng ke dalam area engklek dan melompati setiap kotak tanpa menyentuh area kotak yang terdapat gacoan. Dengan bermain engklek, kita bisa melatih ketangkasan dan kelincahan karena pemain diwajibkan untuk melompati kotak-kotak yang ada pada area permainan. (Sumber: https://ditsmp.kemdikbud.go.id)</p>  <p style="text-align: center;">Sumber: https://blog.milikumi.com/cara-bermain-engklek/</p> </div>	<p>ENKLEK</p> <p><i>Engklek, also known as dampu, is one of the traditional games that is very enjoyable and healthy. This game is played by throwing a marker (gacoan) made from a piece of tile into the engklek grid and then hopping on each square without stepping on the square where the gacoan lands. By playing engklek, we can train agility and balance, as players are required to hop on the squares available in the game area.</i></p> <p>(Source: https://ditsmp.kemdikbud.go.id)</p>
	<p><i>As part of preserving traditional games, one of the villages in South Lampung Regency will organize an engklek competition among village children. The design of the engklek playing area consists of 8 equal-sized squares and a semicircle, as shown in the figure below.</i></p> <ol style="list-style-type: none"> <i>If the side length of each square in the engklek area is 35 cm, what is the minimum area required for the engklek field as shown in the figure? ___ m²</i> <i>To ensure the competition runs more efficiently, more than one engklek field will be built. If the available land has a length of 5 meters and a width of 4 meters, what is the maximum number of engklek fields that can be constructed? Create a sketch of the land</i>

Original Item (Indonesian)

Sebagai bentuk melestarikan permainan tradisional, salah satu desa Kabupaten Lampung Selatan akan mengadakan kegiatan perlombaan engklek antar anak-anak desa. Desain rancangan tempat engklek terdiri dari 8 persegi berukuran sama besar dan sebuah setengah lingkaran sesuai gambar di bawah ini.

1. Jika ukuran panjang sisi persegi untuk tempat engklek tersebut adalah 35 cm, maka luas minimal untuk tempat engklek seperti gambar di samping adalah ... m².
2. Agar pelaksanaan lomba dapat berjalan lebih cepat, maka akan dibuat lebih dari satu tempat engklek. Jika lahan yang disediakan berukuran panjang 5 meter dan lebar 4 meter, maka berapa banyak maksimal tempat engklek yang dapat dibuat? Buatlah sketsa lahan tersebut disertakan dengan seluruh tempat engklek yang dapat dibentuk.



English Translation

including all possible engklek fields that can be formed.

CONGLAK

Congklak atau Dakon merupakan permainan tradisional yang menggunakan sebuah alat yang terbuat dari papan kayu atau plastik yang berbentuk seperti perahu dengan panjang 30 cm sampai 50 cm. Bagian Tengah congklak terdapat cekungan sebagai tempat untuk menyimpan biji-bijian, batu kerikil, atau cangkang kerang laut berbentuk oval.



Sumber: <https://tgrcampaign.com/read/78/manfaat-permainan-congklak>

CONGLAK

Congklak, or Dakon, is a traditional game that uses a tool made of a wooden or plastic board shaped like a boat, with a length of about 30 cm to 50 cm. In the middle part of the congklak board, there are small hollows used to store seeds, small stones, or oval-shaped seashells.

Source: <https://tgcampaign.com/read/78/manfaat-permainan-congklak>

Di Indonesia, jumlah cekungan biasanya ada 14 cekungan kecil dan 2 cekungan besar seperti pada gambar di atas. Setiap cekungan kecil akan diisi oleh biji congklak yang sama banyak.

1. Ani dan Yanti hendak bermain congklak, namun biji congklak yang tersedia ternyata hanya 78 karena banyak yang hilang. Jika mereka ingin tetap bermain, maka di awal permainan setiap cekungan kecil perlu diisi berapa biji congklak? Dan adakah biji congklak yang tidak terpakai? Jelaskan alasanmu!
2. Ketika Ani dan Yanti telah menyelesaikan permainannya, datanglah Ratna dan Nisa yang juga membawa congklak dan 83 biji congklak. Selanjutnya Ani bermain congklak kembali dengan Yanti dan Nisa juga bermain congklak dengan Ratna. Pernyataan yang sesuai adalah...
 - A. Ani dan Yanti hanya dapat mengisi cekungan-cekungan kecil masing-masing dengan 4 biji congklak, sedangkan Ratna dan Nisa dapat congklak mereka dengan 7 biji congklak.
 - B. Biji congklak di cekungan-cekungan kecil congklak Ratna dan Nisa sama banyaknya dengan yang ada di congklak Ani dan Yanti yaitu masing-masing 6 buah.
 - C. Terdapat 8 Biji congklak Ani dan Yanti yang tidak digunakan untuk bermain, sedangkan Ratna dan Nisa tidak menggunakan 13 biji congklaknya.
 - D. Biji congklak yang digunakan Ani dan Yanti pada satu cekungan kecil, sama banyaknya dengan biji congklak di satu cekungan kecil yang digunakan Yanti dan Nisa.

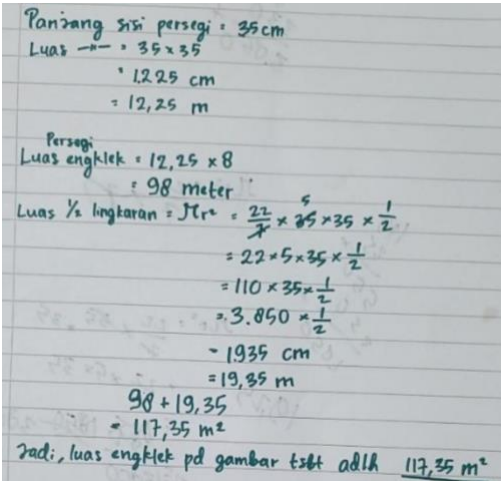
In Indonesia, the number of holes is usually 14 small holes and 2 large holes as shown in the picture above. Each small hole is filled with the same number of congklak seeds.

1. Ani and Yanti want to play congklak, but only 78 congklak seeds are available because many are missing. If they still want to play, how many seeds should be placed in each small hole at the beginning of the game? And how many seeds are left over? Explain your answer.
2. After Ani and Yanti finish their game, Ratna and Nisa arrive, also bringing a congklak board and 83 seeds. Next, Ani plays congklak again with Yanti and Nisa, while Ratna and Nisa play with their congklak board.
 - A. Ani and Yanti realize that the available small holes are only 4, while Ratna and Nisa can use their congklak board with 7 holes.

Original Item (Indonesian)	English Translation
	<p>B. The congklak seeds in Ani and Yanti's small holes are the same as those in Ratna and Nisa's congklak board, each having 6 seeds.</p> <p>C. There are 8 congklak seeds belonging to Ani and Yanti that are not used for playing, while Ratna and Nisa do not use 13 of their congklak seeds.</p> <p>D. The congklak seeds used by Ani and Yanti in one small hole are the same as the congklak seeds used by Ratna and Nisa in one small hole.</p>

Subsequently, the expert review stage was conducted. In this stage, a validation process was carried out by experts on the developed prototype. The validators consisted of two doctoral holders in Mathematics Education and one mathematics teacher with more than 10 years of teaching experience who had been certified by the Indonesian Ministry of Education, Culture, Research, and Technology. The validation activities were conducted through questionnaires and discussions regarding the initial draft of the problems, namely Prototype 1. In addition to the expert review, validation was also conducted with students through the one-to-one evaluation stage. This trial was carried out with two junior high school students, in which the students were able to work on the problems but experienced some confusion on the engklek-related problem, particularly Question 1. An excerpt of the students' work is presented as follows.

Table 2. Excerpt of Students' Responses in the One-to-One Evaluation Stage

Original Item (Indonesian)	English Translation
 <p> Panjang sisi persegi = 35 cm Luas → = 35×35 = 1225 cm² = 12,25 m² </p> <p> Persegi Luas engklek = $12,25 \times 8$ = 98 meter² </p> <p> Luas $\frac{1}{4}$ lingkaran = $\frac{1}{4} \pi r^2 = \frac{22}{7} \times 35 \times 35 \times \frac{1}{4}$ = $22 \times 5 \times 35 \times \frac{1}{4}$ = $110 \times 35 \times \frac{1}{4}$ = $3.850 \times \frac{1}{4}$ = 1935 cm² = 19,35 m² </p> <p> $98 + 19,35$ = 117,35 m² </p> <p>Jadi, luas engklek pd gambar tsbt adlh 117,35 m²</p>	<p>Side length of the square = 35 cm Area = 35×35 = 1225 cm² = 12,25 m²</p> <p>Square Area of engklek = $12,25 \times 8$ = 98 m²</p> <p>Area of $\frac{1}{4}$ circle = $\pi r^2 = \frac{22}{7} \times 35 \times 35 \times \frac{1}{4}$ = $22 \times 5 \times 35 \times \frac{1}{4}$ = $110 \times 35 \times \frac{1}{4}$ = $3850 \times \frac{1}{4}$ = 1935 cm² = 19,35 m²</p> <p>$98 + 19,35$ = 117,35 m²</p> <p>So, the area of the engklek in the figure is 117,35 m²</p>

Nevertheless, the students were able to answer the problem with appropriate responses. Several comments obtained from the expert review and the one-to-one evaluation stages are presented in Table 3.


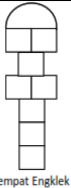
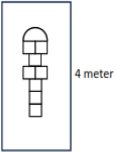

Table 3. Comments from the validation results

Validation Stage	Comments
Expert Review	Some sentences were not sufficiently clear in conveying information. The images used should better align with the problem statements. In Question 1 of the Engklek problem, the word "minimum" should be removed. Question number 2 in the 'Engklek' problem set needs to be made more contextual.
One-to-One Evaluation (Student)	Students showed a lack of understanding of question number 1 in the "Engklek" task. Students inquired whether the two large storehouses (holes) in the "Congklak" game should also be filled at the beginning of the play.

Following revisions of the initial prototype based on expert validation and one-to-one evaluation with students, the revised prototype was submitted again to the validators. The results indicated that the Aiken's V index ranged from 0.83 to 0.92, demonstrating that the developed tasks are valid in terms of content, construct, and language. The validated product is presented in Table 4.

Table 4. English translation of the "Engklek" and "Congklak" mathematical problems.

Original Item (Indonesian)	English Translation
	<p>ENKLEK</p> <ul style="list-style-type: none"> Do you have prior knowledge about Engklek? Answer: _____ Have you ever played Engklek? Answer: _____ If so, when was the last time you played Engklek? Answer: _____ <p>Brief Information</p> <p>Engklek, also known as 'dampu', is a traditional game that is both fun and healthy. Players simply need to throw a 'gacoan' (a flat stone or piece of roof tile) into the Engklek area and hop through each square without</p>

Original Item (Indonesian)	English Translation
<p style="text-align: center;">ENGKLEK</p> <p>Apakah kamu sudah mengetahui sebelumnya tentang engklek? Jawab: _____</p> <p>Apakah kamu pernah bermain engklek? Jawab: _____</p> <p>Jika pernah, kapan terakhir kamu bermain engklek? Jawab: _____</p> <p>Informasi Singkat</p>  <p>Engklek atau yang dikenal juga dengan dampu merupakan salah satu permainan tradisional yang menyenangkan sekaligus menyehatkan. Pemain hanya perlu melempar trengkal/gacoan yang terbuat dari pecahan genteng ke dalam area engklek dan melompati setiap kotak tanpa menyentuh area kotak yang terdapat gacoan. Dengan bermain engklek, kita bisa melatih ketangkasan dan kelincahan karena pemain diwajibkan untuk melompati kotak-kotak yang ada pada area permainan. (Sumber: https://ditsmp.kemdikbud.go.id)</p> <p>Sumber Gambar: https://big.millium.com/kara-bermain-engklek</p>	<p><i>touching the square where the gacoan is located. By playing Engklek, we can train agility and nimbleness, as players are required to jump through the squares in the playing area. (Source: https://ditsmp.kemdikbud.go.id)</i></p>
<p>Sebagai bentuk melestarikan permainan tradisional, salah satu desa di Kabupaten Lampung Selatan akan mengadakan kegiatan perlombaan engklek antar anak-anak desa. Desain rancangan tempat engklek terdiri dari 8 persegi berukuran sama besar dan sebuah setengah lingkaran sesuai gambar di bawah ini.</p>  <p style="text-align: center;">Tempat Engklek</p> <ol style="list-style-type: none"> 1. Jika ukuran panjang sisi persegi untuk tempat engklek tersebut adalah 35 cm, maka luas untuk tempat engklek seperti gambar di samping adalah ... m². 2. Agar pelaksanaan lomba dapat berjalan lebih cepat, maka akan dibuat lebih dari satu tempat engklek. Lahan yang disediakan berukuran panjang 15 meter dan lebar 10 meter. Jika satu tempat engklek diberikan jatah lahan dengan panjang 4 meter dan lebar 2 meter (gambar di bawah), maka berapa banyak tempat engklek yang dapat dibuat?  <p style="text-align: center;">4 meter</p> <ol style="list-style-type: none"> 3. Coba periksa perhitungan Anda dengan membuat sketsanya, apakah sesuai atau tidak. 	<p><i>As an effort to preserve traditional games, a village in South Lampung Regency will organize an Engklek competition for the local children. The design for the Engklek court consists of 8 squares of equal size and a semicircle, as shown in the image below.</i></p> <ol style="list-style-type: none"> 1. <i>If the side length of each square for the Engklek court is 35 cm, then the total area of the court as shown in the side image is ... m².</i> 2. <i>To ensure the competition runs more quickly, more than one Engklek court will be constructed. The available land measures 15 meters in length and 10 meters in width. If each Engklek court is allotted a plot of land measuring 4 meters in length and 2 meters in width (as shown below), how many Engklek courts can be built?</i> 3. <i>Please verify your calculation by creating a sketch to determine whether it is accurate or not.</i>
<p style="text-align: center;">CONGKLAK</p> <p>Apakah kamu sudah mengetahui sebelumnya tentang congklak? Jawab: _____</p> <p>Apakah kamu pernah bermain congklak? Jawab: _____</p> <p>Jika pernah, kapan terakhir kamu bermain congklak? Jawab: _____</p> <p>Informasi Singkat</p> <p>Congklak atau Dakon merupakan permainan tradisional yang menggunakan sebuah alat yang terbuat dari papan kayu atau plastik yang berbentuk seperti perahu dengan panjang 30 cm sampai 50 cm. Bagian Tengah congklak terdapat cekungan sebagai tempat untuk menyimpan biji-bijian, batu kerikil, atau cangkang kerang laut berbentuk oval.</p>  <p>Sumber: https://tgrcampaign.com/read/78/manfaat-permainan-congklak</p>	<p>CONGKLAK</p> <ul style="list-style-type: none"> ● <i>Do you have prior knowledge about Congklak? Answer: _____</i> ● <i>Have you ever played Congklak? Answer: _____</i> ● <i>If so, when was the last time you played Congklak? Answer: _____</i> <p>Brief Information</p> <p><i>Congklak, also known as Dakon, is a traditional game that uses a boat-shaped board made of wood or plastic, typically ranging from 30 cm to 50 cm in length. The middle part of the Congklak board features pits (holes) used to store seeds, small stones, pebbles, or oval-shaped seashells.</i></p>

Original Item (Indonesian)	English Translation
<p>Di Indonesia, jumlah cekungan biasanya ada 14 cekungan kecil dan 2 cekungan besar seperti pada gambar di atas. Pada awal permainan, setiap cekungan kecil akan diisi oleh biji congklak yang sama banyak. Sedangkan dua cekungan besar dibiarkan kosong terlebih dahulu</p> <p>1. Ani dan Yanti hendak bermain congklak, namun biji congklak yang tersedia hanya 78 karena banyak yang hilang. Jika mereka ingin tetap bermain, maka di awal permainan setiap cekungan kecil perlu diisi berapa biji congklak? Dan adakah biji congklak yang tidak terpakai? Jelaskan alasanmu!</p> <p>2. Ketika Ani dan Yanti telah menyelesaikan permainannya, datanglah Ratna dan Nisa yang juga membawa congklak dan 83 biji congklak. Selanjutnya Ani bermain congklak melawan Yanti, sedangkan Nisa juga bermain congklak melawan Ratna. Pilih pernyataan berikut yang paling sesuai dan berikan alasanmu!</p> <p>A. Ani dan Yanti hanya dapat mengisi cekungan-cekungan kecil masing-masing dengan 4 biji congklak, sedangkan Ratna dan Nisa dapat congklak mereka dengan 7 biji congklak.</p> <p>B. Biji congklak di cekungan-cekungan kecil congklak Ratna dan Nisa sama banyaknya dengan yang ada di congklak Ani dan Yanti yaitu masing-masing 6 buah.</p> <p>C. Terdapat 8 Biji congklak Ani dan Yanti yang tidak digunakan untuk bermain, sedangkan Ratna dan Nisa tidak menggunakan 13 biji congklaknya.</p>	<p>Mathematical Problems</p> <p><i>In Indonesia, the board usually consists of 14 small pits and 2 large storehouses, as shown in the image above. At the beginning of the game, each small pit is filled with an equal number of Congklak seeds, while the two large storehouses are initially left empty.</i></p> <p>1. <i>Ani and Yanti intend to play Congklak, but only 78 seeds are available because many have been lost. If they still want to play, how many seeds should be placed in each small pit at the start of the game? And are there any unused seeds? Explain your reasoning!</i></p> <p>2. <i>Once Ani and Yanti have finished their game, Ratna and Nisa arrive, bringing another Congklak board and 83 seeds. Subsequently, Ani plays against Yanti, while Nisa plays against Ratna. Choose the most appropriate statement below and provide your reasoning!</i></p> <p>A. <i>Ani and Yanti can only fill each of their small pits with 4 seeds, whereas Ratna and Nisa can fill theirs with 7 seeds.</i></p> <p>B. <i>The number of seeds in the small pits for Ratna and Nisa's game is the same as in Ani and Yanti's game, which is 6 seeds each.</i></p> <p>C. <i>There are 8 unused seeds in Ani and Yanti's game, while Ratna and Nisa have 13 unused seeds.</i></p>

The next stage is the **Small Group Evaluation**. Prototype 2 was tested on several students with diverse ability levels. At this stage, with the teacher's assistance, six students were selected, representing high (AT1 and AT2), medium (AS1 and AS2), and low (AR1 and AR2) academic abilities. Subsequently, these six students were asked to discuss and solve the designed mathematical literacy problems, as well as provide comments or suggestions regarding the tasks. The evaluation at this stage focused on the students' ease in completing the developed mathematical literacy tasks. The results of the small group evaluation are presented in Table 5.

Table 5. Results of the small group evaluation questionnaire

No.	Student	Total Score	Maximum Score	Percentage	Average Percentage
1	AT1	33	40	82,5%	87,08%
2	AT2	36		90%	
3	AS1	37		92,5%	
4	AS2	33		82,5%	
5	AR1	32		80%	
6	AR2	38		95%	

Based on Table 5, the data shows that the student response percentage reached 87.08%, indicating that Prototype 2 is sufficiently practical. Several comments provided by students during this stage are as follows:

1. Students noted that the problems were engaging due to their connection with traditional games, though they found them difficult to solve individually without collaborative discussion.
2. Students remarked that the tasks were challenging because the solutions could not be derived directly through the application of a single formula.
3. Some students expressed confusion regarding the questions, as they were unaccustomed to encountering this specific type of mathematical problem.

The final stage is the field testing. At this stage, the product was tested on 20 eighth-grade students. The developed mathematical literacy problems were administered to the students within a classroom learning environment. Initially, students were directed to solve the problems individually, followed by a collaborative group discussion.



Picture 2. Field Test Activities

After the students completed the problems, they were given a questionnaire. The results of the questionnaire are presented in Picture 3.

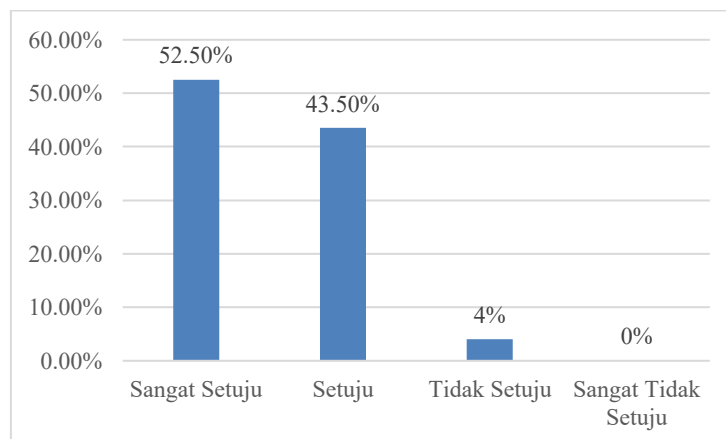


Figure 3. Results of the Field Test Questionnaire

Based on Figure 3, it was found that out of 20 students and 10 questionnaire items, 52.5% of students strongly agreed and 43.5% agreed with the statements. These results indicate that the developed problems have met the criteria for practicality. Furthermore, several students provided feedback regarding the developed product, as follows:

1. Students noted that solving the problems required significant time because they needed to fully understand the context of the questions first.
2. Students remarked that the narratives in the problems were engaging as they reminded them of the traditional games *Engklek* and *Congklak*.
3. Students stated that the mathematical content presented was consistent with what they had previously learned.
4. Some students mentioned that they rarely practiced with such problems, noting that the texts they usually encountered were not as lengthy.
5. While all students were familiar with *Engklek* and *Congklak*, not all had played them; specifically, 19 out of 20 students reported having played *Engklek*, while 17 had played *Congklak*.

Discussion

Based on the research results presented above, the study has produced a set of mathematical literacy tasks utilizing the context of traditional games, specifically *Engklek* and *Congklak*. At the beginning of each task, a brief narrative regarding the respective traditional game is provided. This is intended to introduce the traditional games to students, or to remind them of games they may already know. Following the narrative, problems and questions are presented for the students to solve.

Field findings indicate that many students are still unaccustomed to mathematical literacy problems. Students are more familiar with short word problems where the information is explicitly stated, even though such problems are not truly contextual. In fact, according to the OECD (2016), mathematical literacy is crucial as it helps individuals understand the utility of mathematics in daily life and apply it effectively.

Another finding reveals students are accustomed to solving mathematical problems that result in whole numbers (integers). Consequently, when working on the "Engklek" problem, which involves decimal results, students became hesitant regarding the accuracy of their answers. This warrants attention because, in daily life, mathematical problems frequently involve decimals and are not always limited to whole numbers.

In the "Engklek" problem, students also tended to derive answers through calculation alone, without considering the practical constraints or conditions described in the task. An example can be seen in part 2 of the problem:

"To ensure the competition runs more efficiently, multiple Engklek courts will be constructed. The available land measures 15 meters in length and 10 meters in width. If each Engklek court

is allocated a plot of land with a length of 4 meters and a width of 2 meters (as shown in the image below), how many Engklek courts can be constructed?"

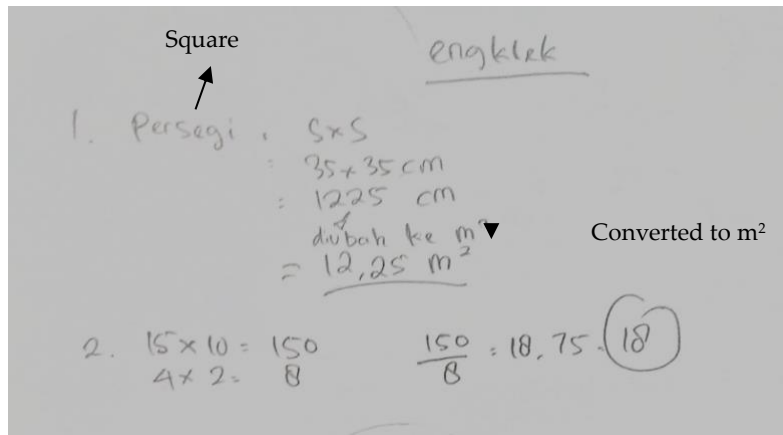


Figure 4. Samples of Students' Answers to The Engklek Problem

Most students answered the problem by simply calculating the area 15×10 and then dividing it by the result of the plot area 4×2 , which yielded 18.75. However, if represented visually, the number of Engklek courts that can actually be formed does not reach 18. Drawing a connection to the study by (Fazzilah et al., 2020), it is evident that the reason students are unable to evaluate the problem correctly is their lack of understanding of the problem-solving process, even though they have identified the correct formula and executed the procedure accurately.

Consistently providing mathematical literacy problems to students will certainly help improve their mathematical literacy skills. Researchers and mathematics teachers also need to participate in developing various mathematical literacy tasks so that more resources can be utilized in mathematics learning. According to (Zulkardi & Kohar, 2018), becoming accustomed to designing mathematical literacy tasks is highly beneficial—not only for enhancing student performance in surveys such as PISA (Programme for International Student Assessment) but also for preparing students to solve more complex problems.

Conclusions and Suggestions

Based on the research results and discussion, this study has successfully developed mathematical literacy tasks using the context of traditional games, namely Engklek and Congklak, which meet the criteria of validity, practicality, and potential effect. The tasks were validated through expert judgment and one-to-one evaluation, demonstrated practicality in small-group and field test implementations, and showed a positive impact, with 96% of students providing favorable responses. These findings indicate that the developed tasks are appropriate and effective for supporting students' mathematical literacy learning, particularly in connecting mathematical concepts with meaningful cultural contexts.

In terms of practical implications, teachers are encouraged not only to use these tasks as supplementary materials but also to integrate a "narrative-to-problem" structure into their daily assessments. This approach can help bridge the gap between abstract mathematical concepts and students' cultural experiences, making learning more meaningful. Additionally, teachers should provide more exposure to non-routine problems involving non-integer results (decimals), as students need to be accustomed to real-world mathematical solutions that are not always whole numbers.

From the perspective of the field of mathematics education, this study highlights the importance of developing culturally responsive learning materials as part of efforts to improve students' mathematical literacy. It also supports the integration of ethnomathematics into classroom practice, contributing to both educational innovation and the preservation of local cultural heritage.

For future research, it is suggested that the scope of this study be expanded by measuring the effectiveness of the developed tasks more comprehensively, such as through pre-test and post-test designs to determine their impact on students' mathematical literacy scores. Furthermore, future studies could explore the development of mathematical literacy tasks using other traditional games, such as Gobak Sodor, Lato-Lato, and Kelereng (marbles), in order to enrich learning resources and support the preservation of Indonesian cultural heritage.

Acknowledgements

The authors would like to express their gratitude to the Faculty of Teacher Training and Education (FKIP), Universitas Lampung, for funding this research through the BLU FKIP Unila Grant for the 2023 Fiscal Year under Contract No. 4737/UN26.13/PN/2023 dated May 24, 2023. We also extend our appreciation to the experts, teachers, and students who participated and contributed their insights during the development and testing stages of this research.

References

- Afriyanti, I. (2018). Pengembangan Literasi Matematika Mengacu PISA Melalui Pembelajaran Abad Ke-21 Berbasis Teknologi. *Prosiding Seminar Nasional Matematika*, 608–610.
- Ahyan, S., Zulkardi, Z., & Darmawijoyo, D. (2014). Developing Mathematics Problems Based on PISA Level of Change and Relationships Content. *Journal on Mathematics Education*, 5(1). <https://doi.org/10.22342/jme.5.1.1448.47-56>
- Berlin, G. B., Efendi, D., & Desmayanasari, D. (2024). Eksplorasi Etnomatematika pada Materi Geometri dan Barisan melalui Permainan Kelereng dan Petak Umpet di Kelas VII SMP Bhakti Mulya. *Journal on Education*, 6(3), 17062–17068.

- Bishop, A. J. (1988). *Mathematical Enculturation: A Cultural Perspective on Mathematics Education*. Kluwer Academic Publishers.
- Bolstad, O. H. (2020). *Teaching and learning for mathematical literacy* [Doctoral thesis]. University of Agder.
- Center for Education Assessment. (2022). *Grouping of educational units based on the 2021 National Assessment results: Policy recommendation document (Research Report)*.
- D'Ambrosio, U. (1985). Ethnomathematics and its Place in the History and Pedagogy of Mathematics. *For the Learning of Mathematics*, 5(1), 44–48.
- D'Ambrosio, U. (2006). *Etnomathematics Link between Traditions and Modernity*. Sense Publisher.
- Fazzilah, E., Effendi, K. N. S., & Marlina, R. (2020). Analisis Kesalahan Siswa Dalam Menyelesaikan Soal Pisa Konten Uncertainty dan Data. *Jurnal Cendekia : Jurnal Pendidikan Matematika*, 4(2), 1034–1043. <https://doi.org/10.31004/cendekia.v4i2.306>
- Gustiningsi, T., Putri, R. I. I., Zulkardi, & Hapizah. (2023). Developing a PISA-Like Mathematical Problem: Using Traditional Food Context. *IJECA International Journal of Education & Curriculum Application*, 6(3), 324–337. <https://doi.org/10.31764/ijeca.v6i3.20200>
- Harahap, N. S., & Jaelani, A. (2022). Etnomatematika pada Permainan Tradisional Engklek. *Paradikma Jurnal Pendidikan Matematika*, 15(1), 86–90.
- Karina, C. D., U.S, S., & L.A, S. (2021). Eksplorasi Etnomatematika Pada Permainan Tradisional Indonesia Komunitas TGR (Traditional Games Return). *Jurnal Cendekia : Jurnal Pendidikan Matematika*, 5(2), 1599–1615. <https://doi.org/10.31004/cendekia.v5i2.674>
- Khairunnisa. (2018). Task design for improving students' engagement in mathematics learning. *Journal of Physics: Conference Series*, 948, 012012. <https://doi.org/10.1088/1742-6596/948/1/012012>
- Maslihah, S., Waluya, S. B., Rochmad, & Suyitno, A. (2020). The Role Of Mathematical Literacy To Improve High Order Thinking Skills. *Journal of Physics: Conference Series*, 1539(1), 012085. <https://doi.org/10.1088/1742-6596/1539/1/012085>
- Matang, R. (2002). The Role of Ethnomathematics in Mathematics Education in Papua New Guinea: Implications for mathematics curriculum. In *Directions: Journal of Educational Studies* (Vol. 24, Number 1).
- Maulida, S. H. (2020). Pembelajaran Matematika Berbasis Etnomatematika Melalui Permainan Tradisional Engklek. *LEMMA : Letters of Mathematics Education*, 7(1), 35–44.

- Merliza, P. (2021). Studi Etnomatematika: Eksplorasi Konsep Matematika pada Permainan Tradisional Provinsi Lampung. *Suska Journal of Mathematics Education*, 7(1), 21. <https://doi.org/10.24014/sjme.v7i1.12537>
- Murtiyasa, B., Rejeki, S., & Setyaningsih, R. (2018). PISA-like problems using Indonesian contexts. *Journal of Physics: Conference Series*, 1040, 012032. <https://doi.org/10.1088/1742-6596/1040/1/012032>
- OECD. (2016). *PISA 2015 Assessment and Analytical Framework*. OECD. <https://doi.org/10.1787/9789264255425-en>
- Orey, D., & Rosa, M. (2007). Cultural assertions and challenges towards pedagogical action of an ethnomathematics program. *For the Learning of Mathematics*, 27(1), 10–16.
- Permatasari, P., Nuraeniyah, A. N., Bungsu, D., Selfiantika, L., & Sartika, N. S. (2023). Improving Mathematical Literacy Based on Ethnomathematical Approach in Congklak Game. *Jurnal Analisa*, 9(2), 110–121. <https://doi.org/10.15575/ja.v9i2.29766>
- Pratiwi, J. W., & Pujiastuti, H. (2020). Eksplorasi Etnomatematika pada Permainan Tradisional Kelereng. *Jurnal Pendidikan Matematika Raflesia*, 5(2), 1–12. <https://ejournal.unib.ac.id/index.php/jpmr>
- Presmeg, N. C. (1998). Ethnomathematics in Teacher Education. *Journal of Mathematics Teacher Education*, 1(3), 317–339. <https://doi.org/10.1023/A:1009946219294>
- Priherdityo, E. (2018). Traditional games and the mandate of the Law on the Advancement of Culture. *CNN Indonesia*.
- Ridwan, R., Zulkardi, Z., & Darmawijoyo, D. (2016). Pengembangan perangkat pembelajaran aritmetika sosial berbasis problem based learning di kelas VII SMP. *Jurnal Elemen*, 2(2), 92–115. <https://doi.org/10.29408/jel.v2i2.180>
- Rosa, M., & Orey, D. C. (2013). Ethnomodeling as a Research Theoretical Framework on Ethnomathematics and Mathematical Modeling. In *Journal of Urban Mathematics Education* (Vol. 6, Number 2). <http://education.gsu.edu/JUME>
- Sasmito, L. F. (2023). Peningkatan Kemampuan Literasi Dan Numerasi Peserta Didik Menggunakan Permainan Tradisional. *Jurnal Ilmiah Penjas*, 9(2), 257–272.
- Supriyono, A. (2018). *Serunya Permainan Tradisional Anak Zaman Dulu*. Badan Pengembangan dan Pembinaan Bahasa. .
- Taus, F. M. V., Nahak, S., & Deda, Y. N. (2022). Eksplorasi Etnomatematika pada Permainan Tradisional Congklak di Desa Femnasi. *MES: Journal of Mathematics Education and Science*, 7(2), 1–9. <https://doi.org/10.30743/mes.v7i2.4979>
- Tessmer, M. (1993). *Planning and conducting formative evaluations*. Kogan Page.

- Wahyudi, W., & Putra, A. (2022). Systematics Literature Review: Eksplorasi Etnomatematika pada Aktivitas Masyarakat. *Jurnal Lebesgue: Jurnal Ilmiah Pendidikan Matematika, Matematika Dan Statistika*, 3(1), 173–185. <https://doi.org/10.46306/lb.v3i1.110>
- Wahyuningsih, A., & Astuti, H. P. (2023). Etnomatika: Analisis Konsep Matematika pada Permainan Tradisional Engklek. *JURNAL PEMBELAJARAN DAN MATEMATIKA SIGMA (JPMS)*, 9(1), 239–248. <https://doi.org/10.36987/jpms.v9i1.4181>
- Zulkardi. (2002). *Developing a learning environment on realistic mathematics education for Indonesian student teachers* [Dissertation]. University of Twente.
- Zulkardi, & Putri, R. I. I. (2020). Supporting Mathematics Teachers to Develop Jumping Task Using PISA Framework (JUMPISA). *Mathematics Education Journal*, 14(2), 199–210. <https://jpm.ejournal.unsri.ac.id/index.php/jpm/article/view/141>
- Zulkardi, Z., & Kohar, A. W. (2018). Designing PISA-Like Mathematics Tasks In Indonesia: Experiences and Challenges. *Journal of Physics: Conference Series*, 947, 012015. <https://doi.org/10.1088/1742-6596/947/1/012015>
- Zulkardi, Z., Putri, R. I. I., & Wijaya, A. (2020). Two Decades of Realistic Mathematics Education in Indonesia. In M. van den Heuvel-Panhuizen (Ed.), *International Reflections on the Netherlands Didactics of Mathematics: Visions on and Experiences with Realistic Mathematics Education* (pp. 325–340). Springer International Publishing. https://doi.org/10.1007/978-3-030-20223-1_18