



## Harmonizing Math and Culture: Exploring Ethnomathematics in Malay Culture through Children's Storybooks

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**Abstract:** The application of mathematics has always been related to everyday life. This study aims to describe the relationship between mathematics and Malay culture integrated with the children's storybook "Asyiknya bermain galah panjang; Pembuatan Jalur; Matematika di Rumah Adat Riau Selaso Jatuh Kembar". This research is qualitative descriptive research, with data collection techniques using literature studies from 3 children's story books from the elementary school teacher education study program. The data analysis technique carried out is content analysis. The results show that children's storybooks in this study presented cultural content in several aspects, such as clothing, language, and activities. The mathematical content linked in this children's storybook is between the traditional game of long poles that form a flat square and rectangular wake pattern. The process of creating paths related to standard and non-standard measurement materials. Then, the Selaso Fall Twin House's architecture can be associated with the mathematical material: flat and angular shapes. The interconnectedness between maths and culture in these children's storybooks can provide readers with valuable insights, especially children, into how maths is a relevant part of their daily lives and cultures.

**Keywords:** ethnomathematics, malay culture, children's storybooks

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## INTRODUCTION

Mathematics is an important subject and cannot be separated from every level of education; learning mathematics is often called the mother of science (Darmayanti et al., 2023; Yeh et al., 2019). This education will be the main key to forming knowledge, character, and individual development in society that cannot be separated from human life (Ningsih et al., 2021; Zuhdi et al., 2021). Mathematics lessons are not only limited to the formal sphere within the classroom but also include daily life in various forms, such as cultural values (Anriana et al., 2023; Utami et al., 2020). The loading of cultural values in learning can be called ethnomathematics. As stated by D'Ambrosio, ethnomathematics is a collaboration between mathematics and culture (Ja'faruddin & Naufal, 2023). Ethnomathematics is an object that can be used as a tool in learning (Pardimin et al., 2021). Teaching students cultural values is vital (Darong et al., 2021).

Through ethnomathematics, this can be an effort to help students develop self-concept and will make them learn about cultural values (Setiana, 2020). In this context, ethnomathematics, an interdisciplinary approach that examines the relationship between culture and mathematics, is becoming increasingly important in understanding how mathematical concepts are embedded in various aspects of culture. One culture in Indonesia that can be implemented in mathematics learning is Riau Malay culture (Astuti et al., 2022; Rianti et al., 2020). The Riau Malay community is one of many groups in Indonesia. They come from the Riau region and are spread across various islands, including the Riau Islands Province. Malay settlements can be found in the Riau Islands, Bengkalis, Kuantan Singingi, Siak, Rokan Hilir, Rokan Hulu, Indragiri Hulu, Kampar, and the Pekanbaru region, which were the center of royal power in the past (Putra & Astuti, 2017). Riau Malay is rich in cultural heritage (Astuti et al., 2022). The richness of Riau's Malay cultural heritage can be from the diversity of traditional tools and ceremonies, clothing, forms of home decoration, traditions, and traditional expressions (peesai petiti, thimble, ibarat, pantun, and syair) inherited from generation to generation (Deswita & Muslim, 2021; Mardatillah et al., 2019). The loading of culture in the learning process will be an innovation in learning (Rianti et al., 2020; Tambak et al., 2020). One is loading cultural values in student reading books (Gunawan et al., 2023; Hashemifardnia et al., 2018; Rindengan, 2023; Scherer et al., 2023). Therefore, this study will focus on children's storybooks related to Riau Malay Culture as a tool to approach ethnomathematical concepts. Children's storybooks certainly have great potential in shaping children's early understanding of math and their

culture. We need to know that reading activities can obtain knowledge (Woudenberg, 2021; Wright et al., 2022). Through reading, students can analyze, critique, and interpret texts into information relevant to knowledge (Simbolon et al., 2021).

Then, it is necessary to read books that are to the characteristics of students. Therefore, it is important to analyze the content of the book. This is intended to know the need for novelty in the book and to recognize the advantages and disadvantages of the book (Rambe, 2020). Mathematics reading books equipped with pictures and associated with culture can be an innovation for students' mathematics textbooks. So, through the implementation of culture in mathematics storybooks, they will also learn about their culture in addition to learning mathematical content. Seeing the interconnectedness between ethnomathematics, Riau Malay, and children's storybooks can provide valuable insight into how cultural and mathematical values can be integrated with children's learning. In addition, further understanding of the mathematical concepts that appear in these stories can help develop a more contextual and meaningful approach to education. By looking at the relationship between ethnomathematics and children's education, this study aims to describe the relationship between mathematics and Riau Malay culture, which is integrated into children's storybooks. Through this research, it is hoped that it can become an innovation in children's storybooks to improve mathematics teaching and learning that is more relevant to local culture and context, especially in the Riau region.

## METHODS

The purpose of the study was qualitative descriptive research. Qualitative research is descriptive and tends to use analysis with an inductive approach. This research analyzed and described how mathematics is integrated with Riau Malay culture in children's storybooks. The data source in this study was a picture children's storybook, the work of the Elementary School Teacher Education study program, Universitas Riau. Data collection techniques were carried out using literature studies. The data analysis technique used in this study was a content analysis approach. Content analysis is a research technique that investigates various aspects contained in an information source, namely children's storybooks, in the context of this study. The steps of data analysis carried out were: (1) Collect information on the theoretical basis; (2) Read the data collected carefully; (3) Recognize phrases that reflect cultural and mathematical values in children's storybooks; (4) Record phrases that reflect the implementation of ethnomathematics; (5) Formulate conclusions based on data analysis, so that cultural and mathematical values can be described more clearly. The following are the specifications of picture children's storybooks that will be carried out in content analysis in this study.

**Table 1.** Story Book Specifications

| Title                                                   | Cover                                                                               | Publish Year | Page |
|---------------------------------------------------------|-------------------------------------------------------------------------------------|--------------|------|
| The fun of playing Long Galah                           |  | 2022         | 22   |
| Path Creation                                           |  | 2022         | 41   |
| Mathematics at Riau Traditional House Selaso Falls Twin |  | 2022         | 22   |

The selection of these children's story books to be analyzed was based on the similarity of content that highlights Riau Malay cultural values. This book is a children's storybook with mathematical material loaded with Riau Malay cultural wisdom. This provides a strong foundation for further analysis in describing how the

relationship between Riau's local Malay culture and mathematics can be integrated into children's storybooks in mathematics subjects. To start the analysis, this study used critical discourse analysis (CDA) (Kress & van Leeuwen, 2020; Widodo, 2018) and analyzed through linguistics and visuals, which are selected in the text as discourses that present multiple layer meanings. Critical discourse studies examine how texts and social practices within a community that override or promote certain values influence or reshape these ideological systems (de los Heros, 2009).

By the explanation, this study used CDA to find hidden meanings in the context of ethnomathematics in children's storybooks. The first step in investigating these ethnomathematical values was the introduction of images and texts that depict cultural values and are associated with mathematics. The data for this study were investigated through three steps: (1) identifying and sequencing the texts, which have ethnomathematical significance following the previously mentioned framework; (2) after the items are identified, a critical discourse study is conducted to reveal how ethnomathematical values are described; (3) the last step is to link the research findings between Riau Malay culture in Indonesia with the mathematical content presented in the findings and discussion section. All ethnomathematical values are carefully analyzed to holistically understand the concept of ethnomathematical meaning.

## RESULT AND DISCUSSION

This study's results and discussion will be divided into subchapters, namely analyzing culture, analyzing mathematical content, and then examining the relationship between mathematics and Malay culture in children's storybooks. The first children's storybook was "The Fun of Playing Long Galah". The cultural content raised in this book is contained in the activities carried out. This aspect is the most dominant in the book. In this book, it is told that the characters in the story, namely Alin, Angga, Ara, Aca, Abi, Aji, and Ami, gather in the field to play. Then, they finally decided to play Long Galah. Other names of the game can also be known as Gobak Sodor on the island of Java and Cak Bur in western Sumatra. The story presented in the book begins with an explanation of the long pole game. The text listed in the storybook is as follows.

*"Long Galah' is a traditional game played by the Riau community on an open field. It is divided into two teams: attackers and defenders. It consists of two parts and several boundary lines. It is played by a minimum of 4-10 players."*

In addition, this book also explains how and the rules of playing the Long Galah. This will help the readers get to know and practice this game directly. In addition, through the book "Fun to play Setatak", the depiction of characters is depicted variously, which is viewed from the aspect of illustration, depiction of skin color and the clothes that the characters wear. This storybook describes that despite being different, they maintain good friendships. This is following today's developments; Riau does not only consist of Malay people but is multiethnic. Through the depiction of diversity, this figure will illustrate Malay society's civilised, harmonious nature by prioritizing peace and harmony and coexistence with respect for others.

The second children's storybook is called "Path Creation". This book tells the story of the process of making paths. The track here will later be used for runway competitions, a routine tradition carried out by the Riau Malay community in the Kuantan Singingi area. The cultural content raised in this book has three aspects: language, clothing, and activities carried out on the first aspect related to Language. In the book "Path Creation", several passages are presented using Malay, such as the word "lane" In this context, the path in question is a type of boat. Furthermore, the word "grandfather" in this context can be interpreted as an elder in the area. Then, when the grandfather explains how to make a path, he says, "Dongar elok-elok muah cuang". This, in Indonesian, can be interpreted as "dengar baik-baik ya cu". Furthermore, there is also the word "indak", which in Indonesian can be interpreted as "tidak". Then, in this book, there is also the word "caroa", which can be interpreted as "way" in the Indonesian language. As in the sentence "indak cuang, nyo lah already caroa dek elder", which can be interpreted as "no cu, the procedure has been arranged by the elder" in Indonesian. The word "cuang" for the people of Kuantan singini here refers to the greeting word to grandchildren or the small children of their grandfathers.

Furthermore, the second aspect related to Malay culture is presented in the form of clothes worn. It can be seen in the picture of 3 women wearing brackets and a headscarf covering their heads. This is in accordance with the characteristics of Malay society, which is synonymous with Islam. The Datuk figure also uses a skullcap, identical to the Riau Malay community. Furthermore, the third aspect of cultural content is related to the activities carried out. This book tells about making a track that will later be used for track races. Pacu track itself is a rowing competition originating from the Kuantan Singingi area. This track race has become a folk party that has become a routine tradition carried out by the Kuantan Singingi Malay community every year. The book "Making Paths" explains how the initial process of making paths to painting the finished path.

In the selection of paths, a traditional tradition is carried out, namely by entering the forest to find wood paths led by the shaman and how enter this forest also has a rule that until the journey of 25 steps, residents must not precede the shaman. The text listed in the storybook is as follows.

*"They entered the forest, and the leader was the shaman. According to the rules of entering the forest, for the first 25 steps, no one was allowed to overtake the shaman. Only after these initial 25 steps were the members accompanying them to gather wood in the forest allowed to move ahead of the shaman."*

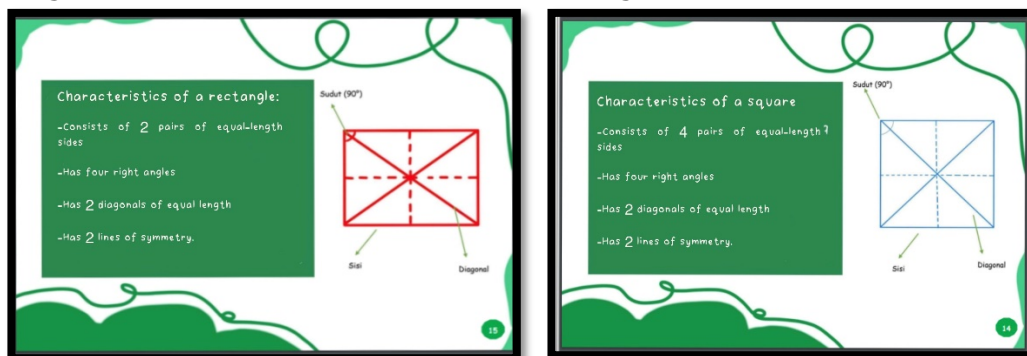
The third children's storybook is entitled "Mathematics in Riau Traditional House Selo Falls Twin". This book tells the story of introducing the traditional houses of the Riau Malay community. The cultural content raised in this book has three aspects: clothing and activities. The first aspect related to Malay culture is the form of clothes worn. Table 1 depicts female characters wearing brackets and headscarves. This is in accordance with the characteristics of Malay society, which is synonymous with Islam. Then, the depiction of the clothes of the boy characters also uses long sleeves, which are synonymous with modesty in Riau Malay. Furthermore, for aspects related to the activities carried out, the book "Mathematics at the Riau Traditional House Selo Falls Kembar" illustrates the story of introducing this traditional house of the Riau Malay community and explains how the traditional house functions. This storybook, with the theme of Riau Malay traditional houses, will provide information and increase readers' knowledge of the region's culture. The text listed in the storybook is as follows.

*"Selo Jatuh Kembar is a traditional house unique to Riau. It is named Selo Jatuh Kembar because it features a lower veranda (Selo) compared to the central room. This traditional house serves as a communal gathering place, a meeting point, and is not intended for private residence"*

The first children's storybook was titled "The Fun of Playing Long Galah." The mathematical content presented in this storybook concerns square and rectangular flat shapes. Before explaining the material, this book begins by submitting questions for readers. This will encourage students to practice thinking before entering the subject matter. The text listed in the storybook is as follows.

*"Do you know that the pattern of the Long Galah game forms flat square and rectangular shapes?"*

Furthermore, the material in the storybook "The Fun of Playing Long Pole" is about the characteristics of square and rectangular flat buildings. The explanation of this material explains mathematical content related to the characteristics of square and rectangular flat shapes briefly and concisely, and it is also equipped with illustrative images. The illustrations in the book also contain bright colors.



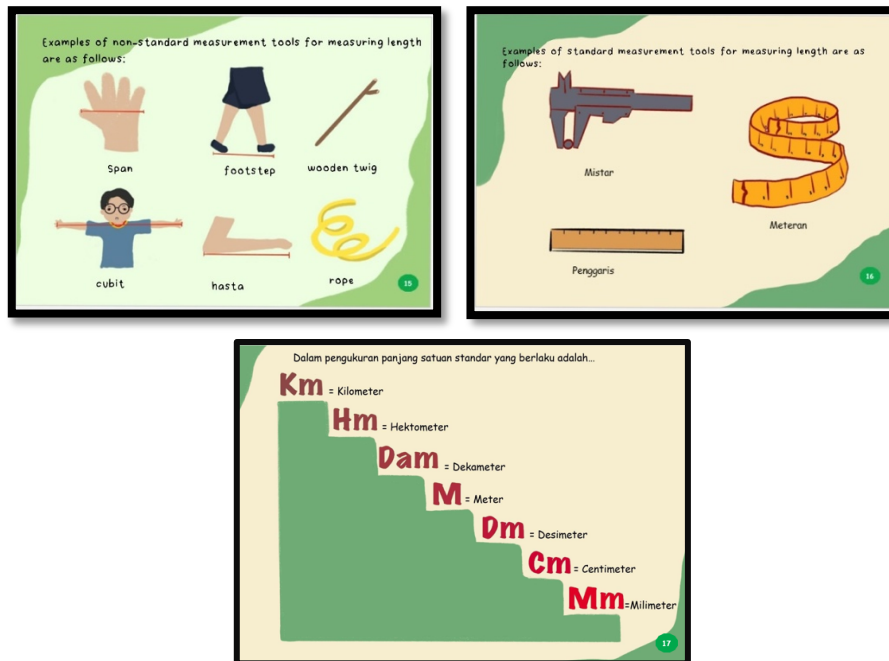
**Figure 1.** Material Content Characteristics of Square and Rectangular Flat Builds

The second children's storybook is titled "Path Creation". The mathematical content presented in this storybook concerns non-standard and non-standard measurements. In the book "Making Paths," the understanding of non-standard and standard measurements is also explained in simple, short, and clear language. This book is also equipped with colorful illustration images to support the explanations.

*"Non-standard measurement is a type in which the results may vary because non-standard or non-uniform measuring tools are used. On the other hand, standard measurement is a type in which the results remain consistent or standardized, with units that have been internationally established."*

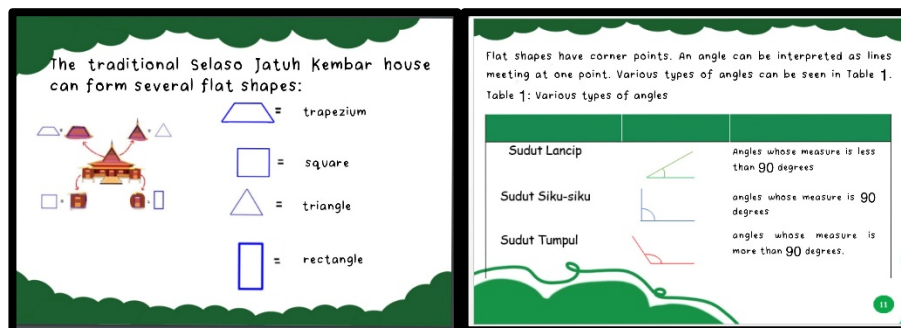
Furthermore, the material presented in the storybook "Path Creation" is about examples of length measurement measuring instruments with non-standard, standard, and standard units of measurement in

standard measurements. In explaining this material, mathematical content is related to non-standard measurements, standards, and standard units of standard measurements. Delivered briefly and concisely, it is also equipped with illustrative images. Then, the illustrations of pictures contained in the book are also bright colors.



**Figure 2.** Examples of Non-standard, Standard, and Standard Measurements of Standard Units of Measurement

The third children's storybook is entitled "Mathematics in Riau Traditional House Selaso Falls Twins". The mathematics content in this storybook concerns various flat and angular buildings. The book explains these buildings in simple, concise, and clear language. It is also equipped with colorful illustration images.



**Figure 3.** Various Materials are Flat and Angular

The three books mentioned connect mathematics with Malay culture. In the first book, "The Fun of Playing Long Galah," the relationship is seen through the activities of the characters who want to play the traditional game of Long Galah. The game is an important part of Riau Malay children's culture, and interestingly, the pattern of the game can be attributed to the square and rectangular flat shapes. In the second book, "Lane Making," mathematics' connection with Riau Malay culture is seen in finding wood for the path. This wood will later be used to manufacture boats used in track races, a cultural heritage still preserved by the Kuantan Singingi Malay community. During this search for wood, strict rules prohibit residents from preceding the shaman by 25 steps, which can be related to the mathematical concept of non-standard measurements using footsteps. In addition, the determination of the size of wood that can be used for making paths also has certain criteria, which, in general, the length of the tree is 33m and the diameter is 1.25m; based on this, the determination of the size density also refers to the mathematical concept of standard measurement. Finally, in the book "Mathematics in Riau Traditional House Selaso Fall Kembar," the relationship between mathematics and culture is reflected in the traditional house. The roof of the Selaso Jatuh Kembar Malay house can form a triangular and trapezoidal flat shape, the walls can form a square flat wake pattern, and the windows can form a rectangular flat wake pattern. This shows how the Galah Panjang game, the making of paths, and the architecture of the

traditional Malay house Selaso Jatuh Kembar are closely related to mathematical concepts.

This research reveals an interesting connection between mathematics and Riau Malay culture in the three children's story books mentioned. The first book, "Asyiknya Play Galah Panjang", brings cultural content involving the game of Galah Panjang, a traditional game of Riau Malay children. In this book, the pattern of the Long Pole game can be related to square and rectangular flat shapes, bringing mathematical elements into this traditional game. The second book, "Lane Making", describes the process of making the track used in track races, a tradition still preserved by the Riau Malay community. The mathematical content presented in this book explains non-standard and standard measurements. The third book, "Mathematics in the Riau Traditional House Selaso Jatuh Kembar", introduces the traditional Malay house Selaso Jatuh Kembar and shows how its parts can form various flat shapes, such as triangles, trapezoids, squares, and rectangles. In this way, the book combines mathematical content with cultural elements in traditional Malay house architecture.

Ethnomathematics is a field of study that studies the relationship between mathematics and culture (Sihombing et al., 2022). Riau Malay ethnomathematics is one of the branches of ethnomathematics that studies mathematics in Riau Malay culture. Through Riau Malay, Ethnomathematics can be a means to teach mathematical concepts and preserve Riau Malay culture. In Riau Malay ethnomathematics, there is a lot of mathematical knowledge contained in Riau Malay culture, such as in building architecture, clothing, traditional games, and traditional food (Febrian et al., 2022; Roza et al., 2020; Suripah & Marsigit, 2021; Syarmadi & Izzati, 2020). Riau Malay ethnomathematics can also improve the quality of mathematics learning to be more meaningful (Az-Zahroh et al., 2019). Ethnomathematics will help students learn mathematics through their culture (Deswita & Muslim, 2021). In ethnomathematics, many mathematical concepts can be applied to mathematics learning, such as geometry concepts or numerical operations (Dominikus et al., 2023; Roza et al., 2020). By studying Riau Malay ethnomathematics, mathematics learning can be more interesting and relevant to everyday life because it provides contextually meaningful teaching (Febrian et al., 2022; Wahyuni et al., 2020). Many efforts can be made to implement Riau Malay culture in mathematics, such as research conducted by Suripah and Marsigit (2021), which explores mathematical concepts in typical foods from the Riau Malay region. Based on this research through traditional Malay food, Riau can be connected with mathematical material to build space. Then, a study by Mustika et al. (2022) explored ethnomathematics in the architecture of the Riau Air Molek traditional hall. Based on this research, it was found that geometric transformation material can be related to the building structure of Balai Adat Air Molek Riau. Furthermore, Roza et al. (2020) conducted research related to learning design in schools using traditional Riau Malay games, showing that many traditional Malay games can be related to mathematical concepts such as ligu, rimau, and guli games. Such games can be associated with numerical operations, measurements, and geometry.

Also included in a learning book, especially a math book. Reading is one of our efforts to acquire knowledge (Lange & Merveldt, 2017; Sartika et al., 2020). Books are an important learning component closely related to reading (Murphy et al., 2022). It should also be noted that students' low interest in reading will also influence their mathematics learning outcomes (Arofah & Ningsi, 2021). Books are an important medium used in schools as teaching materials. Students can obtain knowledge and information from books (Paveši & Cankar, 2022). Therefore, it is necessary to have books in accordance with the characteristics that students like, especially elementary school students (Bayraktar, 2021). Therefore, as educators, knowledge, understanding, and creativity are needed to innovate learning, especially books students use. Innovations that educators can do include providing cultural-based picture books. Integrating culture into learning will make learning more creative and meaningful (Anriana et al., 2023; Fendrik et al., 2020). Picture books will provide students with information about a picture of real context (Strouse et al., 2018). Especially today, it is very necessary to integrate cultural values in learning so that cultural values are not eroded by the times. In mathematics, the integration of culture in mathematics is called ethnomathematics. Loading cultural values in mathematics learning will make learning more meaningful (Az-Zahroh et al., 2019).

The study was conducted to see the relationship between mathematics and Riau Malay culture in the context of children's storybooks. Riau Malay is rich in cultural heritage, so this can be used as a reference to teach mathematics by loading local cultural values (Astuti et al., 2022). Children's storybooks appeal to children and can be used to introduce mathematical concepts in a fun and relevant way (Arneja & Tyagi, 2020) because children's storybooks will be presented with stories that are quite concise, clear, and equipped with colour illustration images. The loading of color images in elementary school-age students' textbooks also follows the characteristics of students of that age (Permana & Utomo, 2021). Connecting mathematical concepts with local culture makes mathematics education more relevant and interesting for students (Acharya et al., 2021; Fendrik et al., 2020; Hidayah et al., 2022). It also helps students understand that mathematics is not only an abstract concept but also has applications in everyday life. Integrating ethnomathematics in mathematics education can attract students' interest so that students enjoy learning mathematics (Hidayah et al., 2022; Kurniawan & Hidayati, 2020). Integrating ethnomathematics in mathematics learning makes education more meaningful and relevant for students, especially in certain cultural contexts such as Malay culture. In this context, picture books

can be used to illustrate the application of mathematics in everyday life in the culture of a particular society. It helps students relate mathematical concepts to real situations and understand their relevance.

## CONCLUSION

The children's story books in this study present cultural content in several aspects, such as clothing, language, and activities. The interconnectedness between maths and culture in these children's storybooks can provide readers with valuable insights, especially children, into how maths is a relevant part of their daily lives and cultures. In addition, the use of Malay language, baju kurung, and Malay community activities presented will help promote and understand the richness of Riau Malay culture, while the mathematical concepts introduced help in more fun and meaningful learning for readers, especially children. Overall, these books provide an interesting way to combine mathematics with culture in the context of children's education, and they can be used as an innovation to create children's storybooks with pictures that relate to the culture in Indonesia. This research study certainly requires a wider exploration of the implementation of ethnomathematics in learning. Presumably, for further research, it is hoped that it can explore the relationship of mathematics in a larger number of books with a larger scope. Further research can be done to expand the use of Malay culture-based children's books on their learning outcomes. This research can also be used as a reference to develop cultural-based children's story books with different material coverage because, in Riau Malay ethnomathematics, there are many mathematical phenomena contained in Riau Malay culture that can be further investigated and implemented in learning.

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