

The Ethnomathematics of Calculating Auspicious Days in Javanese Society as Mathematics Learning

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The purpose of this ethnomatematics research is to describe the process of calculating auspicious days for Javanese wedding in Purworejo. This research is a descriptive research with a qualitative approach which used interviews to collect the data. The subject of this research was an individual who implemented the process of calculating auspicious days in Javanese society. The results show that the process of calculating auspicious days for Javanese wedding in Purworejo was an activity that could be possibly used as mathematics learning.

Keywords: Javanese society, ethnomathematics, mathematics education

Introduction

Tandiling (2013) stated that ethnomathematics is mathematics applied by a certain culture group within society, such as laborer, farmer, children of a certain social class, professional classes, and many more. From a research point of view, ethnomathematics is well known as a form of cultural anthropology of mathematics and mathematics education. Mathematics as a basic study is needed to analyze either basic of calculating sciences or computation as applied in society to enrich mathematics development.

In daily life, most people do not realize that they have been applying mathematics. They think that mathematics is just a subject studied in school, whereas mathematics is often used in every aspects of life, such as measuring, calculating, numbering, and in some types of transaction activities. According to D'Amboise (as cited in Puspadewi & Putra, 2014), mathematics studied in school is known as academic mathematics, while ethnomathematics is mathematics applied by some cultural group which has been identified. Therefore, it can be stated that it is mathematics that appears as the result of impact of an activity in the environment influenced by culture. On the other words, ethnomathematics is a study which is not only studied in a classroom but also grow and develop in a certain culture.

Ethnomathematics is perceived as a lens to see and understand that mathematics is a product of culture. The culture in this research refers to the language, place, and tradition of the society, and how it organizes, interprets, conceptualizes, and names the physical and social world (Ascher, 1991). The research of ethnomathematics in mathematics has been conducted into all sectors, such as architecture, sewing, siblings, ornaments, spiritual and religious practice, and weaving, which is often aligned with the pattern occurring in nature. According to Puspadewi and Putra (2014) a research using ethnomathematics has even analyzed some

of the puzzle games of the Hausa culture (*wasakwakwalwa*) in North Nigeria, the South African carpenters' methods in deciding the center of the box lid shaped rectangle, and so forth.

Method

This research is an ethnomathematics research because it reveals the daily activity of one of an ethnic group in a certain culture and a descriptive research within the qualitative approach (Sugiyono, 2012). The instrument used for collecting the data was interview. The subject of the research was one who knows about the process of calculating auspicious days in Javanese society.

The steps taken in this research were:

1. Introduction, the researcher both decided the area and chose the ethnomathematics activity of the Javanese society, which is Purworejo.
2. Data collection, the researcher constructed a guide for the interview which consisted of the outlines of the questions.
3. Implementation, this step consisted of collecting data taken from the interview focused on calculating auspicious days for a Javanese wedding.
4. Data analysis, summarizing and describing the interview for calculating auspicious days for a Javanese wedding.
5. Conclusion, at this step, the researcher synthesized the results.

Results and Discussion

Pattern of Calculating an Auspicious Day for Javanese Wedding

Weton is a memorial day of birth commemorated in every 35 days and *pasaran* is the naming of time in Javanese culture that consist of five as follows: *Pon*, *Wage*, *Kliwon*, *Legi*, and *Pahing*. In Javanese culture, *weton* does impact upon the daily life, one of its functions is to search for an auspicious day for wedding, building a house, moving out from the house, or looking for the right time for circumcision. The total of *weton* can be known from the birth day and *pasaran* is usually written by parents.

In modern life, the process of calculating an auspicious day starts to be abandoned, but there are still several groups of people believing and using the pattern. In Javanese society, there are some people who can decide auspicious days to conduct an occasion.

In the calculating within Javanese system there is a basic concept called *cocog*, which means match or compatible, such as the matching of the padlock with the key, or the man and the woman in a marriage. There are several things require attention and are used in deciding an

auspicious day, like *neptu* the day and *pasaran* of the birth day in Javanese month for the future bride and groom.

Table 1.
Value of Each Day and *Pasaran* of Javanese Society

| No. | Day | <i>Neptu</i> Value | <i>Pasaran</i> | Value |
|-----|-----------|--------------------|----------------|-------|
| 1. | Monday | 4 | <i>Legi</i> | 5 |
| 2. | Tuesday | 3 | <i>Pahing</i> | 9 |
| 3. | Wednesday | 7 | <i>Pon</i> | 7 |
| 4. | Thursday | 8 | <i>Wage</i> | 4 |
| 5. | Friday | 6 | <i>Kliwon</i> | 8 |
| 6. | Saturday | 9 | | |
| 7. | Sunday | 5 | | |

For deciding an auspicious day, most people calculate using the 7 days (Monday to Sunday) and the 5 *pasaran*. Each day has its own pattern which reflects the value of the day and *pasaran*. Table 1 shows the value list of the day and the *pasaran*. It is only the birth day and the *pasaran* of the bride which is used as reference to decide the auspicious day for the wedding. For example, if the birth day of the bride is Wednesday of *Wage*. There are two ways for determining the auspicious wedding day, using her birth day and her *pasaran*.

Using Birth Day

1. Make a birth day sequence from Wednesday until Tuesday.

Table 2.
Sequence of the Day

| Day | Wed | Thu | Fri | Sat | Sun | Mon | Tue |
|----------|-----|-----|-----|-----|-----|-----|-----|
| Sequence | 1 | 2 | 3 | 4 | 5 | 6 | 7 |

2. Take the bride birth day or day that has an even sequence (Wednesday, Thursday, Saturday, and Monday). For example, Thursday which has sequence number 2.

Matching the bride selected birth day with her *pasaran*. The rule for deciding *pasaran* is by looking a day that the residue, if the *neptu* of the *pasaran* is added up with the *neptu* of the day and is divided by 4, is 1 or 2. The residue of 1 symbolizes teacher (the person who becomes a role mode) and 2 is a symbol of *Wisnu* (puppetry character who descends from the gods). Meanwhile, 3 is a symbol of *bromo* (hot fire) and 4 refers to senility (forgetfulness or the person who has no calculating aspect).

Example: Thursday has *neptu* number 8, it can be matched with *neptu* number 5 (*Legi*), or *neptu* number 9 (*Pahing*). So, the auspicious day for the wedding is Thursday of *Legi* or Thursday of *Pahing*.

Using *Pasaran*

1. Making *pasaran* sequence from *Wage* until *Pon* in order to decide the *pasaran*.

Table 3.
Sequence of the *Pasaran*

| <i>Pasaran</i> | <i>Wage</i> | <i>Kliwon</i> | <i>Legi</i> | <i>Pahing</i> | <i>Pon</i> |
|----------------|-------------|---------------|-------------|---------------|------------|
| Sequence | 1 | 2 | 3 | 4 | 5 |

2. Take the bride *pasaran* or *pasaran* which has even sequence (*Wage*, *Kliwon*, and *Pahing*). For example, the researcher take *Kliwon pasaran* because the sequence is 2. The rule for deciding the auspicious day is by looking for the day having *neptu* of that day which if it is added to the *neptu* of *pasaran*, then divided by 4, the residue is 1 or 2.

Example: *Kliwon* has *neptu* number 8, so it can be matched with 6 (Friday) as $(8+6)/4$ gives residue 2, 9 (Saturday), and 5 (Sunday). Then, if the bride and groom want to throw a wedding party in *pasaran* of *Kliwon*, the matching day will be Friday of *Kliwon* or Sunday of *Kliwon*.

Summarizing the Ethnomathematics in Deciding an Auspicious Day for Wedding.

Based on the statements above, it can be concluded that there are several activities for doing this mathematical challenge. Here are some examples of the mathematical used in the process of calculating an auspicious day in Javanese culture:

1. Value of day and *pasaran*.
2. Each day and each *pasaran* in Javanese culture have a certain value, for example, Thursday has value 8 and Saturday has value 9. Thus, Javanese society has been using mathematics.
3. In deciding an auspicious day for a wedding, Javanese society can take either birth day of the bride or the day which has an even sequence. Again, Javanese society has already been using the pattern of even and odd numbers and using mathematics in their daily life.
4. The rule of deciding an auspicious day can be calculated by the following formula:

$$x = \frac{a + b}{4}, \text{ residue 1 or 2}$$

Where x = divided number
 a = *neptu* day
 b = *neptu pasaran*

Potential of Ethnomathematics for Learning Mathematics

Based on the result of the research, there are several potential problems which can be developed for learning mathematics. One of them is related to the rule of calculating an auspicious day for a wedding. The rule can be developed by teacher, as a sample question in a game format purposed for improving creative mathematical thinking and using patterns.

For example, Bambang and Yuli are Javanese bride and groom who are now calculating an auspicious day for their wedding. They come to see *Mbah* Marijo (one of the elders in that village) to ask him to calculate the best day for their wedding. Bambang was born on Saturday of *Wage* and Yuli was born on Sunday of *Pon*. Help *Mbah* Marijo to answer the following questions from Bambang and Yuli:

1. Is it possible to get married on Sunday?
2. If they want to get married on December 2016, what date will be a match for having their wedding?

Besides improving critical thinking pattern, it is also expected that connecting culture to mathematics can develop students' motivation in learning mathematics.

Conclusion

The result of this research is a good example how a cultural group has used mathematics in a way that is unique in their daily life. Even though these Javanese people will not regard themselves as being mathematics experts yet their system makes use of sound mathematical thinking around residues which resonates with modular arithmetic commonly known as the mathematics of dials or clocks.

This is a good example of how ethnomathematics has the potential to assist mathematics learning in the classroom by providing an interesting and relevant context. Teachers can develop the theory as sample questions in a game format for the purpose of improving creative mathematical thinking of their students. Thus, while improving the critical thinking of the students, teachers at the same time can improve students' motivation to learn mathematics.

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