International Conference on Mathematics and Science Education
of Universitas Pendidikan Indonesia
Volume 3, 2018 | P-ISSN 2655-2361, E-ISSN 2655-3252

Ethnomathematics study: revealing mathematical aspects in determination of a good daily activities in indigenous societies of paseban and cikondang west java

I Muhafidin[1*], E Nurlaelah[1], E Sudihartinih[1]

[1]Departemen Pendidikan Matematika, Universitas Pendidikan Indonesia, Jl. Dr. Setiabudi No. 229, Bandung 40154, Indonesia

[*]irfan.muhafidin@student.upi.edu

Abstract. This study is an attempt to show the relationship between culture and mathematics. Students' paradigm nowadays considers that Mathematics is an abstract concept; as a result they do not like the subject. In fact, indirectly within a culture or group. The aim of the study is to determine the existence of mathematical aspects in determining a good day of daily activities in indigenous societies of Paseban and Cikondang villages. This study uses a qualitative approach with ethnography method such as observation, interviews, documentation, and field notes. The research is conducted in two places namely Paseban Tri Panca Tunggal Cigugur Village, District Cigugur, Kuningan regency, West Java and Cikondang, Lamajang Village, District Pangalengan, Bandung regency, West Java. The results of the study show that there is the presence of mathematical aspects in determining good day of daily activities in indigenous societies of Paseban and Cikondang villages. This study recommends that mathematics is closely related to culture due to the existence of ethnomathematics.

1. Introduction

Mathematics is one of essential courses in education. If the education is illustrated as the machine, mathematics then is one of the important components to run that machine. There are many students who like mathematics but many of them also face difficulties in learning it because they just see it as a course which consists of memorization of formulas, quantification, and abstract.

Opinion about mathematics as a course which is not often used in daily life is a paradigm that has developed since 2000 years ago. [1] states that paradigm is the absolute paradigm in seeing mathematics. Absolute paradigm sees mathematics as if it does not relate with the culture. The mathematics ideas in the context of culture events begins to be seen by the education experts as an important thing in teaching and learning mathematics.

A study that investigates the idea (practical) of mathematics in the various culture events in the last few decades is named as ethnomathematics. [2] Ethnomathematics is a growing field of research, which provides scope for interpreting different socio-cultural environments through their local mathematical practices. When they are contextualized and endowed with meaning, these practices open the door to a broader context, which is quite unlike the mechanical way mathematics is developed in academia.

The definition of ethnomathematics according to Barto [3], is Ethnomathematics is the field of study which examines the way people from other cultures understand, articulate and use concepts and practices which are from their culture and which the researcher describes as mathematical.

Ethnomathematics is therefore a theoretical movement with transformational potential, going beyond the mathematical practices observed in specific contexts. By giving precedence to the cultural context surrounding such practices, this theoretical field brings to light the issues of alterity, the value of difference, and cultural and social relativity.

[4] The following four principles were used successfully in the development of mathematical activities and concepts from authentic cultural elements by students in the course. 1) Each student is considered as having a unique sociocultural history, each student has ethnicity, 2) This ethnicity is a mathematical resource; mathematics may be developed from associated cultural practices, 3) Students can use their ethnicity in developing mathematical activities for sharing with peers, 4) Since the sharing of elements of one's cultural or ethnic practices may be a sensitive issue, those who belong to a culture should be involved in making decisions about who should share the mathematics of its practices, and which practices should be shared. [5] A curriculum based on six public activities found in the cultures and societies that have been shown to be developed, i.e: Counting, locating, measuring, designing, playing, and explaining

Research about ethnomathematics is very suitable in Indonesia. It is because Indonesia is a multicultural and multiethnic country. Based on the context of compound citizen, except the culture of group of ethnic group, Indonesia also consists of various cultures that are results of the combination of cultures.

Sundanese is a tribe that still exist. The custom and tradition of it are still preserved and respected, such as spiritual ceremony. [6] Sub-ethnic of the Sundanese that still keep the custom and tradition from the ancestors is Paseban from Cigugur village of Kuningan, Ciptagelar village of, Sukabumi and Kanekes village of, Banten. Besides, there is also Cikondang village located in village of Lamajang, Kecamatan Pangalengan, Kabupaten Bandung. From that sub-ethnic, the researcher is interested to investigate the customs of Cigugur and Cikondang Village. It is because people there still protect the customs and traditions. Besides, it is also because the vice governor of West Java, Deddy Mizwar, thinks that customs ceremony of Seren Taun that is still regularly held by the people of Cigugur village is the way to preserve the customs and traditions that still exist in West Java [7].

Any researcher conducting a preliminary study toward Paseban indigenous people to uncover a possible link between cultures with mathematics. The results show that it is possible the existence of the recording, documenting, and the bookkeeping values of mathematics on daily activities of Paseban indigenous people, as in the determination of a good day in the daily activities of Paseban indigenous people. Daily activity is the activity in question had a party, moving house, and agriculture.

Any researcher conducting a preliminary study on the community of Cikondang indigenous villages to reveal the possibility of linkages between culture with mathematics. The results show the existence of a similarity with the preliminary results of the study which has been carried out in Paseban indigenous people. Through this ethnomathematics study, researchers are confident that the results of the preliminary research become the initial capital for doing advanced research in order to reveal the relationship of reciprocity between the mathematics and culture in the community of Cikondang indigenous villages.

Based on the backgrounds, the researcher is interest to reveal the aspects of mathematics in deciding the days both activities of Paseban Cigugur people and Cikondang. The title of this study is "Ethnomathematics study: revealing mathematical aspects in determination of a good daily activities in indigenous societies of paseban and cikondang west java"

2. Method

This study employs qualitative methodology. Besides, the study of ethnomathematics basically employs ethnography methodology as stated by Creswell [8] who says that ethnography is one of types of qualitative researches where the researcher conducts the study towards the group culture in the natural condition through the process of observation and interview. [9] Ethnography is a deep research about natural behaviour in a particular culture or social group. This is an attempt to understand the relationship between culture and habit with a certain belief, referring to values, concepts, practices, and attitudes of a group of a particular community

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According to Alangui [6], the frame of the ethnomathematics research that focuses on the practice of the unusual culture is built with four questions. The questions are as follows: 1) Where to start looking?, 2) How to look?, 3) How to recognize that you have found something significant?, and 4) How to understand what it is?

Then, the steps of the research are 1) research background, this step consists of deciding the research setting and also choosing the ethnomathematics activity that is done by the people, 2) collecting data, this step consists of collecting data from the interview and observation, 3) data analysis, analyzing the results of the observation and interview, 4) data conclusion, in this step the con

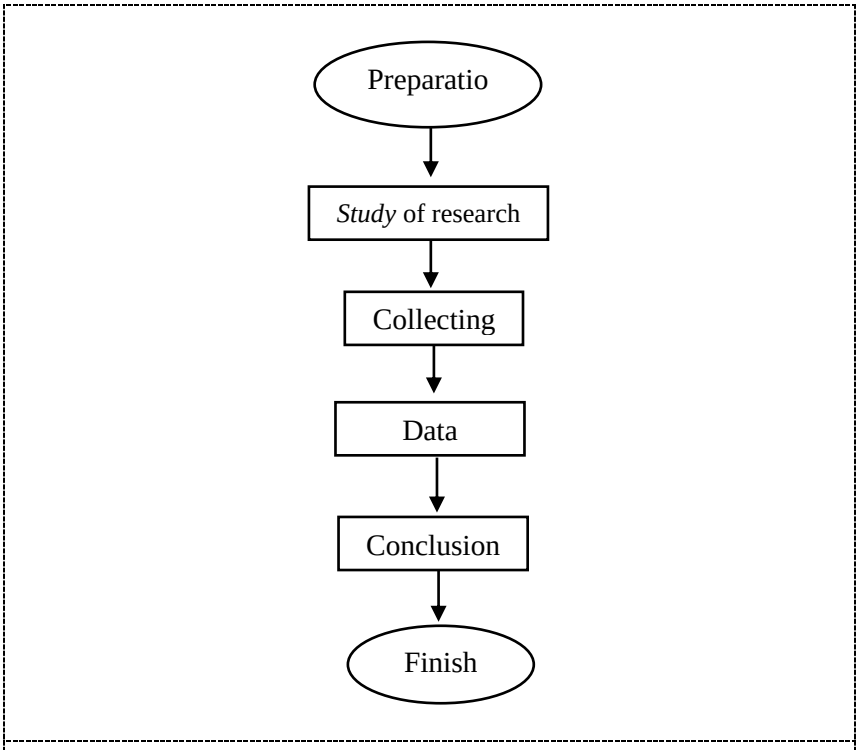

Figure 1. Research Procedure

3. Result and Discussion

Data have been collected in two different settings, namely Paseban and Cikondang. The results of this study are explained below.

3.1. The Research results of Paseban People

There are some terms in deciding the good days in Paseban, such as the terms of sri, lunguh, dunya, lara, and pati. Those terms are used in deciding the good days for the activities of the Paseban people. Deciding the good days for each activity has different way.

The decision of certain people's fortune in the customs of Paseban is in another day or it is called as jayanya. Meanwhile, there are habit of the people in deciding direction to search the fortune. It is through day days add market time then divided four. Diving four is the sign that four direction, namely east, south, west, and north. If the remaining is 1, it means east, 2 means south, 3 means west, and if there is no remaining, it means north.

Party in the custom of Paseban people generally consists of to, namely marriage and circumcision. To decide the good days for marriage, the way is by month when the girl was born plus boy and divided five. Meanwhile, to decide the good day for circumcision, the way is by month when the child

was born plus the market and divivded five. If it is remaining 1, it means sri 2 means lungguh, 3 means di dinya, 4 means lara, no remaining means pati. Sri means the God of rice, lungguh means god, and dunya means world, and lara means pain, and pati means death.

Home is the primary need of every human that has family. In building a home, Paseban people have tradition that is still keep until today. It is about deciding the god days for building the home. How to calculate is by adding the time of the party with the market time and then divided five. It is same with deciding before the party, the difference is only that it must remain three which means dunya.

Paseban people is the people who live in Ciremai foothill, so their jobs are mostly farmers. They have habit inn doing farming, namely calculating when the good starting point is. They usually calculate the jaya time from one of the family members plus year time and month time and divided five. It must remain five or falls into the category of sri.

3.2. The Research results of Cikondang People

Based on the research in Cikondang about how to decide the good days for daily activities of the people. The research finds several habit in this village, such as in deciding someone's fortune, holding the party, building home, and farming activities.

It is actually same with the people of Paseban. In calculating or deciding the good days, the people of Cikondang also recognize some terms, such as naktu, sri, lunguh, dunya, lara, pati, hakul kaya, hakul miskin and so on. Those terms are the terms used in deciding the good days for the people in Cikondang.

Fortune, soulmate, and death are the secret of God but the people of Cikondang have a habit to know the good days or fortune of someone in certain month or year. The ways can be by naktu the born date plus naktu month or naktu year and divided five. Five represents the five of sense that consist of sri, lunguh, dunya, lara, and pati. The good calculation is when it remains one, two or three which means it falls into the category of sri lungguh and dunya. Sri means the good of rice, lungguh means good, dunya mieans world, lara means pain, and pati means death.

Cikondang village is famous with their custom houses. Home is an important thing in a life. In term of building home, there are some rules that must be obeyed by the Cikondang people. The rule is about when to start building the home. The decision to start building a home is like deciding the good days for holding the party. The wasy is planning time plus naktu month plus day and divided by four. Four means panca empat that consists of panca gigis or remain one, panca weregis or remain two, panca adeg or remain three, and panca mantra or without remaining. Gigis means having a lot of challenges, weregis means a lof of wild animals, adeg means building, and mantri means forest rangers.

One point five from the three hectare are rice field, so most of jobs in Cikandong are farmers. In doing farming, the people have a strong belief towards the customs and tradition. One of them is deciding when to start farming. They decide by dividing the planning of the beginning date by four. The results is connected to the panca empat, namely sri remains one, wuwuh remains two, kaewuh-ewuh remains three and kaelang-kaelangan has no remain. Those remaing numbers must be one or two. Sri means god of rice, wuwuh means good, kaewuh-ewuh means a lof of people coming, and kaelang-elangan means a lof of things go missing.

3.3. Discussion

Based on the research, there are some habits that are done by the people of Paseban and Cikondang. Those habits indirectly use the concepts of mathematics. In this point, those concepts are be explained.

3.3.1. The People of Paseban

The results of the research towards deciding the good days for the daily activities of Paseban people shows that there are some mathematics activities in the process of that good days deciding. It is proofed by the existence of basic process of mathematics, namely summing and dividing. In the process, the People of Paseban add naktu-naktu that is suitable with the rules that have been agreed by their ancestor. Then the result of that summing proves is divided by four to decide the fortune of

Volume 3, 2018 | P-ISSN 2655-2361, E-ISSN 2655-3252

someone and divided by five to decide the good days for party, building home, and farming. This explanation suits with the concept of congruence. Congruence according to Burton [7] is explained below.

Let n be a fixed positive integer. Two integer a and b said to be congruent modulo n, symbolized by $a \equiv b \ (mod\ n)$. If n decides the diference $a - b$; that is, provided that $a - b = kn$ for some integer k. Based on those explanation above, the mathematics concept is formed in deciding the fortune of someone. It is $a \equiv b \ (mod\ 4)$. a is direction and c is remaining.

Table 1. Fortune Direction

Direction	Remaining shares
North	0
East	1
South	2
West	3

Meanwhile, in deciding the god days for party, building home, and farming, the mathematics formula that is fored is $a \equiv b \ (mod\ 5)$. The a and c means the remaining. That remaining number is used to decide the time when to start activities of party, building home, and farming, as showed in table below. In party and building home, the remaining number that is taken is three which means dunya. Meanwhile, the remaining that is taken to decide the good days fro farming is one which sri.

Table 2. Good Days For Party

Good Days	Remaining shares
Pati	0
Sri	1
Lunguh	2
Dunya	3
Lara	4

3.3.2. The People of Cikandong

Summing and dividing results connected with the senses are the ways done by the people of Cikondang to decide good days for their daily activities. That process indirectly shows that the people of Cikondang conduct the process of mathematics. The process of mathematics that connects the results of dividing and the remaining numbers towards the sense can be conducted by the concept of congruence.

The concept of congruence is used in dividing process. For example in deciding the fortune of someone in Cikondang. The formula that can be used is $a \equiv c \ (mod\ 5)$ or $a = 5q + c$. The meaning of a is sense or panca and c is the remaining numbers. That remaining number is connected with the sense, as showed by the table below.

Table 3. Panca Fortune

Panca	Remaining shares
Pati	0
Sri	1
Lunguh	2
Dunya	3
Lara	4

Volume 3, 2018 | P-ISSN 2655-2361, E-ISSN 2655-3252

It is same with deciding the fortune of someone. In deciding the good days for party, building home, and farming, the concept of congruence is also used. The concept is $a \equiv c \ (mod\ 5)$ or $a = 5q + c$ dan $a \equiv c \ (mod\ 4)$ or $a = 4q + c$. The meaning of a is panca or sense and c is the remaining numbers.

3.3.3. The Relationship between the Mathematics Concept of Paseban and Cikondang People

Based on the previous explanation above, it can be seen that there are some same and different things from the terms and concepts of revealed mathematics concept. Several same things that thave similarities in deciding the good days for daily activity of Paseban and Cikondang people are the use of naktu term in all calculation of good days. The same aspect of revealed mathematics is identified by using the concept of congruence.

4. Conclusion

The conclusion is divided based on the answer of the uestions of the research. The answers of the questions are as follows: Mathematics aspects that are revealed in the rule of deciding the fortune of someone in Paseban are about born day and the revealed mathematics forms is $a \equiv c \ (mod\ 4)$ or $a = 4q + c$. The meaning of a is direction and c is the remaining numbers. If there is no remaining number, it is north, one remaining number is east, two remaining is south, and three means west. Meanwhile, mathematics aspects that are revealed in the rule of deciding fortune of someone in Cikondang is $a \equiv c \ (mod\ 5)$ or $a = 5q + c$

The aspects of mathematics that are revealed to decide the good days of holding the party in Paseban people are $a \equiv c \ (mod\ 5)$ or $a = 5q$ +c. The meaning of a is direction and c is the remaining numbers. The final result must be 1. Meanwhile, mathematics aspects that are revealed in the rule of holding the party in Cikondang people are $a \equiv c \ (mod\ 5)$ or $a = 5q + c$. The meaning of a is direction and c is the remaining numbers. The remaining number must be 1, 2, and 3.

The aspects of mathematics that are revealed to decide the good days of building home in Paseban people are $a \equiv c \ (mod\ 5)$ or $a = 5q + c$. The final result must be three. Meanwhile, mathematics aspects that are revealed in the rule of building home of Cikondang is $a \equiv c \ (mod\ 4)$ or $a = 4q + c$. The meaning of a is direction and c is the remaining numbers. The remaining number must be three.

The aspects of mathematics that are revealed to decide the good days of farming in Paseban people are $a \equiv c \ (mod\ 5)$ or $a = 5q + c$. The meaning of a is direction and c is the remaining numbers. The remaining number must be three. Meanwhile, mathematics aspects that are revealed in the rule of farming of Cikondang is $a \equiv c \ (mod\ 4)$ or $a = 4q + c$. The meaning of a is direction and c is the remaining numbers. The remaining number must be 1 or 2.

The existence of correlation of mathematics aspects in deciding good days in daily activities of Paseban and Cikondang people is represented by their similarities and diffierence. They both use the concept of Modulo. The definition of modulo itself is $a \equiv b \ (mod\ n)$. Meanwhile, the difference is in the aspect of n that is used, namely they use $n = 4$ or $n = 5$.

5. Acknowledgments

The writer delivers the special gratitude to his parents as they always pray for the writer's future, also to the mathematics education lecturers, particularly Dr. Elah Nurlaelah, M.Si. and Eyus Sudihartinih, S.Pd., M.Pd. who have shared their knowledge and experiences.

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