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EXPLORATION OF THE WEAVING ACTIVITIES IN TIMOR ISLAND FOR MATHEMATICS LEARNING

Wara Sabon Dominikus*, Universitas Nusa Cendana, Indonesia
Ofirenty Elyada Nubatonis, Universitas Nusa Cendana, Indonesia
Patrisius Afrisno Udil, Universitas Nusa Cendana, Indonesia
Irna Karlina Sensiana Blegur, Universitas Nusa Cendana, Indonesia
*e-mail: dominikus@staf.undana.ac.id (corresponding author)

Abstract: The inclusion of ethnomathematical perspectives into the mathematics education of indigenous student is often described as being beneficial. Drawing on weaving activities from West Amarasi society in Timor Island, Indonesia, this paper examines the results from the exploration of mathematical concepts that exist and are practiced in this society. This is a descriptive exploratory with ethnographic qualitative approach research. Data were collected in March 2022 through observations, interviews, and documentation. Some indigenous people from Merbaun Village, West Timor, in East Nusa Tenggara Province, Indonesia, were participants in this research. The results showed that there were several ethnomathematics characteristics in the weaving activities of the West Amarasi society: counting, locating, measuring, designing, explaining, the use of implication logic, and estimating. It was also found mathematics concepts and ways of thinking such as the concept of multiplication as repeated addition, parallel of straight lines, geometric shapes, reflection, rotation, sizes and units, and logical implication. This finding can be used as a source of mathematics learning by teachers, researchers or mathematics education practitioners not only those local in West Amarasi but also in other similar places around the world.

Keywords: ethnomathematics, weaving activities, mathematics concept, mathematics learning, ethnography

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INTRODUCTION

Mathematics can be seen as knowledge that comes from human life experiences and habits (Bito et al., 2021; Prahmana, 2020; Yudianto et al., 2020), used to solve various problems in daily life (Ilyyana & Rochmad, 2018; Risdiyanti & Prahmana, 2018). Mathematics exists and plays an important role in various activities in human life such as calculating, measuring, financial transactions, weather prediction, decision-making,

artificial intelligence, and many other activities. Mathematics can also be found in the construction of traditional houses in many regions, motifs of traditional woven fabrics, traditional games, and the life systems of certain cultural society. Mathematics is actually very close and attached to the life and cultural practices of a particular society. Dominikus & Balamiten (2021) described the relationship between mathematics and society's culture as a complementary two-way relationship.

The mathematics that exists, lives, is practiced, and even develops in certain society cultures by D'Ambrosio (1985) is called ethnomathematics. In general views, ethnomathematics can be seen as mathematics is practiced in people's living habits such as gardening, playing, dressing, and so on (Muhtadi et al., 2017; Weldeana, 2016). Meanwhile, in the context of the local culture of a certain society, ethnomathematics can be seen as a mathematical practice in the culture of the local society, such as in traditional rituals, traditional houses, traditional woven fabrics, and other cultural activities (Dominikus et al., 2017; Shahbari & Daher, 2020; Utami et al., 2020).

Considering that ethnomathematics is related to the mathematical practice of certain cultural communities, it is possible that schools in East Nusa Tenggara Province, Eastern Indonesia, have various cultural-based mathematics learning resources in the classroom. This is because East Nusa Tenggara Province is one of Indonesia's archipelagic provinces (more than 500 islands), consisting of many different cultural societies. One of the cultural societies that exist in this Province is the West Amarasi society. Located on the western tip of Timor Island, where most of the people here are traders, farmers, and fishermen, this society has its cultural values that characterize it. These values are contained in the practice of social life, including weaving activities. It can be said that Mathematics culture-based learning resources should be found easily in West Amarasi.

Teachers may tend to teach mathematical concepts directly, while students learn more material by memorizing formulas. The learning of mathematics based on cultural activities and close to students is still rarely done. One of the fundamental factors of this was the lack of teachers understanding the use of local culture for learning mathematics in the classroom. The tendency to depict mathematics as something free from the daily human activities is still happening. As a result, mathematics learning in schools was also dominated by procedural and algorithmic teaching styles.

Furthermore, it caused that mathematics tends to be seen as difficult, abstract, and far from the context of everyday life (Pathuddin et al., 2021). These facts lead to low conceptual understanding, lacking problem-solving abilities, and poor students learning

achievement in mathematics (Nursyahidah et al., 2018; Sunzuma & Maharaj, 2019; Widada et al., 2020). Meanwhile, the ethnomathematics exploration of culture in this society is minimal, so it is not surprising that the teacher's understanding has emerged as described.

Seeing these facts, the exploration of ethnomathematics in the cultural activities of the West Amarasi society could make a major contribution to the mathematics learning in the classroom. This is because ethnomathematics can bridge the conditions of mathematics learning which tend to be seen as abstract and mechanistic activity with students' needs to learn mathematics in a more concrete, simple and close to student culture (Prahmana & D'Ambrosio, 2020). One of these cultural activities is weaving activity. Weaving is a simple cultural activity of the West Amarasi people and is closely attached to daily life. Most of the parents' weave, while the children help the weaving process. So that ethnomathematics exploration in the weaving activities of this society is the best choice as the first step in exploring the culture of the local society in a wider context.

Previous research related to ethnomathematics exploration in various local cultural context in Indonesia (Alvian et al., 2021; Prahmana, 2020; Risdiyanti & Prahmana, 2018; Yudianto et al., 2020), especially in the context of local culture in East Nusa Tenggara (Dominikus, 2018; Dominikus et al., 2020; Maima et al., 2021; Talan et al., 2021) has begun. However, the existing research is still limited to certain areas. It has not been comprehensive for the cultural context, including weaving activities, especially for local society in the West Timor region-the education center place in East Nusa Tenggara Province.

Based on these facts, this research related to ethnomathematics exploration in the weaving activities of the West Amarasi society was carried out. The exploration is an attempt to explore mathematical concepts that exist and are practiced in the cultural life of the West Amarasi society. This article was specifically written to contain the results of the exploration.

METHOD

The method used in this research is qualitative. Qualitative research is research that intends to understand what phenomena are experienced by research subjects, including behavior, perceptions, motivations, actions, habits, and various other things holistically, through descriptions in the form of words and language in a special natural context (Creswell, 2014; Moleong, 2007). This research was conducted in March 2022 in Merbaun Village, West Amarasi District, Kupang Regency, East Nusa Tenggara

Province, Indonesia. Subjects in this research were selected purposively by considering their knowledge and skills about weaving activity of the West Amarasi Society.

The focus of this research is the exploration of ethnomathematics in the weaving activities of the West Amarasi society. Research data collection was done through observation and interviews with research subjects. Observations were made on the weaving activities of the West Amarasi society which included several aspects and stages as the focus of observation. The focus of the observation is related to weaving tools and equipment, selection and determination of weaving motifs, estimation of weaving time, weaving process, utilization and sale of woven fabrics. Meanwhile, interviews were conducted on research subjects selected purposively. Subjects interviewed are natives of West Amarasi who do regular weaving activities.

After the data was collected through observation and interviews, then the data was tabulated to find various ethnomathematics aspects based on Bishop's ethnomathematics characteristics such as counting, locating, measuring, designing, playing, explaining (Dominikus, 2018), and various other characteristics that may be found in a particular cultural context. In addition, analysis is also done to find mathematical concepts that lived and were demonstrated in the weaving activities of the West Amarasi society. In general, data analysis was carried out using the Miles and Huberman interactive method which included data reduction, data presentation, and verification (Sugiyono, 2013).

RESULTS AND DISCUSSION

The result and discussion of this research will be provided in two main stages. The first one describes the weaving activity process of West Amarasi society. The second one provides the analysis of ethnomathematics aspect in the weaving activity of West Amarasi society.

The Weaving Activity of West Amarasi Society

The weaving activity of the West Amarasi society has been carried out since ancient times until now. The weaving process of the West Amarasi society generally consists of several stages which can be explained as follows.

Roll The Yarn ("Taun Abas or Naun abas")

Yarn is used as the main material in the weaving activities of the West Amarasi society to produce cultural products in the form of woven fabrics. In this process, the yarn is first formed into rounds or small balls such as baseball as shown in Figure 1. This

process by local people called *"Taun Abas"* or "*Naun Abas"* or process of rolling the yarn. In this process, the weaver also produces 2 skeins of yarn from 1 yarn head.

Figure 1. The yarn form into small balls

Unravel ("lolo benang") and Collect the Yarn to Form Motifs

After rolling the yarn or *"Taun Abas"* process, the next activity is to unravel the yarn or "*lolo benang*" which is carried out in the big loom or "*roki ko'u"* using four sticks. Four sticks are used for alternating purposes. This is intended to facilitate the binding process. The top stick is to show the fingers while the bottom stick is to show the veins. After that, the yarns are collected or put together to form a particular motif. Each motif has its own strand limit. For example, the *Kret Tun Maka'i Pan Bua Ana* motif reaches thirty-seven fingers after it is put together. This process is carried out in a large loom (*Roki Ko'u*). After being put together, it is transferred to a small loom (*Roki Ana*) with the aim of binding it to the shape of the motif.

Binding Process ("Fut")

The binding process to form the motif (Figure 2) is carried out in a small loom (*roki ana*). Formerly, this process used *Gewang* (palm plant with scientific name *Corypha Utan*) rope. This Gewang rope is called "*khufa"* by the local people. The advantage of using *kufa* is that it will affect the color of the yarn. But nowadays, the yarn can be bound according to the motif using raffia (*fut kabas*). The binding process is carried out by top-down process to form an orderly arrangement/shape according to the motif.

Figure 2. Binding process in a small loom according to a certain motif

Oiling Process ("Ta'fenu")

This process is carried out using candlenut and other leaves. This process is carried out for about two weeks. The first week to soak with a mixture of candlenut, crushed leaves, and water. This is carried out every morning and evening and must be peeled so that it is evenly distributed down to the smallest bond. Then in the second week it is dried in the sun and also dew. This process will strengthen the color or the color will not fade quickly. So that it can last for years and the color becomes lighter.

Coloring Process

After the oiling process, it is continued with the coloring process. The whole yarn is colored with the brick red color-the most used color besides the others such as pink, blue, green and black- so it remains the part of bounded yarn with white/original color that forms the motif. This coloring process used root bark of noni (Figure 3a) and tree bark from Alor Island namely "*Noba"* or *"Loba"*. This brick red coloring for one head requires one small sack of root bark of noni and approximately three glasses of mineral water *Loba* (because it is in powder form). The coloring process is carried out by pounding the noni root bark together with *Loba* according to the number of heads. Then mix it with enough water and soak the yarn. This process is carried out for about two nights, with the condition that every morning and evening must be peeled. After two nights, take the yarn and dry it (Figure 3b). After drying, put it back into the water and dry again. This process is repeated until the water runs out. After that, make the mixture again and repeat the process until the noni root bark and *Loba* are used up.

(a) (b)

Figure 3. (a) The root bark of noni; (b) Drying process of the yarn after coloring with the brick red colors

Untie the Bound Yarn ("Sef Futus") and Unravel the Yarn ("Lolo Benang")

After coloring process, 6 tis continued with untie the bound yarn. Then proceed with unravel the yarn (*lolo*) again back in *roki ko'u* according to the specified pattern and color (Figure 4). For West Amarasi and especially *Uim Ne'e* have five color shades. The five colors are red, pink, blue, green and black. In this process, the bonds that make up

the motif are opened and the yarn is then unraveled and tightened again so that the resulting flower or motif does not fall apart. This process is followed by a *nanisa* process, namely placing a small stick in the middle to straighten the thread so that the motif is straight and balanced.

Figure 4. Yarn unraveling (*lolo benang*) in *roki ko'u* after coloring

Weaving

In this process the aim is to tighten or condense the yarn to make cloth. There is an additional yarn in the weaving process called *afat* or *sahuk* (Figure 5a). The *afat* or *sahuk* must be brick red to match the base color. This *afat* will not affect the white color of the yarn because there are two sticks that function as separators. Basically, how to make a shawl or sarong is the same (Figure 5b). It's just that there are several processes that are added, such as sewing to connect the fabric or there is a *lotis* which is an additional part that functions to add motifs. *Lotis* uses black and white colors (especially for *Uim Ne'e*).

(a) (b)

Figure 5. (a) Weaving activity; (b) Weaving activity and many parts of weaving tools

Ethnomathematics Aspect in the Weaving Activity of West Amarasi Society

Based on the description of the weaving activities of the West Amarasi society above, ethnomathematical aspects can be identified, which refer to the characteristics of ethnomathematics activities according to Bishop (1988).

Counting

Counting is an ethnomathematics characteristic related to the practice of counting in certain societies. The practice of counting is also related to the tools, symbols, languages, and number systems used for thousands of years in various forms. In the weaving activities of the West Amarasi society, ethnomathematics characteristics related to counting activities can be found in the rolling the yarn activities. In this process the roll of yarn produced can be determined from the number of yarn heads obtained from the spun or purchased. The following shows an interview with one of the research subjects.

R	:	Can you tell me the process of making yarn? (*Aina mupeoba mit kit he hom moe abas nook abnafu*?)
S	:	Then spun the yarn in the *moleng* until it is round or form small balls like baseballs, no more. One *ketula*/ one head (*naka mese*) gets 2 rolls (*aunu nua*). (*Oke te nasuin abas ta nani neu moleng talan tia jair kbubu onla bora kasti, kaisa nes bora kasti. Naka mese napein aunu nua*)

The interview above shows that in producing yarn there is a counting activity related to the concept of multiplication as repeated addition. The subject said that one head of spun yarn produces 2 rolls of yarn. It also means that 2 heads produce 4 rolls of yarn, and so on. So, it can be written mathematically as follows.

1 head (*naka mese*)	=	2 rolls (*aunu nua*)
2 heads (*naka nua*)	=	1 head (*naka mese*) + 1 head (*naka mese*)
	=	2 x 1 head (*naka mese*)
	=	2 x 2 rolls (*aunu nua*)
	=	4 rolls

The practice of counting is also found in the binding process to form the motif. In the process of binding the yarn to form motifs, the weaver determines the number of yarns needed to make one fabric motif. Take a look at the following interview.

R	:	How to determine the number of yarns for each motif?
S	:	Each motif has a different finger (*krare*); there are 15, 18, 19, 21, 22, 25, 27, 29, 33, 35, 37, 39, 43 and 45 fingers. Then, the motif will be formed from 2 strands (*no'*) of yarns which were put together in big loom (*roki ko'u*).

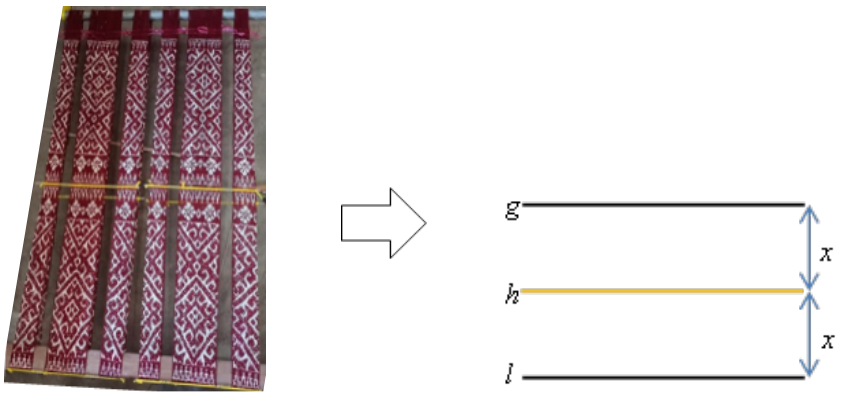
The interview above shows that to determine the number of yarns in one motif, it is determined based on the finger of each motif. For motifs with one finger, it is formed by 2 strands of yarn. So, based on the interview above, a multiplication form can be constructed in determining the number of yarns in each motif as follows.

Krere 15 (15 fingers)	=	15 + 15 = 2 x 15 = 30 *no'* (30 strands),
Krere 18 (18 fingers)	=	18 + 18 = 2 x 18 = 36 *no'* (36 strands),
Krere 19 (19 fingers)	=	19 + 19 = 2 x 19 = 38 *no'* (36 strands), and so on.

Locating

This relates to spatial abilities; how spatial conceptualization is and how an object is positioned in a spatial environment. In weaving activity in Amarasi Barat society, this characteristic can be found in the activity of weavers in forming motifs when binding the yarn (*fut*). In this process, weavers used and tied raffia on yarns in small loom (*roki ana*) to form certain motifs. The use and placement of the rope tied to the yarn is not done randomly, but refers to the motif wanted to form. The binding process was carried out so that an orderly arrangement/ shape were formed according to the motif. In the Figure 2, it can be seen that the rope tied to the yarn forms a certain pattern. In this case, it can be said that there was locating characteristic in the waving activity of West Amarasi society that related to the spatial pattern and geometric shape in mathematics concept.

This locating characteristic was also found in the process of unraveling the yarn. In this process, the bonds that make up the motif were opened and the yarns were then unraveled and tightened again so that the resulting flower or motif did not fall apart. This process was carried out on a big loom followed by a *nanisa* process, namely placing a small stick in the middle to straighten the yarn so that the motif is straight and balanced. In this process, the weaver places a small stick in the center of the yarn equidistant from and parallel to the two edges of the large loom. In this case, there was a concept of paralleling two straight lines that was carried out in the activity of placing a stick in the middle of the yarns as illustrated in Figure 6. It can be seen that line *h* (representation of sticks in the middle of yarns) is parallel to the line *g* and *l* (representation of big loom edges). It also shows that the distance between line *h* and *g* is equal to the distance of line *h* and *l*.



(a) (b)

Figure 6. Representation of parallel line concept in the process of unraveling the yarn

Measuring

Measuring activities can be found in the weaving activities of the West Amarasi society in the process of determining the size of certain woven fabrics. West Amarasi woven fabrics consist of 4 types, namely, blankets (*taimuti*) which are used by men, *po'uk* which are used together with blankets by men, sarongs (*tairunat*) which are used by women, and shawl which are used by women together with the sarongs worn by women. For each type of fabric was measured using a weaver's arm. The following is an excerpt from an interview with one of the weavers.

R	:	How did you determine the size of each cloth? And what tools did you use to measure? (*Ho muhin na'ko me es hom tentukan tais le'i inimnanun? Hom ukur mek sa*?)
S	:	For *tairunat*, the width was about 1 meter, and for *taimuti* the width was about 1 and half meters. For the length was vary, some were up to 2 meters and others were about 1 meter, depending on the size of the motif. To measure there was already a benchmark when unravel the yarn (*lolo benang*). (*Karu tairuna in manuan metresam'nes, karu taimuti in manuan metresam'stena. Karu inim mnanun bianan tia meter nua, bian metresam'nes na'ko motif ini naen. Karu hitit ukur mui'in patokan etan lolo abas. Waktu hit ta'ben mu nain ukuran*). [While answer the interview, the weaver indicates the width of the *tairunat* and *taimuti* by measuring using arm which represents the size about to 1 meter, 1 and a half meters, and 2 meters]

Based on the interview, it can be seen that the weaver determined the size and carried out the activity of measuring the length and width of the fabric with the standard unit of meters. However, it was not determined based on the activity of measuring with a meter or other standard length measuring instrument. Even the weavers measured and estimated the length and width of the fabric with the arm. This shows that the weaver determined and measured the size of the fabric with their own measurement tools which in this case was the arm, and then estimated the results in meters. It shows that there was a measuring characteristic in waving activity of West Amarasi society.

Designing

Designing characteristic can be found in the process of designing the shape of each motif. In this case the weavers form a certain motif starting from the process of binding the yarns to the weaving process so that a complete motif is formed according to the motif image that has been prepared. The motifs formed are mostly in the form of cultural-based geometric shapes that describe life and nature in West Amarasi. Some of the motifs referred to include: (1) the *panbua ana* motif which means that a small crate or small coffin means the framework of human attitudes, feelings and events in society; (2) the *korkase* motif depicts the symbol of the Republic of Indonesia, namely the *Garuda*. But in the reign of the kingdom, this motif with the head down meant that every leader had to unite with the small society; (3) the *kai ne'e* motif contains the meaning of

six symbols of environmentalism which means that even though they are separated in work, they must still remember togetherness in brotherhood; (4) the *kaimanfafa* motif has the meaning of joining hands which means that in running our lives we cannot walk alone, we will always need other people; and there are several other motifs.

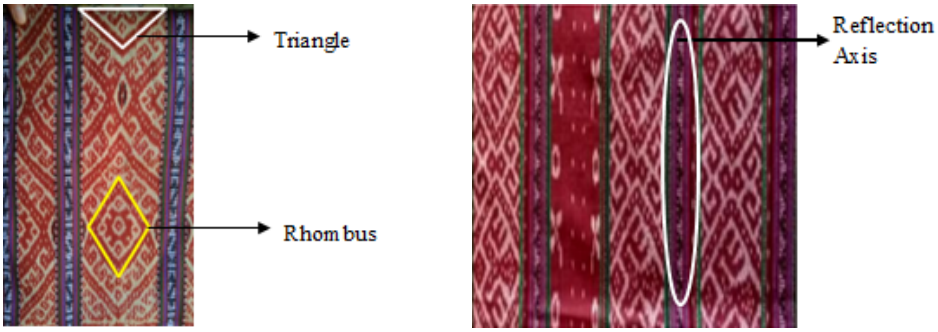


Figure 7. (a) geometric shapes in the *kai ne'e* motif; (b) reflection concept in the *korkase* motif

In the motifs of West Amarasi woven fabrics, two dimensional shapes such as rhombuses and triangles were found. In fact, these two geometric shapes can be found in one motif as shown in Figure 7(a) of the *kai ne'e* motif. In addition to geometric shapes, the design of the West Amarasi motif also contains the concept of geometric transformation. One of them is the concept of reflection with a reflection axis using other variations of yarn as shown in Figure 7(b) of the *korkase* motif.

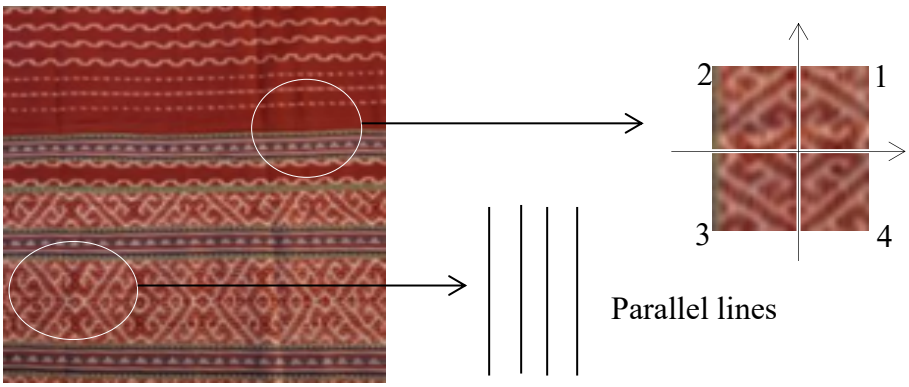


Figure 8. Concept of rotation and parallel lines in the motif of *pan bua ana*

In addition, the concept of geometric transformation in the *pan bua ana* motif was also found, as shown in the Figure 8. Based on the figure, it can be explained that the motif in part 1 can form the motif in part 2, 3, and 4 by rotating the part 1 with the center of the motif being the center of rotation. If the motif in part 1 is rotated 90° counterclockwise, then motif section 2 will be formed, while the motif section 3 and 4 can be formed by rotating the motif 1 with 180° and 270° counterclockwise respectively

to the center of the motif. In addition, the *pan bua ana* motif can also be found in the concept of parallel line which represents the philosophy of the river that flows in the motif.

Explaining

Explaining relates to various cognitive aspects of society in questioning, conceptualizing, and explaining environmental phenomena in a clear, systematic, and logical argument. In relation to research, attention is paid to the logical connectivity in language that allows propositions to be combined, contradicted, expanded, limited, elaborated, and so on. In the weaving activity of the West Amarasi society, the ethnomathematics characteristics associated with explaining can be seen from how the weavers were able to explain very well, clearly, and systematically the weaving process that was carried out from beginning to end. In addition, the arguments that the weavers included in each answer, including an explanation of the meaning and philosophy of each motif, indicated that the people of West Amarasi know and understand well the weaving activities they did. This shows that the West Amarasi society has a way of thinking that is in accordance with the characteristics of regular, structured, and logical mathematical thinking.

The Use Implication Logic

In the weaving activities of the West Amarasi society, it was also found ethnomathematics characteristics that Bishop (1988) did not mention. In the weaving activities of the West Amarasi society, it was found the use of implication logic. Weavers use implication sentences when estimating the processing time of a particular fabric motif. Take a look at the following interview excerpt.

R	:	How long does it take to weave one sarong? (*Neon fauk aina hom mteun tais*)
S	:	If we are focus to wave, from morning to evening, then it is approximately taken 1 week. If there are many obstructions, then it may take more than 1 week. (*Karu mteun focus na'ko kiku tia man sen maeb karu tairunat bisa kre'es. Karu mui halangan nes na'ko kre'es*).

The interview above show that the weavers use implication logic sentences when giving answers regarding the time of making a sarong motif for women. Mathematically, it can be expressed in the form of implications as follows.

If *p* then *q* "denoted by" $p \Rightarrow q$

***p*:** Weavers focus on weaving from morning to evening,
***q*:** It takes approximately 1 week to complete a cloth motif for women.

Estimating

In the weaving activity of the West Amarasi society, other ethnomathematics characteristics was also found, namely the activity of weavers in estimating the size of fabrics, dose of *loba*, and duration of time for several stages of weaving. In the process of rolling the yarn, the weaver stated that the yarn was first shaped into small balls of maximum size like a baseball. This indicates that the weavers estimated the size of the spherical yarn roll with the diameter of a baseball. The unit of length used in this estimation was not stated with certainty, but by using other objects that have a similar geometric shape.

Weavers also made estimation when determining the amount of noni root bark and *loba* bark needed to color one head of yarn. Take a look at the following interview excerpt.

R	:	Can you tell me a little about the coloring process?
S	:	After oiling, it (the yarn) is then colored with brick red color using noni root bark and *loba* bark. One head of yarn requires 1 small sack of noni root bark and 3 glasses of mineral water of *loba*. (*Ta'fenu urari, au moe warna re me' bata nek hau ba'at mengkudu nok loba. Naka mese tan butuh hau ba'at mengkudu kaor an'es ok'ete kras akua loba*).

Based on the interview, it can be seen that the weavers estimated the need for noni root bark with a small sack and the need for *loba* with the size of a glass of mineral water. In this case, there was no specific size of the sack or volume of the glass of mineral water. But the wavers estimated the need with specific daily tools namely small sack and glass of mineral water.

Estimation was also found in many stages of weaving activity when weavers estimated the time required to complete the stages or the whole weaving activity. For example, when estimating the time to weave a blanket, the weaver stated that it would take longer than 1 week because it took 3 times of waving (*karu taimuti nes na'ko kre'es because mteun hae tenu*). In this case, the weaver cannot determine the exact time required to weave a blanket, but can estimate the processing time based on the level of difficulty of the process.

Based on the results of observations and interviews that have been described above, it can be found ethnomathematics in the weaving activities of the West Amarasi society. The results of the research described above show that ethnomathematics characteristics are identified in many stages of weaving. In general, the ethnomathematics found in the weaving activities of the West Amarasi society include counting, locating, measuring, designing, explaining, the use of implication logic, and estimating activities.

In each of these ethnomathematics activities and characteristics, various applications of mathematical concepts by the West Amarasi society can be found in their weaving activities. In the counting activity, it was found the use of the concept of multiplication as repeated addition in the process of rolling yarns and determining the number of yarns for one fabric motif. In the locating activity, the concept of parallel lines was found. In the measuring activity, the concept of the length and width of the cloth was found in certain units. In the designing activity, geometric shapes (triangles and rhombuses) and geometric transformation concepts (reflection and rotation) were found. In the explaining activity, it can be found the characteristics of regular, structured, and logical mathematical thinking. This was in line with the previous research. (Talan et al., 2021) which is found that some of the ethnomathematics characteristics and activities above in the weaving activities of the West Amarasi society.

Furthermore, this research also found other ethnomathematics characteristics in the weaving activities of the West Amarasi society that were not found in previous studies and in addition to Bishop's perspective. The other ethnomathematics characteristics were the use of implication logic and estimating activity. In the weaving activity of the West Amarasi society, the wavers used implications logic to answer the question about the working time of a certain fabric motif. This was also in line with the findings of previous research in other cultural context (Dominikus et al., 2017) which also identified the characteristics of using implication logic sentences in the weaving practice in Adonara. In addition, this research was also found the estimating characteristic in the waving activity of West Amarasi society. The estimating activities was found in determining the size of the yarn roll, the dose of noni root bark and *lobo* for coloring, and the time to make a blanket motif. This was also in line with the findings of previous research in other cultural context (Muhtadi et al., 2017), which found estimating activities in the context of Sundanese culture.

Based on the explanation above, it can be said that in the weaving activities of the West Amarasi society, various ethnomathematics characteristics were identified. The ethnomathematics characteristics also indicated the existence and practice of mathematics in the context of the socio-cultural life of the West Amarasi society. Furthermore, mathematics concepts, geometric shapes, and characteristics of mathematical thinking were also found in the weaving activities of the West Amarasi society.

CONCLUSION

Based on the results of the data analysis and discussion above, it can be concluded that in the weaving activities of the West Amarasi society, various ethnomathematics characteristics were identified. The ethnomathematics characteristics were counting, locating, measuring, designing, explaining, the use of implication logic, and estimating. Those ethnomathematics characteristics can be found in many stage as well as in the entire weaving activity of the West Amarasi society, starting from spinning and rolling yarn to weaving activities and determining the price of woven fabrics.

Furthermore, the discovery of various ethnomathematics characteristics in the weaving activities of the West Amarasi society shows the existence, practice, and development of mathematical concepts and ways of thinking in the socio-cultural context of the West Amarasi society. Some of the concepts and ways of thinking in question are related to the concept of multiplication as repeated addition, parallel of straight lines, geometric shapes, reflection, rotation, sizes and units, and mathematical (implication) logic. In addition, it can also be concluded that the West Amarasi people also have the characteristics of mathematical thinking in their weaving activities.

Departing from this, it can be said that the weaving activity of the West Amarasi society can be a context and resources for students to learn mathematics. Therefore, the weaving activity of the West Amarasi society needs to be considered by teachers, researcher or Mathematics Education Practitioner, especially those who stay in West Amarasi as a learning resource and context for learning mathematics. This allows students to learn and understand various mathematics concepts more concretely. Therefore, it is recommended for mathematics teachers to design and apply ethnomathematics based learning. It is also recommended for researcher to conduct research regarding ethnomathematics based learning for students learning outcome.

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