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Analysis of Riau traditional game-based ethnomathematics in developing mathematical connection skills of elementary school students

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Abstract: This study aims to analyze the ethnomathematics-based Riau traditional game in developing mathematical connection skills of elementary school students through *Pacu Jalur* game. This study used a realist ethnography type of a qualitative research approach to 64 students of the fifth grade elementary school. The data are shown by descriptive narrative with data sources using purposive sampling methods on students who have good, medium, and low abilities, and teachers who teach mathematics. The results showed that *Pacu Jalur* game can be used in mathematics learning by teachers as learning and cultural agents to develop mathematical connection abilities of elementary school students. This is because using ethnomathematics learning becomes more interesting and meaningful for students, especially in geometry concepts of tube.

Keywords: Ethnomathematics, pacu jalur, mathematical connection, elementary school

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INTRODUCTION

Mathematics is one of the subjects in Indonesian elementary school education curriculum. Mathematics is very important to be learned in elementary school because it can equip students' ability to think logically, analytically, systematically, critically and creatively, and their ability to work together in dealing with current and future problems (Sholihah & Mahmudi, 2015; Artikasari & Saefudin, 2017). Furthermore, the importance of studying mathematics at school because mathematics has a nature of connection or is directly related to daily life so that it can help solve problems related to mathematics learning material taught at schools (Heather, Merrie, Charalambos, Jennifer, Geoffrey, Laurie, & Deborah, 2008).

Mathematics learning is the process of providing learning experiences to students with a series of planned activities so that they gain new knowledge about mathematics through various mathematics skills. The National Council of Teacher Mathematic (NCTM), as a standard in the mathematics curriculum, has established five mathematical skills, namely problem-solving, reasoning and proof, connection, communication, and representation. One of the skills that must be mastered by elementary school students through learning mathematics is the skill of mathematical connections. Mathematical connection skills can provide an overview of the connections and have much useful relevance to other fields, both in other subjects and in everyday life (Arthur, Owusu, Addo, & Arhin, 2018; Fendrik, 2019). This is in line with the goal of mathematical connection skills according to NCTM (1989) namely "... to help students broaden their perspective, to view mathematics as an integrated whole rather than as an isolated set of topics, and to knowledge its relevance and usefulness both in and out of school". Therefore, students must be able to understand the relationship between mathematics and other fields of learning so that mathematics learning has relevance and is useful for itself.

At this time, mathematics learning has not shown satisfactory results. This can be seen from the results of the 2018 National Standard School Examination (USBN) for elementary school level which shows that mathematics is still low when it is compared to the two other subjects tested (Natural Sciences and Indonesian) (Susandi, 2018). Overall, the scores of USBN in Riau Province can be informed as follows.

Table 1. *USBN scores of elementary school in Riau province*

No	Regency/ City	Indonesian	Mathematics	Natural Science	Number of Participants
1	Pekanbaru	7.64	7.28	7.53	16.391
2	Pelalawan	7.35	7.05	7.51	5.969
3	Rokan Hulu	7.35	7.14	7.5	9.807
4	Kuantan Singingi	7.47	6.96	7.38	5.887
5	Kampar	7.39	7.02	7.38	14.373
6	Siak	7.28	7.07	7.38	8.685
7	Bengkalis	7.31	6.91	7.18	11.259
8	Dumai	7.28	6.78	7.3	5.085
9	Indragiri Hilir	7.28	6.87	7.14	13.419
10	Indragiri Hulu	7.21	6.72	7.2	7.415
11	Kep. Meranti	7.01	6.74	6.94	3.794
12	Rokan Hilir	7.05	6.58	6.97	13.105

Source: Riau Province Education Agency

In Table 1, it describes that mathematics subjects in 12 regencies/cities in Riau province are at the very low score, not least in Kuantan Singingi (Kuansing) regency which is the research site. USBN score in mathematics is 6.96, and it is different from Indonesian and Natural Sciences which are at 7.47 and 7.38. This shows that the results of USBN mathematics learning of elementary school students in Kuansing regency are still relatively low compared to the two other subjects which have an average score of more than 7.00.

This phenomenon shows the relatively low mathematics achievement in elementary school compared to other subjects, Indonesian and Natural Sciences, which serve as a standard for the quality of mathematics learning at the elementary school in the national level. The factors of the incomplete results of student mathematics learning scores come from the lack of students in understanding mathematical concepts and also teachers who are still having difficulty in teaching abstract things to elementary school students who are still in the concrete operational phase. The cognitive development age of elementary school students is still bound by concrete objects that can be captured by the senses (Heruman, 2007; Ain, 2017; Newton & Harrison, 2005). So in practice, learning mathematics requires learning resources that can help elementary school students in developing their mathematical connection skills.

In elementary schools, mathematics learning is not only taught in formal learning, but also connected to the local culture that is around the students. Mathematics learning will be more interesting and meaningful for students when the process of learning itself can be linked to the culture that is around students because they can directly learn with the local culture in their place. The use of culture on learning, i.e. the count of matchmaking (Utami, Sayuti, & Jailani, 2019), indigenous games (Mosimege & Ismael, 2019; Knijnic, 2012), calendar (Syahrin, Turmudi, & Puspita, 2016), improve learning more meaningful. This is in line with the opinion of (Madusise & Mwakapenda, 2014) that mathematics learning connecting itself to the culture will be able to empower students and teachers socially to contribute in real life.

Today, many students do not know and appreciate the culture in their area. In fact, cultural awareness is one of the important skills in the 21st century. The results of the study indicate that cultural awareness skill is at the lowest order among the 14 other skills (collaboration, initiative, work skills, learning skills, creativity, problem solving, communication and others) "Overall, the lowest ranking was given to cultural awareness, at 75%, equivalent to an average score of 6.5"

(Kalevi & Kinnunen, 2015). Real objects such as cultural artifacts in the community can make students interested and understand real world problems that can be solved by mathematics (Arisetyawan, Suryadi, Herman, & Rahmat, 2014; Pradhan, 2018). Mathematics learning that uses local culture will have an impact on students. They will assume that mathematics is the knowledge and skills needed in their daily life as well as an appreciation for their own culture (Adam, 2004; D 'Entremont, 2015).

The process of linking informal mathematical knowledge to formal mathematical knowledge takes place in teaching and learning activities at schools (Purpura, Baroody, & Lonigan, 2013; Aubrey, 1993; Heather, Merrie, Charalambos, Jennifer, Geoffrey, Laurie, & Deborah, 2008). In this process, the teacher plays a role in building formal knowledge based on informal knowledge that students already have by using the conceptual framework of culture-based elementary school mathematics learning to be taught in the classroom. Therefore, teachers need to recognize and understand the potential socio-cultural experiences of their students so that they can be developed as a starting point for learning mathematics. This understanding will assist the teacher in determining the appropriate pedagogical and didactic steps to guide students towards learning mathematics. Madusise & Mwakapenda (2014) argue that the main objectives of developing teacher professionalism are to lay the basis of teaching mathematics in students' cultural backgrounds, and to use mathematics in their daily lives and cultural activities. This can be done by the teachers who know and understand students' cultural backgrounds and cultural potential in the community that can be utilized for learning and teaching mathematics.

In reality, it shows that mathematics learning activities carried out by elementary school students do not always go well, given abstract mathematical objects, the learning starts from concrete objects so that mathematical concepts can be understood correctly by students, especially if it is associated with students' ability to use reasoning skill in solving existing problems. However, the reality is that most students have not been able to relate the material learned to the knowledge used. This is because learning not only produces people who simply know or understand something, but is also expected to be able to solve problems that arise in everyday life by creating an environmental system allowing students to learn effectively and efficiently.

Ethnomatemics, according to D'Ambrosio (1985), is "The mathematics which is practiced among identifiable cultural groups such as national culture societies, labor groups, children of certain age brackets and professional classes". Then, D'Ambrosio (1999) perfected the term: "I have been using the word ethnomathematics as modes, styles, and techniques (tics) of explanation, of understanding, and of coping with the natural and cultural environment (mathema) in distinct cultural systems (ethnos). Ethnomathematics can connect between culture and mathematics, as revealed by Wahyuni et.al (2013), one that can bridge between culture and mathematics is ethnomathematics. In addition, mathematics and culture are also two things that are closely related and can explain each other and are an integral part of humanity's cultural heritage (Barta & Shockey, 2006; Rosa & Orey, 2010). The relationship can be in the form of an effort to express mathematical ideas from the culture of society and the application of mathematics in solving problems in everyday life. The ethnomathematics concept proposed by D'Ambrosio views culture and mathematics as two interrelated things that can be explained to each other through the daily activities of a mathematical society (Shirley & Palhares, 2013; Brandt, & Chernoff, 2017; Muzdalipah & Yulianto, 2018).

The involvement of mathematics with culture must be explored based on local wisdom possessed by a particular region (Ufie, 2013; Darmadi, 2018; Parwati, Sudiarta, Mariawan, & Widiana, 2018). One of the local cultures in the form of a traditional game that is set as a national cultural heritage by the Ministry of Education and Culture (Kemendikbud) of the Republic of Indonesia is Pacu Jalur. *Pacu* according to the local community means a race, while *Jalur* (boat / canoe) is actually one of the water transportations in Kuntan Singingi Regency, Riau Province. This boat made of logs can reach 25 to 30 meters in length with a width of about 1.5 meters in the

middle with a capacity of between 40-50 paddlers (runners) who will enter the race (Gazali, Cendra, & Putra, 2018). *Pacu Jalur* is held every year on the celebration of the Republic of Indonesia's Independence Day (August 17) on the Kuantan River. Whereas for the sake of this research, the researcher wants to analyze ethnomathematics-based Riau traditional game in developing mathematical connection skills of elementary school students through *Pacu Jalur* game in Kuantan Singingi, Riau.

Cultural diversity in Indonesia should incorporate local cultural values into mathematics learning, so that mathematics is not considered a science that is far from the reality of life. This is because in cultural activities there are mathematical ideas that are considered as important in learning mathematics (Prabawati, 2016). With ethnomathematics learning, it is hoped that mathematics learning will be more meaningful, cultured and increase love for the motherland. If seen the success of the Japanese and Chinese countries in learning mathematics is because these countries use ethnomathematics in learning mathematics at schools (Achor, Imoko, & Uloko, 2009). This proves that ethnomathemics-based mathematics learning can be more meaningful and interesting to learn at school in order to understand in depth the mathematical concepts that exist in culture, so as to develop students' mathematical skills in elementary school.

The purpose of this study is to analyze the ethnomathematics-based Riau traditional game in developing mathematical connection skills of elementary school students through *Pacu Jalur* game in the Kuantan Singingi Regency of Riau. This research deals with the causes of students' difficulties in developing mathematical connection skills, the difficulties faced by teachers in developing mathematical connection skills, and the efforts made by teachers in developing mathematical connection skills. As a result, it is expected to be able to achieve satisfactory results in mathematics through an understanding of the mathematical concepts that exist in *Pacu Jalur* game in Kuantan Singingi Regency, Riau Province, Indonesia.

METHOD

Type of the Research

This study used a realist ethnography type of a qualitative research approach that is useful for analyzing ethnomathematics-based Riau traditional game in developing mathematical connection skills of elementary school students. This research prioritizes the existence of researcher' sense of realities, the process of deep thinking and interpretation of facts based on the concepts used and develops them with a deep understanding and prioritizes the values studied. This ethnography method allows researcher to interpret any information or data obtained so that it can be better understood. It is supported by Spradley (2011) who says that the essential core of ethnography is the concern with the meaning of actions and events to people we seek to understand.

Data and Data Sources

This research was conducted on 64 students of the fifth grade elementary school who were studying geometry material in the academic year of 2018/2019 in Sentajo sub-district, Kuantan Singingi Regency, Riau. Data obtained from this research are description and information from data sources. The selection of data sources in this study is based on observation, interview, and documentation. The type of data revealed in this study is descriptive narrative. Sampling used in this study was a purposive sampling method that is data sampling with certain considerations. The reason for choosing this sample, because the sample is representative or considered to be able to communicate well so that it can facilitate researcher to explore and understand the object of research. The data sources taken for this study consisted of nine students who had good, medium, and low abilities based on students' academic reports from teacher's assessment records, as well as from the fifth grade teacher who taught mathematics.

Data Collection Techniques

Data collection techniques used in this study came from observation note, interview transcripts, and documentation studies collected through participatory observation techniques, in-depth interviews and documentation studies. This is in line with Moleong (2010) who suggests that data collection techniques used in qualitative research is observation, interviews, field notes, and documents. Based on that opinion, data collection techniques used in this study are observations, interviews, and documents in the field.

Data Analysis

Qualitative research using ethnographic methods is carried out in natural conditions and is discovery. In qualitative research, researcher is a main instrument from the data in the field. Therefore, researcher must have sufficient theory and broad insight both in the form of questions, analysis, and constructing the object under study in order to become more clear and meaningful. Data analysis in this study was done every time data collection carried out. This is in accordance with the opinion of Creswell (2010) who states that data analysis is an ongoing process that requires continuous reflection of data, asking analytical questions, and writing short notes throughout the study. The main purpose of data analysis is to make factually and realistically understandable data. While the data analysis is carried out systematically, the researcher conducts an analysis through reading, observing, understanding and studying all data that have been collected based on the results of observations, interviews, and documentation studies arranged systematically through important and decisive stages, namely the stages of validity and reliability. Validity and reliability divided into some stages, namely data reduction, data presentation, and drawing conclusions or verification.

RESULTS

Factors causing students difficulties in developing mathematical connection skills

Pacu Jalur is a traditional game from the Kuantan Singingi regency of Riau Province, which competes the fastest boat from the start line to arrive at the finish line with 40-50 numbers of paddlers with a length of each path between 25-30 meters. *Jalur* is a type of boat or canoe made from a piece of solid wood (log), without being split, cut or connected with a very long manufacturing process, ranging from selecting wood until the decline of boat to the river. In mathematics learning, a tubular piece of solid wood that exists in the concept of geometry, of course, must be taken into account, including the size so that later the boat can win the race and not easily sink into the river. Therefore, ethnomathematics as a learning innovation that uses culture in learning mathematics has an important role as a source of learning in the classroom. Teachers as learning and cultural agents need to package mathematics learning so that it is more interesting and meaningful for elementary school students, such as the concept of tube geometry that can be taught at school. The following is the figure of *Jalur* or boat that can be used as a source of learning mathematics in elementary schools.

FIGURE 1. *An example of boat for Pacu Jalur traditional game*

Based on the results of observations, there are several factors that cause students' difficulties in developing mathematical connection skills that are influenced by several factors, including the basic competence and student characteristics due to lack of confidence in participating in learning mathematics. In addition, the teacher's ability to package learning also influences the ability to develop the mathematical connection skills. To support this data, the researcher tried to conduct an interview with a student who was classified as not very active in conveying his ideas. The following are excerpts of interviews conducted after learning activities take place with students who are not too active (their activities are considered to be lacking) in participating the learning:

Researcher : Do you enjoy learning by using ethnomathemics in *Pacu Jalur* game?

Student : Yes happy.

Researcher : What are the benefits you get from ethnomathematics in the form of *Pacu Jalur* game?

Student : I can know the concept of geometry that exists in *Pacu Jalur* of mathematics.

Researcher : Are there any difficulties that you find during mathematics learning?

Student : Yes, I have a hard time in calculating.

Brief interview above illustrates that the difficulty factor of students in developing mathematical connection skills, including students' low motivation to participate in learning so that their self-confidence is reduced. Furthermore, the results of the documentation study seen from the existing value data on mathematics teachers prove that students with high and medium average have good mathematical skills. But there are among students who have ordinary skills, because they are stimulated by teacher's habit to come up with ideas, both through question and answer activities and discussions, eventually they become accustomed to conveying their ideas. This explanation is also supported by the data contained in the field notes that eight students who are classified as high, actively convey their ideas and responses so that they receive an award from the teacher in the form of an active star. It was also revealed from the field notes that students who conveyed ideas either through expressions of questions or answers to questions given seemed happy to get an active star award from the teacher.

Difficulties faced by teachers in developing mathematical connection skills

Elementary school teachers are required to be able to master and understand all subjects, including mathematics learning. Teachers have difficulties in teaching mathematics concepts to their students

so that it has an impact on the low mathematics scores of students. The cause of the incomplete value of students' mathematics learning outcomes comes from their lack of understanding of mathematical concepts, and also teachers still have difficulties in teaching abstract things to elementary school students who are still in the concrete operational phase.

To find out the difficulties faced by the teacher, the researcher conducted a direct interview with the fifth grade mathematics teacher. Following is an interview excerpt between the researcher and the teacher about the students' difficulties in developing mathematical connection skills during the learning process:

Researcher : In your opinion, what factors are obstacles in developing students' mathematical connection skills?

Teacher : In my opinion, the inhibiting factors are students' experience in their daily life or environment, and their lack of confidence in expressing ideas and opinions.

Researcher : May you give an example?

Teacher : For example, students do not understand the size of the money in buying and selling because there are no snacks for them in this school. So, they do not or rarely find buying and selling in their daily life.

From the interview excerpt, it was found that there were some difficulties faced by teachers in teaching mathematics related to students' mathematical skills, including: students' experiences in daily life and lack of student confidence in expressing their ideas and opinions. This is surely a problem that must be resolved immediately. This statement is supported by the results of researchers' interviews with a student who stated about the difficulty in proposing ideas/ opinions due to lack of confidence in conveying his ideas. The following are excerpts of the interview with the student:

Researcher : Did you feel happy with the mathematics lesson?

Student : Happy but I'm still confused.

Researcher : Why?

Student : Confused in understanding it.

Researcher : Are there any difficulties you felt during the study? What?

Student : Yes. In calculating because I'm afraid if the answer is wrong.

That brief interview gives an illustration that the student has difficulty in calculating because of fear of being wrong, meaning that the student is not confident to take part in learning because he is ashamed of his peers. The data is also supported by field notes and observations which illustrate that there are two students who are less concentrated in participating group activities because they are busy chatting with their friends.

The efforts made by the teacher in developing mathematical connection skills

Teachers as learning and cultural agents play a role in building formal knowledge based on informal knowledge that students have by using the conceptual framework of culture-based elementary school mathematics learning to be taught in the classroom. Therefore, teachers need to recognize and understand the potential socio-cultural experiences of their students so that they can be developed as a starting point for learning mathematics. This understanding will assist the teacher in determining the appropriate pedagogical and didactic steps to guide students towards learning mathematics.

Based on observations, field notes, and interviews with mathematics teachers during learning activities, there are a number of attempts made by teacher in developing mathematical connection skills, including observational data that illustrates learning activities take place using ethnomathematics in the learning process. This learning model requires active student involvement so that their mathematical connection skills can develop properly. In addition, the strategies used by teacher by the use of discussion and question and answer methods emphasize more on the active involvement of students in learning activities. Teacher provides many opportunities and flexibility to students to convey their ideas on problems that arise. This is done by the teacher as an effort to develop students' mathematical connection skills both spoken and written.

At the beginning of the meeting the teacher always conveys the learning goals and motivates students to be able to concentrate and be inspired in developing their ideas, so that learning can truly be meaningful and support the development of achieving students' mathematical connection skills. When learning activities take place, the teacher acts more as a facilitator and mediator for students so that learning is prioritized on student activities as subjects in learning. As an effort to develop mathematical connection skills, the teacher facilitates students with questions and answers, discussions and group presentations. Through this learning, the teacher tries to provoke students' ideas expressed both spoken and written.

In addition, the teacher also gives exercises that are done in groups or individually through student worksheets accompanied by giving active stars to groups or students who are active in answering questions given as an effort to develop students' mathematical connection skills. To provide more explanations of the efforts made by teacher in developing students' mathematical connection skills, the researcher conducted interviews directly with the teacher concerned. The following is written excerpts from researcher' interviews with mathematics teachers of the fifth grade are as follows:

Researcher : What is your effort to build students' interest in developing their mathematical connection skills?

Teacher : I always attract their interests and convey the purpose of learning mathematics so that students are interested and motivated to participate in learning.

Researcher : What is your effort to develop students' mathematical connection skills?

Teacher : I always try to provide innovation in learning, especially by giving examples that are easy to understand by the students.

Researcher : Would you give me an example?

Teacher : I use culture in learning mathematics in the form of *Pacu Jalur* game in explaining the concept of tubes.

From the interview excerpt above, it is clear that the teacher uses ethnomathematics in developing students' mathematical connection skills, where ethnomathematics is one of the innovations in learning mathematics by using the culture that is around students. In other words, the tube concept on geometry material in mathematics learning can use culture in the form of a traditional game, namely *Pacu Jalur*, to bridge between mathematics at the school and the culture in the students' environment.

DISCUSSION

Based on the results of research that has been done, the discussion about ethnomathematics-based Riau traditional game in developing mathematical connection skills of elementary school students through *Pacu Jalur* game has grown and developed in the community. As a result, learning mathematics that is abstract can be more interesting and meaningful for

students by using the culture around them, which is *Pacu Jalur*, an ethnomathematics-based Riau traditional game.

The topic of mathematics material on *Pacu Jalur* is about tube geometry concept in the form of logs without connection that can be learned by students at school. This is in line with Sirate's (2012) opinion that mathematical skills learned by students at school are not logically constructed and based on abstract cognitive structures, but rather as a combination of previously acquired knowledge and abilities and as new (cultural) input where activities involving numbers, geometry patterns, counts and so on are considered as applications of mathematical knowledge. So constructivist learning is needed in transferring skills (Saputro, Irwanto, Atun, & Wilujeng, 2019; Aksal, Gazi, & Isman, 2008; Justice, Rice, & Warry, 2009).

Factors causing students' difficulties in developing mathematical connection skills

Mathematical connections skills as part of the standard mathematics curriculum is one of the fields of science that supports the development of science and technology, and plays a role in supporting social and cultural sciences in the community (Park, 2006; Milaturrahmah, Mardiyana, & Pramudya, 2017; D 'Entremont, 2015; Mata, Monteiro, & Peixoto, 2012). These fields are certainly very influential on the learning process as part of the education component. As revealed by Ilgün & Demirtaşli (2017) that several of these factors are related to the teaching and learning process, which is the central point of education. Therefore, learning mathematics must be seen broadly not only related to the class but also related to other fields of science.

Based on the results of the study, there are several factors that cause students difficulty in developing mathematical connection skills including the basic ability factor of students in learning and understanding geometry concepts through ethnomathematics-based Riau traditional game and the innate factors of students. While another contributing factor is the teacher's ability to package learning in the classroom. During learning activities, the teacher always tries to associate mathematics learning with students' knowledge so that learning becomes more meaningful. Learning will be more meaningful if students try to connect new phenomena into their knowledge structures in each problem solving so that they can better understand what they have obtained and are associated with other conditions so that what they learn will be better understood (Hmelo-Silver, 2004; Heruman, 2007).

Difficulties faced by teachers in developing mathematical connection skills

Mathematical connection skills for elementary school students must be a daily activity obtained through the surrounded culture. This is in accordance with the opinion of Sirate (2012) that mathematics skills learned by students at school are not logically constructed and based on abstract cognitive structures, but rather as a combination of knowledge and skills that have been obtained previously and as new (cultural) input where activities involving numbers, geometric patterns, counts and so on are considered as applications of mathematics knowledge.

In terms of learning, in general students can learn culture through the subjects of Social Sciences and Cultural Arts at school. In fact, students can also learn various kinds of culture in Indonesia with mathematics. Shirley (Marsigit, 2016) argues that ethnomathematics at this time, which is mathematics that grows and develops in society and in accordance with the local culture can be used as a center of learning processes and teaching methods, although it is still relatively new in education.

Based on the results of direct interviews between researcher and mathematics teacher in the fifth grade, there are some difficulties faced by teacher in developing students' mathematical skills, including students who are less concentrated in participating the learning, less able to cooperate with their friends and sometimes they lack confidence in express their opinions. Those are of course problems that must be immediately resolved, especially for the teacher concerned so that students' mathematical skills can really emerge.

The statement was supported by the results of the interview with a student who stated the difficulty in proposing ideas/opinions caused by fear of being wrong and ashamed of his peers. Thus, it can be concluded that the difficulties that arise for teachers in developing students' mathematical connection skills are more focused on factors from within the students themselves, namely the lack of students' experience in daily life or environment and the lack of self-confidence of students while participating in learning activities.

The teacher as a learning and cultural agent plays a central role in linking mathematics learning in the classroom with real life, because if students can connect mathematical ideas, their understanding will be deeper and more lasting in their memories (Wahyudin, 2008; Fendrik, 2015; Boaler, Chen, Williams, & Cordero, 2016). Through mathematical connections skills strived in the classroom, it can be linked to other learning so that students do not have a narrow view of mathematics learning.

The mathematical concepts that exist in the ethnomathematics-based Riau traditional game can be learned for elementary school students who live in Kuantan Singingi because local cultural traditions *Pacu Jalur* only exists in that area. Therefore, ethnomathematics needs to be taught by teacher to students so that students can understand mathematical concepts that exist around them, because ethnomathematics includes mathematical ideas, thoughts and practices developed by all cultures (Barton, 1996; Rosa & Orey, 2011). Ethnomathematics can also be considered as a program that aims to learn how students to understand, articulate, process, and finally use mathematical ideas, concepts, and practices that can solve problems related to their daily activities (D'Ambrosio, 1985).

In addition, mathematics curriculum currently used is too euro-centric which causes existing mathematical concepts to be too oriented to Europe so that the impact of local culture related to mathematics is increasingly marginalized, even though each local culture has a number of wisdoms related to mathematics (Hasanuddin, 2017; Fasheh, 1982). Therefore, the teacher must be able to identify the factors causing the emergence of the problem so that the teacher can find a strategy and be able to erase all of these obstacles, especially in connecting mathematics learning with the culture around them, as a result, students' mathematical connection skills can truly appear optimally.

The efforts made by the teacher in developing mathematical connection skills

Mathematics learning using ethnomathematics is an innovative learning that can facilitate students to be able to develop thinking skills in understanding and solving problems around them because ethnomathematics is a field that studies people's way from different cultures understand, pronounce and use concepts of culture related to mathematics (Rosa & Orey, 2011; Hariastuti, 2017; Suryawan & Sariyasa, 2018).

Marsigit (2016) states that ethnomathematics is an educational development approach that is used to construct how mathematics is adapted from a culture and subsequently used in mathematics learning activities. Today, learning mathematics requires understanding concepts that can be supported by local culture in the community. This is in accordance with the statement of Sumliyah (2018) that learning mathematics really needs to provide content that can bridge the gap between mathematics in daily life based on local culture and school mathematics. In addition, ethnomathematics can also build value on students' experience and knowledge with the culture in their area to be studied at schools. This is in line with Rosa & Orey (2011) statement that "ethnomathematics also builds on and values the cultural experiences and knowledge of students regardless of whether they are represented by dominant or non-dominant cultural systems and empowers them intellectually, socially, emotionally, and politically by using cultural referents to impart their knowledge, skills, and attitudes in the pedagogical work in schools".

Based on the results of observations, and interviews with the teacher conducted by the researcher, there are several attempts by teacher to develop students' mathematical skills. During

the observation, it was seen that during the learning activities the teacher used ethnomathematics-based Riau traditional game in the form of *Pacu Jalur* as one of learning innovations that was supported by the use of discussion methods, questions and answers, and presentations that demand students' active participation so that their mathematical connection skills can develop properly.

Teacher activities during learning activities play a role as facilitators and mediators for students, so learning is prioritized on student activities as subjects in learning is an effort made by teachers in developing mathematical connection abilities. In this case, the teacher facilitates students with questions and answers, discussions, and presentations both group discussions and class discussions as an effort to provoke the students to express their ideas both spoken and written, and to enhance students' understanding of the content of mathematics. This is in line with the opinion expressed by Tjokrodihardjo (Trianto, 2010) that there are several advantages of class discussion, it can improve students' way of thinking by helping students arouse understanding of the lesson, fostering students involvement and participation, and helping students learn communication skills and thought activities. This opinion is supported by Desmita (2011) who said that elementary school students indeed need to learn how to cooperate with one another in groups because children between 7 and 11 years spend more time reaching up to 40% to interact with their peers.

Thus, it can be concluded that the main efforts made by the teacher in developing students' mathematical connection skills are more focused on activities to package learning into something interesting and meaningful for students so that they are motivated and inspired in developing their ideas. Moreover, the activities of conditioning students as subjects in learning so that students have discretion in developing their activities during mathematics learning activities. This behavior is expected to erode the old paradigm addressing students as objects in learning so that they become shackled and cannot develop their full potential in developing mathematical connection skills.

CONCLUSION

Based on the results of research and discussion, it can be concluded that ethnomathematics-based Riau traditional game, *Pacu Jalur*, can be used in mathematics learning by teachers as learning and cultural agents to develop mathematical connection skills of elementary school students, especially in the tube geometry concept. Where in making a boat requires a piece of solid wood in the form of a tube with a size of 25-30 meters, requires a good geometry concept so that a boat can win the race and not easily sink into the river. In addition, based on the results of mathematics learning analysis, it was found that several causes of students difficulty in developing mathematical connection skills are internal factors, namely the basic competence and students' characteristics in understanding mathematics learning and the teacher's ability to package learning in the classroom. Furthermore, the difficulties faced by the teacher in learning mathematics, especially in developing students' mathematical connection skills include the students' experience in the surrounding environment, students' lack of concentration in learning and students less motivation to connect learning in their environment with the learning process. Therefore, teacher needs the effort to package learning in order to arouse students' interest and motivation to lead the achievement of the emergence of students' mathematical connection skills. While the efforts made by teachers in developing students' mathematical connection skills are to use ethnomathematics-based Riau traditional game, namely *Pacu Jalur* which is one of Riau's cultures supported by the use of discussion and question and answer methods in providing opportunities and freedom for students to express their ideas and responses to learning mathematics especially on geometry material.

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