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Ethnomathematics Study at The Tomb of Sunan Bonang Tuban

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Abstract

Mathematics learning will become more meaningful if ethnomathematics is implemented in students' daily activities. The tomb of Sunan Bonang is one of the cultures of Tuban City that students know. Therefore, this study aims to describe ethnomathematics at the tomb of Sunan Bonang so that it can be used as a reference source for ethnomathematics in Tuban. These Data were obtained through observation, interviews, and documentation. The data were analyzed using domain and taxonomy analysis based on Bishop's mathematical aspects of counting, locating, and designing. The results showed the existence of mathematical concepts, especially counting, geometry, arithmetic sequence, and congruence. The results of this study can be developed as an alternative material used for mathematics learning media at all school levels according to the material taught.

Keywords: Ethnomathematics, Counting, Locating, Designing

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INTRODUCTION

Mathematics is also called the queen of knowledge, servant of knowledge, art, and human activity (Ernest, 2018). Human activities are related to the local community's culture (Muhtadi & Prahmana, 2017). Mathematics is a culture (Bishop, 1994). Therefore, mathematics has universal properties (Ngiza, 2015). Culture and mathematics are a unity (Wati et al., 2021). According to researchers, mathematics is a science inherent in human life as a culture.

The increasingly rapid push of the times impacts all aspects, including education. Providing students with reasoning and critical thinking skills becomes one of the foundations for building students' way of thinking (Rachmantika & Wardono, 2019). One of the subjects that can train students in processing and analyzing information is mathematics (Warli, 2017). Mathematics learning is learning that has two assumptions. Learning mathematics is considered easy and fun for students who like challenging and logical things (Dirgantoro, 2018). Learning mathematics is also considered difficult and tedious for students who lack an understanding of mathematics (Pinahayu, 2016).

Many factors underlie this assumption. One of them is because of the abstract characteristics of mathematics (Sriyanto, 2017). Apart from that, students do not sufficiently understand the perception regarding implementing mathematics learning in daily activities taught at school (Pepin et al., 2017). This results in low learning outcomes and students' interest in mathematics, making mathematics learning less meaningful. Learning will be more meaningful if learning is close to students' daily activities (Widada et al., 2018).

Students' daily activities cannot be separated from local wisdom in each region. Local wisdom can act as the identity of a particular community or region (Novitasari et al., 2017). Local wisdom has changed, evolved, and been updated during the transformation

(Singsomboon, 2014). Local wisdom has a relationship with mathematics. Mathematics can emerge from local wisdom (Budiarto, 2016). Mathematics and local wisdom can be studied through ethnomathematics (Arisetyawan et al., 2014). In the educational sphere, learning mathematics through ethnomathematics will be closer to students' activities because learning is related to local wisdom in their respective regions. To improve student insight, instructional materials should include local wisdom content (Abadi et al., 2018) when knowledge is transferred from sources and teachers to students through the environment around students (Hariastuti et al., 2019). Local wisdom, especially in Tuban Regency, is an aspect that can be relevant to mathematics learning to make it more meaningful.

D'Ambrosio introduced Ethnomathematics as a mathematical science applied to different cultural groups, namely the professional class, working groups, Indigenous peoples, children's groups, and various ages (Wikaningtyas et al., 2022). D'Ambrosio says that ethnomathematics comes from the words “ethnic,” “mathema,” and “tics.” The word “ethno” is seen from a comprehensive socio-cultural context and includes language, jargon, behavioral codes, myths, and symbols. “mathema” means explaining, knowing, understanding, and performing activities such as coding, measuring, clarifying, inferring, and modeling. The last word, “tics,” comes from the word techne and has the same meaning as technique (D’Ambrosio & Rosa, 2017). Ethnomathematics is a method of knowledge applied in society, specifically in mathematical activities (Mulyasari et al., 2021). Ethnomathematics is a field that studies and investigates mathematical ideas through local wisdom and history in a society (Aditya, 2018).

Ethnomathematics can be a bridge between mathematics and local wisdom. Ethnomathematics is mathematics that emerges, develops, sticks, and is applied repeatedly in the form of local wisdom in a community group (Alangui, 2017). Ethnomathematics is a field of science whose nature is to express the relationship between culture and mathematics. At the same time, mathematics is defined as a broad term for counting, classifying, sorting, inferring, and modeling (Kristial et al., 2021). According to Bishop, mathematical aspects that can be indicators of ethnomathematics are counting, measuring, locating, designing, playing, and explaining (Novella, 2021).

Several researchers have carried out research related to ethnomathematics at the tomb of influential figures. There is ethnomathematics research on the tomb of Sunan Kudus, which integrates mathematics learning with the local wisdom of the community in Kudus Regency. Local wisdom combines calculating, discovering, drawing, measuring, designing, and playing activities to strengthen multiculturalism (Masamah, 2019). Ethnomathematics research on Bung Karno's tomb provides the possibility of ethnic mathematics for human learning and finding mathematical principles in Bung Karno's tomb through realistic mathematics learning (Nisa & Rofiki, 2022). Ethnomathematics research at the High Board Tomb found mathematical concepts, especially the concept of flat and spatial shapes (Sinaga & Yahfizham, 2023). The results of ethnomathematics research at the tomb of Maulana Malik Ibrahim, commonly called Sunan Gresik, contain mathematical concepts including geometry, namely spatial and flat shapes, and transformation geometry, which can be used as a reference for creating contextual-based mathematics learning methods (Sholichah et al., 2021). Another research study is the Ki Ageng Giring III building complex, which contains mathematical elements, namely geometry (Adelia et al., 2020).

In connection with the above problems, the researcher wants to combine the local wisdom of Tuban Regency with mathematics through ethnomathematics. The local wisdom to be studied is the Tomb of Sunan Bonang. The tomb is a tangible local wisdom (Ghofur & Ismanto, 2022). Tangible local wisdom is local wisdom that has a physical form (Widodo, 2012). Sunan Bonang's tomb is one of the religious tours in Tuban Regency.

Research related to ethnomathematics has been carried out at the Sunan Bonang mosque. Meanwhile, ethnomathematics research has never been conducted at the Tomb of Sunan Bonang. Therefore, researchers conducted an "Ethnomathematics Study at the Tomb of Sunan Bonang." This research aims to describe ethnomathematics at the Tomb of Sunan Bonang so that it can facilitate educators and students, especially in Tuban Regency, to get to know and understand math lessons more closely.

METHODS

The ethnomathematics data obtained and analyzed is qualitative. The data is presented in detail in a descriptive form. Thus, this research is qualitative descriptive research with an ethnographic approach. The ethnographic approach is empirical and theoretical. This approach aims to obtain in-depth descriptions and data analysis related to local wisdom (Côté-Boileau et al., 2020). The research instrument used is a human instrument, a direct researcher who goes to the field as a data collector who cannot be replaced (Indrawati, 2021).

According to Spradley, this research adopted the six stages of the ethnographic approach (Saragih et al., 2022). The first stage is the selection of the ethnographic project. The ethnographic project the researcher chose was the tomb of Sunan Bonang, Kutorejo Village, Tuban District, Tuban Regency, East Java. The researcher also limited the focus of the research, which was only on exploring ethnomathematics from the tomb of Sunan Bonang. The second stage is the submission of ethnographic questions. In this cycle, the researcher interviewed informants about the information they had about Sunan Bonang's tomb. Cultural heritage experts in Tuban Regency became informants in this research. The third stage is ethnographic data collection. Researchers conducted field observations in this stage to collect ethnomathematics data at Sunan Bonang Tomb. The fourth stage is ethnographic recording. Researchers made ethnographic notes at this stage by photographing and capturing informants' voices. The fifth stage is ethnographic data analysis. At this stage, the author evaluates the field data collected.

Domain analysis and taxonomy analysis are the analysis techniques that researchers use in this stage. This domain analysis was conducted to gain a broad understanding of the object under study (Wijaya, 2018). The object was the tomb of Sunan Bonang. After that, a taxonomic analysis was conducted. Taxonomic analysis is done by digging deeper into the information and grouping it into categories (Wijaya, 2018). According to Bishop, the taxonomy analysis was carried out using mathematical aspects, namely counting, locating, and designing, which were found at the tomb of Sunan Bonang. The sixth or final stage is writing an ethnography. Data will be presented in images and detailed descriptions in descriptive form, as obtained through interviews, observation, and documentation.

RESULTS & DISCUSSION

Results

The Sunan Bonang Tomb Complex is located in Kutorejo Village, Tuban District, Tuban Regency, East Java, Indonesia (Hanifah, 2020). It is close to the crowds, namely to the west of the *Agung* Mosque in Tuban. Apart from that, the location is strategically in the middle of the city, close to Tuban Square and the *Kambang Putih* Museum (Febriyanti & Ayundasari, 2021).

Sunan Bonang is one of the *Walisongo* in Java. Sunan Bonang's real name is Raden Maulana Makdum Ibrahim. He was born in 1465 AD and died in 1525 AD. He was the son of Sunan Ampel from his marriage to Nyai Ageng Manila, daughter of Aryo Tejo Tumenggung Majapahit, who ruled in Tuban. Because his biological mother came from Tuban and his mother's younger brother, Arya Wilatikta, became the Duke of Tuban, Sunan Bonang had a special relationship with the Tuban Regent's family since childhood. Until his death, he was buried in Tuban (Warsini, 2022).

Raden Maulana Makdum Ibrahim is better known as Sunan Bonang because he preached while using a folk art called "*Bonang,*" similar to a gong but smaller in size (Faizi, 2007). Folk art was used to attract the sympathy of the people of Tuban, who were still Hindus then. Because Sunan Bonang played it in the mosque, people who heard it flocked to the mosque. He recited Javanese songs containing Islamic teachings accompanied by the gamelan bonang. When Sunan Bonang himself struck the bonang with a soft wood, it could sing a melodious sound (Warsini, 2022).

The Sunan Bonang Tomb in Tuban Regency is a complex consisting of three yards: yards I, II, and III. The following is a plan of the Sunan Bonang Tomb complex horizontally:

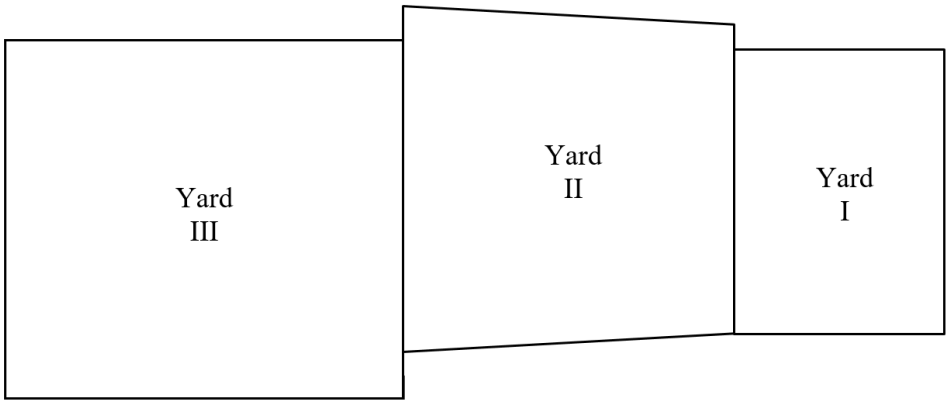

Figure 1. Plan of the Division of the Sunan Bonang Tomb Complex

From a design perspective, based on Figure 1, yard I is a rectangle with a length of 27 meters and a width of 19 meters. The yard I is called the "*jaba depan*." In Javanese, *jaba* means outside, and *depan* means front, so *jaba depan* is the outside yard in front. Because I am the outer yard at the front, it is not included in the sacred part—yard I is usually used as a resting place for visitors on pilgrimage. To enter yard I, you must pass through the gate I, the *regol* gate.

The next yard is yard II. Yard II is the middle yard between yard I and yard III. From a design aspect, yard II is shaped like an isosceles trapezoid with parallel sides measuring 32 and 39 meters, and the hypotenuse is 44 meters. Yard II is also called "*jaba tengah"*. In Javanese, Central Java has the outer yard in the middle, which is almost similar to the yard I. Yard II is usually used to take ablution water for visitors who want to go on a pilgrimage. Therefore, yard II is semi-sacred. In yard II, the Mabarrot Sunan Bonang Foundation office, the Tuban Regency Cultural Preservation Center office, the Atana mosque, ablution places and bathrooms, the west *Rante* pavilion, and the east *Rante* pavilion. To enter yard II, you must pass through gate II, the *paduraksa* gate, between yards I and II.

The last yard is yard III. When viewed from a design aspect, yard III is rectangular, with a length of 49.5 meters and a width of 38.5 meters. Yard III is also called "*jeroan*". In

Javanese, *jero* means in, and *an* is a *panambang* or affix at the end of a word. Therefore, the *jeroan* is the yard inside. Yard III is the main yard and is sacred. Yard III is an area of other ancient and new tombs, and the main one is the tomb of Sunan Bonang and the four dukes, which are in the Cungkup. To enter yard III, you must pass through gate III, namely the paduraksa gate, between yards II and III. Based on the results of the observations, the interviews conducted with cultural heritage expert subjects in the interview transcripts are written as "S." For S001, the first conversation is given. For S002, the second conversation is given on the same subject. This also applies to researchers. The researcher is written with "R". The following are the results of the interview conducted with the research subject:

R001 : What is the division of yard arrangement I, yard II, yard III, ma'am?
S001 : I mean, I am called "*jaba depan*" at the front. Before that there was the *regol* gate. So, go to the *regol* gate first, then the *jaba depan*. So, there are two gates here; one is in the form of a *regol,* and the other is a *paduraksa* gate. Suppose *paduraksa* is the gate to enter yard II and yard III. Yard II is called "*jaba tengah*". The *jaba tengah* is semi-sacred for wudlu. Then, there is also a *paduraksa* gate to enter yard III. There is a gate; maybe you can say it is like a temple because there was a Hindu-Buddhist religion before Islam entered. When Islam entered, this gate already existed, and Sunan Bonang also respected each other and did not eliminate what had been built by the previous religion because, indeed, the approach taken by Sunan Bonang was not harsh, right? Again, yard III is the "*jeroan,*" a sacred place. You can see it in the data for the size of each yard.

In the locating aspect, according to Table 1, the layout of yards I to yard III has sequential placement starting from the front, namely yard I, which has the smallest area, to the last yard III, which has the smallest area to the rearmost yard III which has the largest area, as shown in table 1 below:

Table 1. Area of yard I, yard II, and yard III

Yard	Shape	Formula of area	Area
I	Rectangle	$l \times w = 27\ m \times 19\ m$	513 m^2
II	Isosceles trapezoid	$\frac{1}{2}(number\ of\ parallel\ sides) \times h$ $= \frac{1}{2}(71) \times 43{,}86$	1557,03 m^2
III	Rectangle	$l \times w = 49{,}5\ m \times 38{,}5\ m$	1904,75 m^2

There are three gates in the Sunan Bonang Tomb Complex: gate I is the regol gate, gate II is the paduraksa gate, and gate III is the *paduraksa* gate. In the locating aspect, there is a pattern between the location of the gate and the courtyard; that is, after passing through the gate, the courtyard will continue. So the pattern is gate I, yard I, gate II, yard II, gate III, yard III. This can be seen in Figure 2 below:

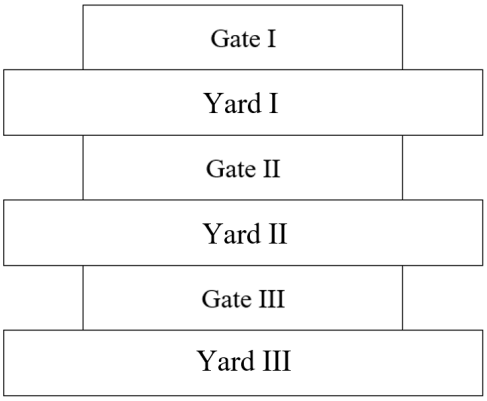

Figure 2. Alternating Gate and Yard Arrangement Patterns

The beautiful shape of the gate is included in the design aspect. Gate I has a *regol* shape. Therefore, it is called a *regol* gate. The *regol* gate is a gate that is not too high. So, to pass, it must be done down. The shape of the gate is shown in Figure 3 below:


Figure 3. *Regol* Gate or Gate I

On the *Regol* gate is an inscription in Javanese script that reads "*Rasa Tunggal Pandhita Wahdat*." The writing is in the middle above the entrance to the *Regol* gate. This article is included in the counting aspect because this article refers to a year. Figure 4 shows the Javanese script inscription on the *Regol* gate:

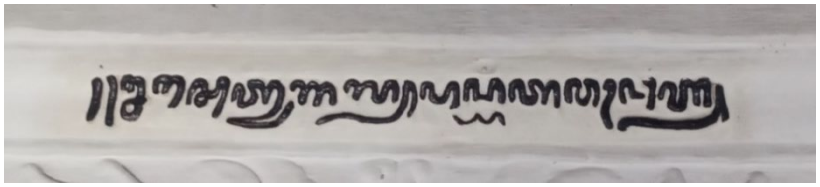
Figure 4. *Rasa Tunggal Pandhita Wahdat* writing in Javanese script on the *regol* gate

The following is a transcript of the results of the interview with the subject, namely as follows:

R014 : Were there any games from Tuban during Sunan Bonang's time that were used as a medium for da'wah, ma'am? If so, what was the model?

S014 : There were no games; maybe Sunan Bonang used songs to preach. There is a traditional bonang musical instrument in the Museum that Sunan Bonang also used to preach. To say that there is a tomb of Sunan Bonang is proven by many evidences as supporting data. A Javanese carving reads "*Rasa Tunggal Pandhita Wahdat*" at Gate I. Sunan Bonang did not have a wife,

> meaning he was Sunan Wahdat. "*Wahdat*" is one. "*Rasa*" is six, "*Tunggal*" is one, "*Pandhita*" is seven. That's sengkalan mbak. it's called "*Candra Sengkala*". It is a writing that contains a meaning, the meaning of a number, and shows the direction of a year. So, "*Rasa Tunggal Pandhita Wahdat*" reads the direction of the year from the back. So, *wahdat* is 1, *pandhita* is 7, *tunggal* is 1, and *rasa* is 6. So the year is 1716, just like reading numbers.

In line with the observation and the interview results, the subject also explained an explanation related to the writing. The inscription "*Rasa Tunggal Pandhita Wahdat*" is a moon of *Candra Sengkala*. *Candra sengkala* is an inscription that indicates a year and contains a meaning from that number. *Rasa* means six, *Tunggal* means one, *Pandhita* means seven, and *Wahdat* means one. Sunan Bonang is also known as Sunan Wahdat, which is one because Sunan Bonang has no wife. To read the year, it starts from the word that is at the end. So, the "*Rasa Tunggal Pandhita Wahdat*" indicates 1716 Javanese year.

Before passing through gate III, there are two *rante* pavilions, namely the east *rante* pavilion and the west *rante* pavilion as shown in Figure 5. In the design aspect, the two pendopo rante have the same shape and are congruent, or are called congruent. Congruent is two flat shapes with corresponding sides of the same length and angles of the same size (Safitri, 2021). A series of congruent flat shapes with the same layout between the east *rante* pavilion and the west *rante* pavilion produce congruent spatial shapes too.

Figure 5. Congruent East and West *Rante* pavilion

The two *rante* pavilions are in the form of a *joglo*. As seen in Figure 6, the roof shape of the pavilion is a combination of a square pyramid and a truncated square pyramid. At the top of the pendopo rante roof is a rectangular pyramid and at the bottom the roof is a sharp rectangular pyramid.

Figure 6. The shape of the *Pendopo Rante* Sirap is a combination of rectangular pyramids and truncated rectangular pyramids

The following is the formula for the volume and area of the blanket of a rectangular pyramid shape (Salsabila & Soebagyo, 2023):

The volume of a rectangular pyramid $= \frac{1}{3} \times area\ of\ the\ rectangular\ base \times h$ ……..(1)

Area of a rectangular pyramid blanket $= 4 \times area\ of\ the\ triangle$ ……..(2)

A truncated rectangular pyramid is a cut from a rectangular pyramid. The following is the formula for the volume and area of a truncated rectangular pyramid (Arta & Ansosry, 2019):

The volume of the truncated rectangular pyramid $= \frac{1}{3} \times h \times \left(A_1 + \sqrt{A_1 A_2}\right) + A_2$ ……..(3)

Cover area of a truncated rectangular pyramid $= 4 \times area\ of\ an\ isosceles\ trapezoid$ ……..(4)

In the locating aspect, there is a pattern in the arrangement of the *sirap* on the *rante* pavilion. *Sirap* are made of teak wood. Figure 7 below applies the pattern of arithmetic sequences arranged on the pavilion *sirap*:

Figure 7. The shingle arrangement at the Rante Pendopo has a number sequence pattern

The arrangement of the sirap on the *rante* pavilion, as shown in Figure 7, is relevant to the concept of arithmetic sequences and series. An arithmetic sequence is a sequence of numbers with adjacent terms and has a specific pattern; namely, the difference between two terms is fixed/constant. Meanwhile, an arithmetic series is several numbers with a specific pattern, namely, the difference between two consecutive terms is the same and constant; in other words, an arithmetic series is the sum of arithmetic sequences (Khairi, 2018). The results of observations on the arrangement of *sirap* on the *Rante* pavilion, starting from the top shingle to the bottom shingle, are as shown in Table 2 below:

Table 2. Arithmetic Sequences and Arithmetic Series of *sirap* Arrangements at *Rante* Pavilion

Shingle Row	The nth Term Arithmetic Sequence (U_n)	Arithmetic Series (S_n)
1-3	$a_1 = 1, a_2 = 2, a_3 = 3$	$S_3 = 6$
4-7	$a_1 = 3, a_2 = 4, a_3 = 5, a_4 = 6$	$S_4 = 18$
8-18	$a_1 = 6, a_2 = 7, a_3 = 8, a_4 = 9,$ $a_5 = 10, a_6 = 11, a_7 = 12, a_8 = 13,$ $a_9 = 14, a_{10} = 15, a_{11} = 16$	$S_{11} = 121$
19-22	$a_1 = 19, a_2 = 20, a_3 = 21, a_4 = 22$	$S_4 = 82$

The following is the formula for the nth term of the arithmetic sequence (Khairi, 2018):

$$a_n = a_1 + (n-1)d \quad \text{.....(5)}$$

With description:
a_n = The nth term in sequence
a_1 = the First term in sequence
n = Lots of lines
d = The common difference between terms

To calculate the number of the nth term for the preparation of sirap in the *rante* pavilion, the concept of an arithmetic series can be used, namely as follows (Khairi, 2018):

$$S_n = \frac{n}{2}(2a + (n-1)d) \quad \text{.....(6)}$$

With description:
S_n = Sum of first n term
a = the First term in the sequence
n = Lots of lines
d = The common difference between terms

The total number of sirap in one pavilion is 4×227= 908 sirap. So, for the two *rante* pavilions, namely the east *rante* pavilion and the west *rante* pavilion, the total number of sirap is 2×908= 1816 sirap. In the design aspect, sirap form a shape similar to a flat rhombus structure.

In the designing aspect, it can be seen from Figure 8 that the arrangement of the first combination of flat shapes with the combination of other flat shapes uses the concept of geometric transformation, namely the reflection or mirroring of a vertical line. Apart from that, the concept of reflection is also found on the right side of the fence, which is reflected on the vertical line in the middle of the fence and will produce a shadow in the form of the left side of the fence. Figure 8 below is the observation result:

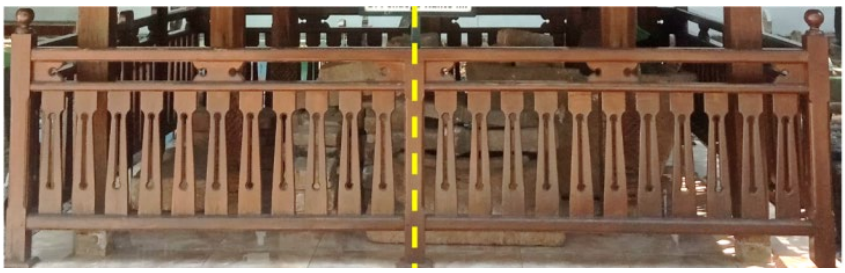

Figure 8. Arrangement of the Chain Pendopo Fence between the Right and Left Parts, which is Congruent and Uses the Concept of Reflection

After entering yard III, the first thing you will encounter is *rana*. *Rana* is a shutter/screen to viewing barrier that functions so that people outside cannot look directly into a sacred space. *Rana* is decorated with a circular arrangement of ceramic plates. *Rana* is 3,56 meters long, 2,22 meters high, and 0,57 meters thick. The following are the results of the interview with the subject:

R010 : The shutter is the wall behind Gate III, ma'am?

S010 : Yes, that is right. It is *Rana* or *Kelir*; the color is white. If in the community at home, it is usually a barrier but not the wall; it is a wooden barrier in the house so that it looks wider. However, if the *Rana* / *Kelir* functions as a view barrier, it prevents people from seeing what it looks like inside directly. *Rana* here has a decoration, a ceramic plate that might be able to enter the shape of the ceramic plate, maybe a circle. The length of the shutter is 3.56 m, the height is 2.22 m, and the thickness is 0.57 m.

In the arrangement of the ceramic plate ornaments contained in *rana*, there is a locating aspect, namely the number of plates in each vertical arrangement forming a row pattern of 2,3,2,3,2,3,2. So, the total number of ceramic plates is 17 pieces. Figure 9 is the observation result on the *rana*:

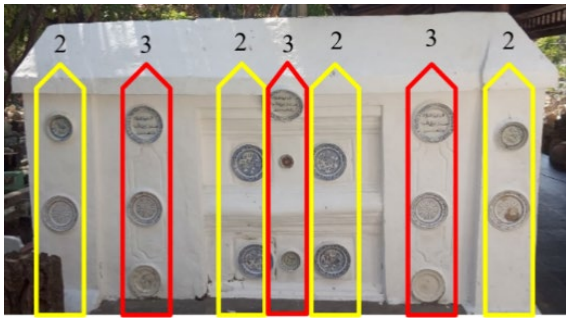

Figure 9. Arrangement of Ceramic Plates on *Rana* Forming a Repeating Row Pattern

After passing through *rana*, courtyard III is full of tombstones and tombstones. The tombs in the Sunan Bonang Tomb Complex are the tombs of Sunan Bonang and his relatives, the tombs of several dukes of Tuban, and the tombs of residents around the Sunan Bonang Tomb Complex. In the locating aspect, there is an arrangement of tombs whose ceramics are parallel between one row and another. It can be seen from Figure 10 that the tombstones between one row and another are parallel to the other tombstones. However, the tombs that are not ceramic are still arranged irregularly.

Figure 10. Arrangement of Tombs Parallel to Other Tombs in Each Row

Sunan Bonang's tomb is inside a cungkup measuring 11×11 m^2 and 6.65 m high. The building is shaped like a joglo. Inside the cungkup, there are five tombs. The following is an explanation of the subject:

R007 : How are the tombs in the Sunan Bonang complex grouped and arranged, ma'am?

S007 : The tombs in this complex are constantly changing. However, there are five tombs in the Cungkup for the cultural heritage we preserve. The arrangement is Sunan Bonang in the center; the *jirat* is the longest, and the headstone is the tallest. The size of the jirat can be seen in the data later. To

the left of Sunan Bonang's tomb is the tomb of Adipatih IX, namely Adipatih Kyai Ageng Ngasreh. On the right side of Sunan Bonang's tomb is the tomb of Adipatih X, namely Adipatih Kyai Ageng Gegilang. He was the son of Adipatih Kyai Ageng Ngasreh. Then, on the far right is the tomb of Adipatih XI, namely Adipatih Kyai Ageng Boto Abang. He is the son of Adipatih Kyai Ageng Gegilang. Then, on the far left is the tomb of Adipatih XII, namely Adipatih Balewod. He is the son of Adipatih Kyai Ageng Boto Abang. So the arrangement is lined up like that. Adipatih is now called Regent.

Based on the interview results, Inside the *cungkup*, there are five tombs with the Sunan Bonang dining arrangement in the middle. The tomb is the longest, and the tombstone is the tallest. Then, to the left of Sunan Bonang's tomb is the tomb of Adipatih IX, namely Adipatih Kyai Ageng Ngasreh. Then, to the right of the Sunan Bonang Tomb is the tomb of Adipatih X, namely Adipatih Kyai Ageng Gegilang. He is the son of Adipatih Kyai Ageng Ngasreh. Then, on the far right is the tomb of Adipatih XI, namely Adipatih Kyai Ageng Boto Abang. He is the son of Adipatih Kyai Ageng Gegilang. Then, on the far left is the tomb of Adipatih XII, namely Adipatih Balewod. He is the son of Adipatih Kyai Ageng Boto Abang. Adipatih is the leader of the regency. According to the interview results with the subject, the tombs inside the cupola can be arranged as shown in Figure 11.

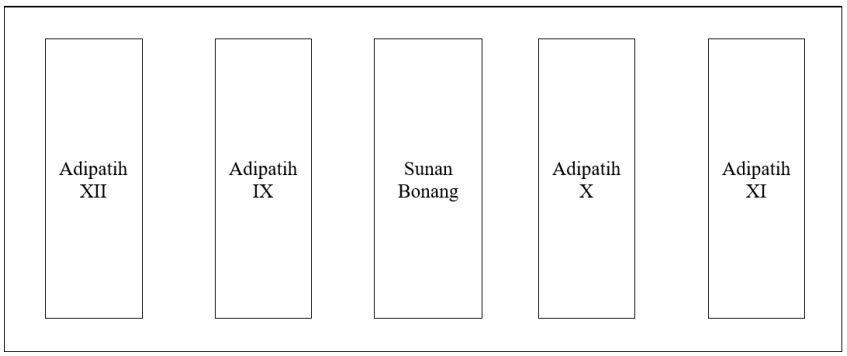

Figure 11. Arrangement of Sunan Bonang and Adipatih's tombs in the cungkup

The *cungkup* of Sunan Bonang's tomb is made of teak wood and is called a *sirap*. The following is a transcript of the results of the interview with the subject:

R004	:	The roof of Sunan Bonang's tomb is called a *cungkup*, ma'am?
S004	:	Yes, it is called "*cungkup*."
R005	:	What is the size of the *cungkup*, ma'am?
S005	:	The *cungkup* is 11x11 m, 6.65 m high. The cungkup is overlapping. So the *cungkup* has *sirap*. The "*sirap*" is a wooden structure. However, you can probably calculate the number of sirap using the math formula.

In the design aspect, this *cungkup* has the combined shape of a sharp pyramid and a rectangular pyramid like the roof of the chain pavilion. Figure 12 is the shape of the *cungkup* of Sunan Bonang's tomb:

Figure 12. The *cungkup* of Sunan Bonang's tomb in the form of a combined rectangular pyramid and truncated rectangular pyramid

In the locating aspect, the arrangement of the *sirap* on the *cungkup* also forms an arithmetic series and arithmetic series as found on the *sirap* on the *rante* pavilion. An arithmetic sequence is a sequence of numbers with adjacent terms and has a specific pattern; namely, the difference between two terms is fixed/constant. Meanwhile, an arithmetic series is several numbers that have a specific pattern, namely, the difference between two consecutive terms is the same and constant, or in other words, an arithmetic series is the sum of arithmetic sequences (Khairi, 2018). The results of observations on the arrangement of *sirap* on the *cungkup,* starting from the top shingle to the bottom shingle, are as shown in Table 3 below:

Table 3. Arithmetic Sequences and Arithmetic Series in the Arrangement of *Sirap* in the Sunan Bonang Tomb

Shingle Row	The nth Term Arithmetic Sequence (U_n)	Arithmetic Series (S_n)
1-7	$U_1 = 1, U_2 = 2, U_3 = 3, U_4 = 4$ $U_5 = 5, U_6 = 6, U_7 = 7$	$S_7 = 28$
8-15	$U_1 = 9, U_2 = 10, U_3 = 11, U_4 = 12,$ $U_5 = 13, U_6 = 14, U_7 = 15, U_8 = 16$	$S_8 = 100$
16-23	$U_1 = 18, U_2 = 19, U_3 = 20, U_4 = 21,$ $U_5 = 22, U_6 = 23, U_7 = 24, U_8 = 25$	$S_8 = 172$
24-27	$U_1 = 28, U_2 = 29, U_3 = 30, U_4 = 31$	$S_4 = 118$
28-32	$U_1 = 33, U_2 = 34, U_3 = 35, U_4 = 36,$ $U_5 = 37$	$S_5 = 175$
33-36	$U_1 = 40, U_2 = 41, U_3 = 42, U_4 = 43$	$S_4 = 166$

You can use the formula as in number (5) to calculate an arithmetic sequence. Meanwhile, you can use the formula as in number (6) to calculate the arithmetic series.

Discussion

The discussion of ethnomathematics in Tuban local wisdom by the data presentation and research data analysis is as follows on the counting aspect of the *regol* gate before entering the Sunan Bonang Tomb Complex, there is an inscription "*rasa tunggal pandhita wahdat*" which indicates a year called *candra sengkala*. *Rasa* is six, *tunggal* is one, *pandhita* is seven, and *wahdat* is one. So, reading the writing from the back means it shows the year 1716. Prabowo's research (2015) discusses the year numbers in the form of *sengkala*; the *candra sengkala* are arranged from the leftmost position, but the reading of the year numbers starts from the opposite direction, namely the right. Each word used to compose the *sengkala* has one of the characters from zero to nine. Because *sengkala* is used to express a year without using numbers, it is called a year number code. *Sengkala*

is also entombed in the Sanjaya (Canggal) inscription "*critic indriya rasa*." *Cruti* means four, *indriya* is five, *rasa* is six. The year that was declared the year was 654 Saka.

In the Sunan Bonang Tomb's locating aspect, yards are sequentially divided from the smallest to the most significant area, namely from yards I, II, and III. The arrangement between the gate and the courtyard has an alternating pattern: gate I, yard I, gate II, yard II, gate III, and yard III. Relevant mathematical material is sorting and comparing numbers. The tombs at Sunan Bonang Cemetery are also arranged parallel to each other.

In the designing aspect of the Tomb of Sunan Bonang, there are yards I and yards III in the shape of a rectangle and yards II in the shape of a trapezoid. The shape of the eastern rante pavilion is congruent with the western rante pavilion. The shape of the roof of the pendopo rante and the cungkup of the Sunan Bonang tomb building combines rectangular and truncated pyramid shapes. Several studies discuss flat shapes, spatial shapes, and congruence. Starting from Wahyuni & Alifia's research (2022) which examines ethnomathematics on the geometric shapes of the Probolinggo Museum, then Krisma & Nurjanah's research (2023) which examines ethnomathematics on the Raja-raja Imogiri complex, as well as research by Salsabila & Soebagyo (2023) which examines ethnomathematics related to the geometric shapes of Cut Meutia mosques. The research results relevant to this research in the designing aspect are different from this research because the research object is different but has similarities in relevance to mathematics learning material, namely material about plane shapes, space shapes, and material about similarity and congruence.

Based on the results of ethnomathematics research on Tuban local wisdom, it can be used as a reference for developing mathematics learning materials in the form of Student Worksheets, introduction to the material to be taught, materials for making example questions and practice questions, can be used as a reference for learning in the classroom in the form of projects or learning outside the classroom so that students do not feel bored with mathematics by learning continuously in the classroom. The following is the relevance of ethnomathematics to mathematics learning material, which can be used as mathematics learning material at elementary school/equivalent, junior high school/equivalent, and senior high school/equivalent levels.

CONCLUSION

According to Bishop, the results of the ethnomathematics study at the Tomb of Sunan Bonang Tuban obtained three out of six mathematical aspects. First, in the counting aspect at the Sunan Bonang Cemetery, a *candra sengkala* or writing indicates a year on the *regol* pavilion. Second, in the locating aspect at the Sunan Bonang Tomb, there is an arrangement of yards with successive areas, the arrangement of the yards and gates has a shape pattern, the arrangement of the ceramic plates on the *rana* forms a number pattern, the arrangement of the sirap on the *rante* pavilion and the *sirap* on the cungkup of the Sunan Bonang Tomb form an arithmetic sequence, as well as the arrangement of other parallel tombs. Third, in the design aspect of the Sunan Bonang Tomb, yard I and yard III are rectangular, and yard II is trapezoidal; the shape of the eastern *rante* pavilion is congruent with the western *rante* pavilion, the *sirap* shape of the *rante* pavilion and the cungkup shingle of the Sunan Bonang tomb building are a combination of pyramid shapes: quadrilaterals and truncated quadrilaterals.

Accuracy is needed in selecting research subjects so that the information obtained is based on the research objectives. The results of this research can be used as alternative materials for learning media in elementary school/equivalent, junior high school/equivalent, or senior high school/equivalent mathematics learning material. This

research needs to be developed in more depth with more research subjects, and it is necessary to link ethnomathematics at the tomb of Sunan Bonang with learning media.

CONFLICT OF INTEREST

In this research, there is no conflict of interest between the authors.

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