

Traditional House of Lampung Kedatun Keagungan: Ethnomathematics Exploration

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Abstrak

Tujuan penelitian ini adalah untuk mengeksplorasi Etnomatematika konsep Geometri pada arsitektur rumah adat Kedatun Keagungan. Diharapkan siswa akan lebih mudah memahami kemampuan pemahaman terhadap keabstrakan Matematika melalui representasi visual dalam bentuk kebudayaan yang telah dikenal. Pembelajaran matematika dengan mengaitkan budaya sekitar sehingga pembelajaran lebih bermakna bagi siswa. Penelitian ini merupakan penelitian kualitatif dengan pendekatan Etnografi. Teknik Pengumpulan data diawali dengan observasi, menyusun dan validasi instrumen, studi dokumentasi serta FGD. Teknik analisis data menggunakan model *Spradely*. Berdasarkan hasil penelitian ditemukan Etnomatematika pada rumah adat Kedatun Keagungan yang telah menerapkan konsep Matematika baik pada komponen bangunan rumah serta ornamen yang ada di dalamnya yang meliputi: (1) konsep Geometri yang terdiri dari bangun datar, bangun ruang, dan besaran sudut, (2) konsep Transformasi Geometri yang terdiri dari sifat Simetris, sifat Translasi, Refleksi, dan Dilatasi. Hasil penelitian ini dapat digunakan sebagai rujukan dalam mengembangkan bahan ajar pada materi Geometri sehingga pembelajaran menjadi lebih bermakna.

Kata kunci: Etnomatematika, Kedatun Keagungan, Rumah Adat

Abstract

The purpose of this study is to explore Ethnomathematics of Geometry concepts in Kedatun Keagungan traditional house architecture. It is hoped that students will more easily explore understanding of mathematical abstractness through visual representations in familiar cultural forms. Learning mathematics by linking the surrounding culture so that learning is more meaningful for students. This research is a qualitative research with an ethnographic approach. Data collection techniques begin with observation, compiling and validating instruments, documentation studies and FGD. Data analysis technique uses the Spradley model. Based on the research results, it was found that Ethnomathematics in the Kedatun Keagungan traditional house has applied mathematical concepts both to the components of the house building and the ornaments inside which include: (1) the concept of geometry which consists of shapes, shapes and angles, (2) the concept of Geometry Transformations consisting of Symmetrical properties, Translation properties, Reflections, and Dilations. The results of this research can be used as a reference in developing teaching materials on Geometry material so that learning becomes more meaningful.

Keywords: Ethnomathematics, Kedatun Keagungan, Traditional Houses

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INTRODUCTION

Education and culture are interrelated entities. Education is an effort that is used to pass on or preserve the values of a culture from generation to generation (Yuristia, [2018](#)). Mathematics is part of a culture that has integration in all aspects of human life (Faiziyah et al., [2022](#); Tandailing, [2013](#)). Learning mathematics teaches logical, systematic, careful, objective

and open thinking ways of reasoning needed to solve problems in everyday life as well as to face future challenges (Desmayanasari et al., [2018](#); Faiziyah et al., [2021](#); Permata et al., [2022](#)).

However, facts in the field show problems related to students' ability to solve Mathematics problems in the context of everyday life. The results of previous study showed that students' achievement in solving contextual problems only reached 37.04% and 72.12% of students were less able to process the information listed on the questions (Hardianti & Desmayanasari, [2022](#)). This happens because students are accustomed to being given routine problems in which the elements needed to solve mathematical problems are known without doing analysis first. Therefore, other learning alternatives are needed that can make it easier for students to understand Mathematics concepts related to everyday problems.

One of the links between Mathematics and real life is through culture (Astuti et al., [2023](#); Loviana et al., [2020](#)). Such mathematical linkages can provide students with an understanding that mathematics is not just a concept that is difficult to learn, more than that mathematics is used in everyday life. Learning that can link Mathematics with everyday problems can become more meaningful learning (Hardianti & Desmayanasari, [2022](#)). In such a way that with meaningful learning students can relate their own existing knowledge with new knowledge (Dahar, [2011](#); Tandailing, [2013](#)). Thus, students are expected to be able to optimize their abilities.

Culture-based learning, namely Ethnomathematics is a cultural bridge with Mathematics (Faiziyah et al., [2020](#); Putra & Indriani, [2017](#)). Ethnomatematics aims to find out the specific methods used by certain communities in Mathematical (Ambrosio, [1985](#); Rudyanto et al., [2019](#)). The related mathematical activities are grouping, counting, measuring, designing buildings or tools, making patterns, counting, determining locations and (Rubio, [2016](#); Rudyanto et al., [2019](#)). Ethnomathematics is a field of study related to culture-based Mathematical activities (Prahmana & D'Ambrosio, [2020](#); Rosida, [2016](#); Wulantani & Maskar, [2019](#)). Things learned in Ethnomathematics are related to language, symbols, codes, objects, habits, art, or whatever is in culture (Sulistiyani et al., [2019](#); Wulantani & Maskar, [2019](#)). Ethnomathematics also helps students learn more fun related to introductory material through traditional Ingek-Ingek children's games (Rusliah, [2016](#)). Furthermore, Mathematics is applied by the Dayak community on the Indonesia-Malaysia border, Sanggau district, West Kalimantan in terms of carrying out certain traditional ceremonies and rituals and each ceremonial equipment is determined in a certain number (Hartoyo, [2012](#)). Mathematical concepts namely Transformation Geometry and Fractal Geometry are found in the Osing Banyuwangi Traditional House (Hariastuti, [2018](#)). Therefore, it is necessary that the opportunity is given by

educators to students to understand mathematical concepts through ethnomathematics (Dahlan & Permatasari, [2018](#)).

Lampung province is one of the provinces in Indonesia which has cultural diversity which is a characteristic of Lampung (Merliza, [2021](#)). Kedatun Keagungan traditional house is one of them. A traditional house is a building with a structure, method of manufacture, form and function as well as decoration that has its own characteristics which are passed down from generation to generation and can be used to carry out life activities by the surrounding residents (Ardiansyah et al., [2023](#); Said, [2004](#)). The Kedatun Keagungan traditional house is a heritage passed down from generation to generation by the descendants of the Lampung Pepadun tribe. The shape of the roof of this building is in the form of a rectangular pyramid with square walls. The Kedatun Keagungan traditional house has a pyramid-shaped roof with a triangular base. Based on this, it can be seen that the concept of geometry can not only be applied in studying the concept of mathematics itself, more than that, the concept of geometry can also be applied in life (Desmayanasari & Hardianti, [2021](#)).

The Kedatun Keagungan traditional house building consists of two floors which contain many decorative philosophies on the four elements of the house such as ornamentation and traditional spatial layout which have an important meaning in the life of the people of Lampung, as a manifestation of an identity or cultural characteristic of Lampung. The shape of the Kedatun Keagungan traditional house building has physical characteristics, namely a colonnaded stage, certain sides of the building have distinctive ornaments, and in building construction, the concept of Geometry is found which is one of the Mathematical concepts which is unknowingly found in the Kedatun Keagungan traditional house. The Kedatun Keagungan traditional house is a symbol of cultural embodiment in the people of Lampung which has architecture in the procedures, behavior and values of social life that existed long ago before people knew more about Mathematics where the concept of Mathematics itself was contained (Ambrosio, [1985](#); Sulistyani et al., [2019](#)).

Therefore, researchers are interested in exploring ethnomathematics regarding the concept of geometry in the architecture of the Kedatun Keagungan traditional house building because in addition to increasing love for Lampung culture it is also an alternative to students' fascination with mathematics. Furthermore, it is hoped that students will more easily explore understanding of mathematical abstractness through visual representations in familiar cultural forms (Fitriyah et al., [2018](#)). Apart from that, learning Mathematics based on local culture is expected to be able to bridge Mathematics with real life which can make it easier for students to understand basic Mathematical concepts and assist students in constructing mathematical

understanding through visual representations that are truly felt by students through Lampung culture.

METHOD

This research is a qualitative research with an ethnographic approach (Moleong, [2015](#); Sugiyono, [2015a](#)). The ethnographic approach is an empirical and theoretical approach that aims to obtain a description of data about Kedatun Keagungan based on field research in an intensive period of time (Moleong, [2015](#); Sugiyono, [2015b](#)). The research subjects were the traditional leaders of the Kedatun Keagungan who knew and understood the intricacies of the Kedatun Keagungan including architecture and ancestral values. The research instrument consists of main instruments and auxiliary instruments. The main instruments are interview guidelines and observation guidelines. Auxiliary instruments in the form of observation sheets and documentation sheets.

The data collection technique begins with observation in order to find out data about the behavior and symbolic meaning attached to Kedatun Keagungan (Sugiyono, [2015a](#)). Then compile research instruments, perform instrument validation, determine informants (respondents) who have extensive knowledge about Kedatun Keagungan and documentation about the architecture and components of Kedatun Keagungan. Furthermore, a documentation study with attention to the validity of the data developed, namely: a) Triangulation of sources through checking the validity of data from one source with another, b) Triangulation of methods, namely checking the validity of data according to the method repeatedly (Moleong, [2015](#)). The next step, Focus Grup Discussion (FGD) by conducting discussions involving FGD members obtained based on their ability and competence in mastering the focus of the problem, analyzing the results of the FGD with micro analysis to code attitudes and opinions, determine the similarity of attitudes and opinions, carry out classification and categorization, look for relationships between each categorization exists and determines the form of opinion or results to be discussed so that a draft can be prepared for discussion in a larger group in order to obtain wider input. Also doing a macro analysis, namely the researcher not only found the relationship of each category but was also able to describe it to a more substantial level.

The data analysis technique uses the Spradely model, namely 1) domain analysis which consists of: observation using passive partitioning techniques, namely observing and visiting locations, preparing interview guide instruments, validating interview instruments with experts, specifying informants who are directly involved and know directly both about the matter being studied, conducting interviews with informants with the interest of prior information, conveying

research objectives, conducting literature studies (Moleong, [2015](#)). Then, make ethnographic notes including field notes, image recorders, artifacts and other objects that document all the culture related to Kedatun Keagungan. Next, asking descriptive questions, conducting ethnographic interview analysis by underlining all the terms obtained and making structural statements to find out how informants organize knowledge related to Kedatun Keagungan; 2) Taxonomic analysis, namely making categories of existing cultural symbols, documenting buildings, connecting the philosophy of Kedatun Keagungan with Ethnomatematics related to the concept of Geometry; 3) Component analysis, namely analyzing and deepening the data that has been found through submission of related statements; 4) Theme analysis, which is an effort to find common threads that integrate across existing domains.

The stages of the research carried out were: 1) preliminary research, namely literature study, finding problems and general research objectives, then followed by a thorough exploration of the problem in the field; 2) preparation, namely the researcher identifies the problem and information obtained from stage one then narrows down the problem and selects a research problem, determines research objectives, prepares research instruments with literature studies, documentation studies, and discussions with other lecturer colleagues. Then, validate the instrument against experts and evaluate the readiness of researchers to carry out research in the field; 3) implementation, namely researchers conducting research in the field to collect data, selecting research subjects according to the criteria, selecting research locations, and collecting data in the form of field notes, audio recordings, and photos or videos resulting from the observation and interview processes; 4) validation; 5) verification of the naturalness of the data obtained from primary data sources that have been collected directly on research subjects, both verification of observations, interviews, and field notes; 6) data analysis; 7) drawing conclusions.

RESULT AND DISCUSSION

The ethnomatematics exploration in this study was carried out at the Kedatun Keagungan traditional house which is located at Sultan Haji street number 45 Sepang Jaya Kedaton, Bandar Lampung city, Lampung province. This cultural house has a building area of 5000 built starting from the Kedatuan di Puncak which has been passed down from generation to generation. This exploration is focused on the components and ornaments of Kedatun Keagungan.

The Kedatun Keagungan component consists of the Kedatun Keagungan building itself (roof, halls, stairs) and *Lunjuk Balagh*. While the ornaments are the decorations contained in

the Kedatun Keagungan traditional house which are dominated by wood carvings on parts of the building as well as items contained in Kedatun Keagungan. In the Kedatun Keagungan room component there is a meeting room (Pusiban) which is used as a place for deliberations which is located on the first floor. Then, head for the second floor using *IjanTitei* namely stairs made of wood. Stairs, balusters and railings can be seen in the [figure 1](#).



Figure 1. IjanTitei

The number of steps consists of 19 steps, symbolizing the number of hijaiyah letters in the Bismillahirohmanirohim sentence which has the philosophy that each rung of the ladder is a gradual phase of life to become a better human being. When viewed from the mathematical concept of three-dimensional space, each rung of the ladder shows a block shape. Furthermore, when viewed from the mathematical concept of two-dimensional space, each rung of the ladder shows a rectangular shape. The supporting pillars of the building consist of wood material supported by natural stone, an odd number which has a philosophical meaning that everything we do, God sees, becomes a reminder to mankind.

On the second floor there is the Balai Agung room: Kuto Rajo as the throne where the oldest king sits which means Kuto: fence, Rajo: king. Balai Agung is equipped with a hall: Tukue Hall measures 17x12 meters wide with the number 12 meaning whatever is contained in the human soul. Then, the number 17 symbolizes the Independence Day of the Republic of Indonesia, namely on August 17 and the night of Lailatul Qadar on the 17th of Ramadan. Thus, the King is surrounded by the concept of norms and customary law.



Figure 2. Great Hall

In [figure 2](#), it can be seen that at the top there is a filter-shaped tongue ornament which is dominated by the golden color, meaning that the boundaries in norms and customs are the guideline in life. In addition, there is an umbrella, namely the white Agung Umbrella is a sign of honor for the king, which means it symbolizes the position of the traditional head (Punyimbang). The Great Umbrella is used by Punyimbang Agung (Leader of Traditional Ceremonies). Then, the yellow umbrella is used by Punyimbang Tiyuh as a representative if Punyimbang Mega is not present at the Gawi traditional event.

The concept of Mathematics, namely Geometry, can also be seen on the roof or commonly referred to as Pemungungan which is made of wood and covered with tiles and has a ceiling equipped with ornaments Berna Culu Langi. Pemungungan has the philosophy that a traditional head has a great responsibility in advising and fostering his citizens so that unity and integrity without division can be created.



Figure 3. Pemungungan



Figure 4. Berna Culu Langi

The component of Kedatun Keagungan Lunjuk Balagh "Rujungan Sako" is the place for the Lampung traditional wedding process. Lunjuk means a high place, it is hoped that marriage can have a high meaning physically and mentally. The white and yellow colors are a symbol of the unity of the people of Lampung.


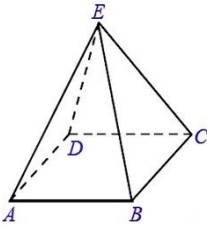

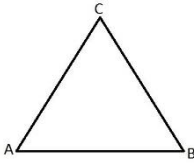

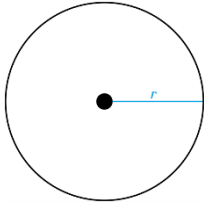
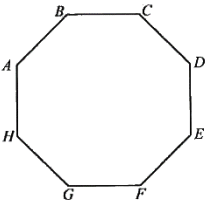
The white umbrella is interpreted as a symbol of leadership, purity and majesty. While the yellow umbrella is interpreted as a symbol of the people of Lampung who have a big heart.



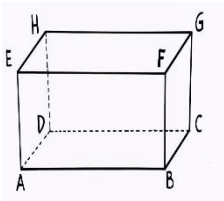

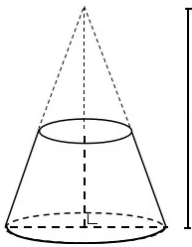



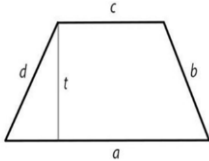
Figure 5. Lunjuk Balagh


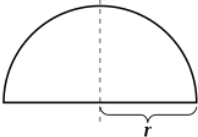
Mathematical concepts are also implemented into building elements and ornaments contained in Kedatun Keagungan. The concept is Geometry, namely flat shape, spatial shape, angle magnitude, symmetrical properties, translation properties, reflection properties, and dilatation properties. This can be seen in the [Table 1](#).

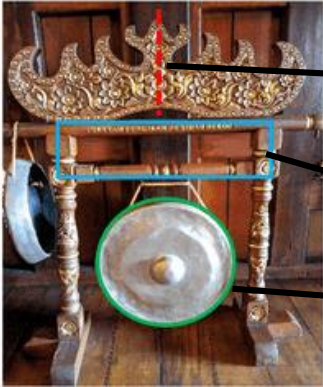
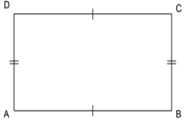
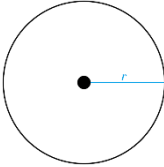

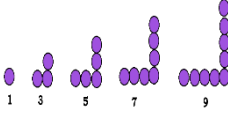
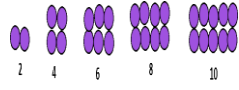
Table 1. Ethnomathematics of Kedatun Keagungan Traditional House




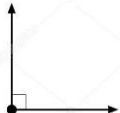

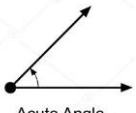

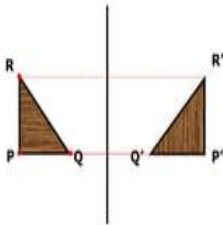
No	Ethnomathematics	Mathematical Concepts	Learning implementation
1	 <p>The roof of this traditional house is commonly called a shelter, has the philosophy of a traditional head to cover, advise and build so as to create a strong and complete unity</p>		Identify rectangular pyramid-shaped space
2			Implementation of the concept of a triangular flat build into congruence and congruence and a symmetric concept in a flat build
3			Implementation of the concept of building a flat circle
4			Implementation of the concept of n-faceted buildings


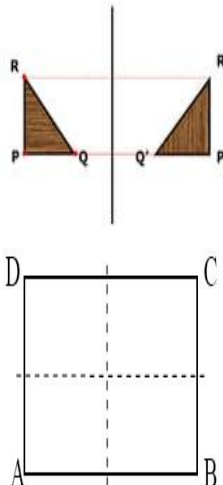

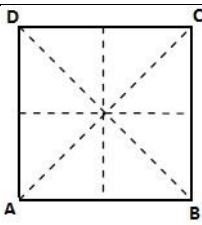
No	Ethnomathematics	Mathematical Concepts	Learning implementation
	 <p>Brass trays or commonly called trays used in the stages of traditional implementation, used as a medium to put traditional delivery trays are a sign of bad luck in bringing something to guests without using a pedestal</p>		
5	 <p>Brass Box Tools used as media in traditional ceremonies</p>		Implementation of the concept of building bar space
6	 <p>Brass cup utensils used as media in traditional ceremonies</p>		Implementation of the concept of building a Paced Cone space


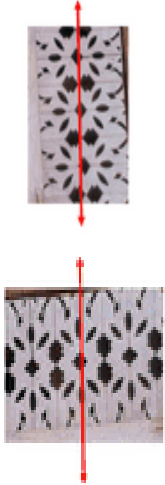

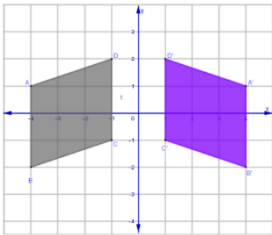

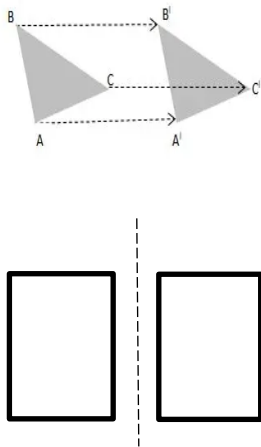
No	Ethnomathematics	Mathematical Concepts	Learning implementation
7	 <p>Ornaments on the roof of the traditional house Kedatun Keagungan</p>		Implementation of the trapezoidal flat build concept


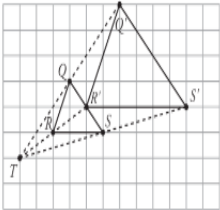

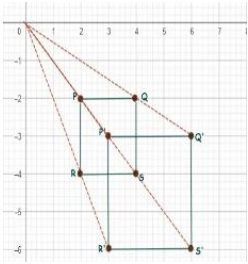
8	 <p>The majesty of Lunjuk Balagh "Rujungan Sako" is a place for the traditional wedding process of Lampung. Lunjuk means a high place, it is hoped that marriage can have a high meaning outwardly and mentally. White and yellow colors are a symbol of the unity of the people of Lampung. The white umbrella is interpreted as a symbol of leadership, purity and majesty. While the yellow umbrella is interpreted as a symbol of the people of Lampung who have a big soul</p>		Implementation of the concept of a semicircular flat build
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No	Ethnomathematics	Mathematical Concepts	Learning implementation
9	 <p>Talo Balak is a musical instrument that is usually used in various traditional ceremonies Begaweu Mepadun Muploadi Bumei for taking the highest title of Sutan Pengiran Pesirah Mergo</p>	<p>1. The concept of folding symmetry is seen in the siger section. Siger Pepadun consists of 9 ornaments if folded with the other end into one part will become $9/2$</p>  <p>2. </p> <p>3.</p>	<p>Implementation of symmetric concept on Siger, rectangular and circular flat build concept</p>
10	 <p>Gung is a traditional musical instrument of the people of Lampung in the form of a circle and golden yellow which means greatness and glory depending on the golden yellow Dicagak Siger rope as a symbol of the crown which means greatness, luxury, cultural majesty in various tribes and religions</p>	<p>The concept of pattern says odd number pattern is: 1, 3, 5, 7, 9, ..., n</p>  <p>The pattern of even numbers is: 2, 4, 6, 8, ..., n</p> 	<p>We can use the implementation into the nth number pattern from the arranged gamelan form</p>

No	Ethnomathematics	Mathematical Concepts	Learning implementation
11	  <p>Oranamen on the inside of the roof of the traditional house Kedatun Keagungan</p>	 <p>Reflex Angle</p>  <p>Right Angle</p>  <p>Obtuse Angle</p>  <p>Acute Angle</p>	Implementation of the concepts of taper angle, right angle, obtuse angle, and reflex angle
12	 <p>The throne of the oldest king seat that has the meaning Kuto: fence, Rajo: king</p>		The concept of symmetry and reflection in buildings

No	Ethnomathematics	Mathematical Concepts	Learning implementation
13	 <p>The door is rectangular which means it is full of openness, namely when there are guests, the house should not be closed at least when there are guests must be opened. The ornament on the door reads Kedatun Keagungan traditional house using Lampung script</p>		<p>The concept of symmetry and reflection in buildings</p>
14	 <p>In the building of the traditional house of Kedatun Keagungan there is Tighai consists of 20 support poles</p>		<p>The concept of symmetry and reflection in buildings</p>

No	Ethnomathematics	Mathematical Concepts	Learning implementation
15	 <p>The virtuous motif in this ornament symbolizes if the community or family has problems solved by deliberation</p>		Implementation of Kedatun Keagungan traditional house building ornaments for the concept of reflection and translation
16	 <p>Ornaments on the inside of the roof of the Kedatun Keagungan traditional house</p>		Implementation of the concept of reflection
17			Implementation of congruent and translational concepts

No	Ethnomathematics	Mathematical Concepts	Learning implementation
18	 <p>Dilatation is found in the Pepadun Subing ornament. Pepadun Kedatuan at the peak of ± 712 M. People who climb Pepadun are called Mupload Bumi. Mupload means ascending the earth which means take care of yourself towards the earth because the earth is your mother because the earth is your mother earth. This ornament consists of Sesako (senderan) and Upik (seat). Every generation goes up Pepadun and makes it. Dilatasi terdapat pada ornamen Pepadun Subing.</p>		Implementation The concept of dilatation
19	 <p>Balo-balo ornamen symbolizes the guardian of Kedatun Keagungan. Balo-balo in the</p>		Implementation The concept of dilatation

No	Ethnomathematics	Mathematical Concepts	Learning implementation
	form of a typical bird symbol of Lampung culture. In charge of guarding the door and has a meaning as a warner, his facial expression reminds people to self-reflect from words and deeds		

The Talo Balak namely a musical instrument that is usually used in various traditional ceremonies of Begawi Mepadun Muntungi Bumei to take the highest title of Suttan Pengiran Pesirah Mergo. Apart from that there is the Gung, a traditional musical instrument of the people of Lampung in the form of a circle and golden yellow in color which means greatness and glory hanging on a golden yellow Dicagak Siger string as a symbol of the crown which means grandeur, luxury, cultured majesty in various ethnicities and religions.

The Gung, the Mathematical concept in the Siger section shows the concept of folding symmetry, namely when it is folded with the other end it will form a flat shape and can be a basic concept in introducing fractional numbers because Siger Pepadun consists of 9 ornaments. If folded with the other end, it becomes one part $\frac{9}{2}$ part. At Kulintang Sembilan it can teach students about the concept of fractions and number patterns. In addition, there is a flat shape concept in Rectangle and Circle found in Talo Balak.

CONCLUSION

Based on the discussion that has been described, it is proven that there is ethnomathematics in the Kedatun Keagungan traditional house. The traditional house of the Lampung community, namely Kedatun Keagungan, has implemented a mathematical concept so that it is proven that there is Ethnomatematics both in the components of the house building and the ornaments inside which include: (1) the concept of geometry which consists of shapes, shapes, and angles, (2) the concept of geometry transformations consisting of symmetrical properties, translation properties, reflections, and dilations. Learning mathematics by linking the surrounding culture so that learning is more meaningful for students (Sulistyawati & Shinta Rahayu, [2022](#)). Ethnomathematics in the Kedatun Keagungan traditional house can be a source of learning mathematics to increase knowledge and love for local culture. The results of this research can

be used as a reference in developing teaching materials on Geometry material so that learning becomes more meaningful. The research team would like to thank the University of Muhammadiyah Lampung and all parties who have supported in completing this research.

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