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Basic Concepts and Values of Mathematics in Bengkulu Traditional Musical Instruments as Media and Resources for Learning Mathematics

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ABSTRACT

This study aims to determine the basic concepts and values of mathematics contained in traditional Bengkulu musical instruments in elementary schools. The urgency of this research is to use regional culture in learning mathematics theoretically and practically as a medium and source of learning mathematics through learning outside the classroom to achieve the objectives of learning mathematics in elementary schools. This research method is a qualitative method with an ethnographic approach. Data sources are in the form of traditional Bengkulu musical instruments, namely dhol, tassa, long drums, and serunai. Other data sources are documents and interviews with experts and practitioners of Bengkulu traditional musical instruments. The data were analyzed qualitatively with the method of content analysis. The result of this study shows that the basic mathematical concepts in Bengkulu traditional musical instruments are points, lines, angles, triangles, quadrilaterals, kites, circles, tubes, half balls, cut balls, cut cones, universes, and patterns. At the same time, the mathematical values contained in traditional Bengkulu musical instruments are obeying the rules, consistency, creativity, and cooperation. Therefore, as an alternative to effective learning in elementary schools, Bengkulu traditional musical instruments can be used as a medium and source of learning mathematics outside the classroom.

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A. INTRODUCTION

Traditional music was born and developed in a particular area and passed down from one generation to the next (Saptiawan et al., 2021). The community uses these traditional musical instruments as an expression of pleasure from an activity, such as weddings, welcoming guests, and others. Bengkulu people use the dhol musical instrument in the tabot festival in a series of 1 Muharram celebrations (Mahyudi & Yanti, 2019). Various forms of traditional Bengkulu musical instruments, such as dhol, serunai, tasa, and long drums. Bengkulu traditional musical instruments as Bengkulu cultural products contain the values of the Bengkulu community itself. For example, the serunai musical instrument includes the value of togetherness and friendship (Pili, 2018).

The spiritual representation of the Bengkulu community is manifested in the form of values on traditional musical instruments. Such as the values of togetherness, unity, and cooperation. In addition to many values, Bengkulu traditional musical instruments contain various basic

mathematical concepts. For example, the concept of a circle is found in the upper and lower sections of the dhol musical instrument (Widiarti et al., 2019). An example of the concept of a triangle is located in the webbing on the walls of the dhol musical instrument. In other areas, the concepts of circles, tubes, and half balls were found on traditional ja'i dance musical instruments in the Flores area (Bito & Fredy, 2020).

In addition to containing values, Bengkulu traditional musical instruments include various concepts from various sciences, such as mathematical concepts. For example, the 'dol' musical instrument contains the concept of a circle (Widiarti et al., 2019). There are many other mathematical concepts found in Bengkulu traditional musical instruments. In other areas, the concepts of circles, tubes, and half balls were found on traditional musical instruments ja'i dances in the Flores area (Bito & Fredy, 2020).

Spiritual values are essential for life to create a harmonious life in society. As the nation's next generation, students need to be equipped with values that form a strong personality and noble character. These values can be obtained through learning mathematics related to culture. Moral values can build students' character (Sipahutar et al., 2021). The concepts and values of life contained in Bengkulu traditional musical instruments can be used as sources and media for learning mathematics in elementary schools. As a learning resource, Bengkulu traditional musical instruments contain various mathematical concepts. This can motivate students to learn mathematics. Damaningrum & Budiarto (2021) stated that Reyog Ponorogo's musical instruments could encourage students to learn mathematical literacy. As a medium for learning mathematics, Bengkulu traditional musical instruments can bring students closer and easier to abstract mathematical concepts. In addition, it can be used as a contextual tool in the explanation of mathematical material related to a musical instrument (Turmudi et al., 2021).

The results of previous research on the concepts and values of mathematics contained in traditional Bengkulu musical instruments are still limited. This research will reveal more detail and broadly about the basic concepts and values of mathematics contained in traditional Bengkulu musical instruments and their relation to media and learning resources for mathematics in elementary schools. So this research develops from the results of previous studies.

The formulation of the problem in this research is what are the basic concepts and mathematical values found in Bengkulu traditional musical instruments? In addition, what are the uses of Bengkulu traditional musical instruments in learning mathematics in elementary schools? So the purpose of this study is to find out the basic concepts and mathematical values contained in traditional Bengkulu musical instruments. In addition, to find out the use of Bengkulu traditional musical instruments for learning mathematics in elementary schools.

1. Bengkulu Traditional Musical Instruments

Traditional music is music or sounds from various regions in Indonesia. Traditional music is music that was born and developed in a certain area and passed down from generation to generation. The types of Bengkulu traditional musical instruments include dhol, tasa, long drum, serunai, and kelintang (Tarmizi et al., 2018). The dhol musical instrument is a traditional musical instrument originating from Bengkulu Province. Dhol is made using the stump of an old coconut tree (Mardinata, 2019). Tasa/ Tassa is also known as tambourine kerincing. This musical instrument is made of metal such as copper, iron, or aluminum, and later the surface is

covered with dried animal skin (usually goat). The long drum is made of coconut trunks, leather, wood, and rattan. This instrument is cylindrical with a double head. Finally, Serunai is a traditional Bengkulu musical instrument in the form of a wind instrument. The serunai musical instrument is used by blowing it into the hole in the chrysanthemum.

2. Concepts and Values in Mathematics

Mathematics has various meanings, depending on which angle he views mathematics. Hersh (1977) explains that mathematics is a vast network of interconnected problems and solutions. Hersh (1977) sees mathematics from the aspect of relationships and problem-solving. So mathematics is defined as a science that contains various associations and can be used to solve multiple problems. In mathematics, there are relationships between concepts, mathematics, other sciences, and everyday life. Like the relationship between the concepts of variables, constants, the square of a number, equations, and arithmetic operations form the Pythagorean theorem. The basic concepts referred to in mathematics are basic abstract ideas and can distinguish between an example and a non-example. Such as basic concepts in geometry in the form of understanding triangles, rectangles, circles, cubes, blocks, prisms, pyramids, cones, tubes, and spheres. To limit a basic concept in mathematics, a definition emerges. For example, the definition of a trapezoid is a quadrilateral that has exactly one pair of sides. There are three types of definitions, namely analytic, genetic, and formula definitions.

Value is something that gives meaning to life, a reference, a starting point, and a purpose in life (Şahinkayasi & Kelleci, 2013). The meaning of life is related to morals. So moral values are universal truths that are considered good and important by humans (Esteban, 1990). Values are standards of conduct and attitudes that determine who we are, how we live, and how we treat others (Pa & Tapsir, 2013). The emphasis on values on the elements of action and mindset was also put forward by Şahinkayasi & Kelleci (2013). The moral value of mathematics is related to the meaning of mathematics for life. Soedjadi (2000) linked the moral values of mathematics to mathematics for all. Mathematics is needed by all humans and can be applied to everyday life. In relation to mathematics, values are translated into formal values and material values. The formal value of mathematics is found in the formal purpose of mathematics education, namely to organize reasoning, personality formation, and aesthetic value. Aktayeva et al. (2022) mention that teaching mathematics contains aesthetic values. Aesthetic values in teaching geometric concepts found in traditional musical instruments. At the same time, the material value of mathematics is related to the application of mathematics in mathematics and outside mathematics.

Mathematical values, both formal and material, can be seen in traditional Bengkulu musical instruments, which can be seen in the shape and arrangement of the instrument. Some of mathematics's formal and material values are universe, pattern, and cooperation. The universe or universe is a grouping value that unites things more broadly, like the grouping of various plane shapes in geometry as a plane universe. The pattern is a value that forms a specific rule, such as arithmetic and geometric sequence patterns, even and odd number patterns, and geometric patterns. Finally, the pattern of cooperation is a formal mathematical pattern that contains the value of collaboration between various components in achieving a goal, like the pattern of association between geometric shapes that form a beauty. The values of mathematics

are reflected in the characteristics of mathematics itself, namely: (a) have an abstract study object; (b) based on agreement; (c) deductive mindset; (d) have a symbol that is empty of meaning; (e) pay attention to the universe of conversation; and (f) be consistent in the system (Soedjadi, 2000). Like the mathematical values found in Bengkulu besurek batik cloth, they are the value of the agreement, consistency, empty symbols with meaning, and the universe of conversation (Haji & Yumiati, 2018).

Research relating values and culture to mathematics has been carried out by researchers and others in the past few years. The results of these studies indicate that some facts, concepts, principles, and algorithms in mathematics are found in the culture of an area, such as traditional houses, batik cloth, culinary arts, traditional ceremonies, and trade transactions by the community. Haji & Yumiati (2018) suggest that the mathematical values contained in Bengkulu besurek batik cloth are the value of agreement, consistency, having a symbol of empty money with meaning, and the universe of conversation. Novita & Haji (2018) found two- and three-dimensional concepts in the Rejang Lebong traditional house, the concept of transformation in the Rejang Lebong woven fabric, and the concept of parallelism in the kejei Rejang Lebong dance. Yanti & Haji (2019) stated that Bengkulu besurek cloth contains concepts and values related to transformation, namely reflection, translation, rotation, and dilation. Octizasari & Haji (2019) explains the concept of a circle found in the southern Bengkulu tat cake. In learning, applying an ethnomathematics-based realistic mathematics education approach can improve mathematical problem-solving abilities (Octizasari & Haji, 2019).

B. METHODS

This type of research is qualitative research with an ethnographic approach. Data sources are in the form of traditional Bengkulu musical instruments, namely dhol, tasa, long drum, serunai, and kelintang. Other sources of data are documents and interviews from competent sources about Bengkulu traditional musical instruments. Data were analyzed qualitatively. The research subjects were three resource persons with the initials F, FD, and AT. F the owner of one of the studios in the city of Bengkulu, namely the STM Budaya Studio, to be precise in the Downfall of Bengkulu City. The interview was conducted on May 20, 2021. Meanwhile, FD is an artist and studio builder. AT is the chairman of the Bengkulu Arts Council and an art teacher at a high school in Bengkulu city. Interviews were also conducted by HO, an Arts and Culture teacher at SMP N 12 Bengkulu Utara, on November 3, 2021. The research instruments were in the form of observation guidelines and interview guidelines. Observation guidelines are used so that researchers guided in finding data about the basic concepts and mathematical values contained in Bengkulu tradisional musical instruments. Interview guidelines were used to guide researchers when interviewing resource persons in order to obtain the information needed in this study. Data collection techniques are in the form of observation techniques and interviews. The research procedure is as follows: (1) Research preparation, namely the preparation of research tools in the form of instruments that have been validated by experts, data search equipment, and accommodation materials for research activities; (2) Data collection. The data collected is in the form of basic mathematical concepts and mathematical values contained in traditional Bengkulu musical instruments, which consist of dhol, tassa, long drum, and serunai; (3) Data analysis uses qualitative analysis with content analysis method with the following stages: (a) Data collection; (b) Data reduction; (c) Presentation of data; and

(d) Withdrawal/verification of conclusions (Bercht, 2021); (4) Research reports are addressed to The Research and Community Service Institute (LPPM) Bengkulu University; and (5) Dissemination. The results of the research are published in the scientific journal of mathematics education.

C. RESULT AND DISCUSSION

The initial activity of the research was carried out through the preparation of research tools in the form of research scenarios and materials and tradisional Bengkulu music equipment consisting of dhol, tasa, long drum, serunai, and kelintang. The next stage of the research is the search for data about the basic concepts and mathematical values contained in the Bengkulu traditional musical instrument. Data searches were also conducted through interviews with people who know about Bengkulu tradisional musical instruments. They are art teachers and managers of traditional Bengkulu art studios. The results of the interviews are explained as follows.

From the results of interviews with resource persons obtained, data about traditional musical instruments Bengkulu. Interviews were conducted with HO, one of the Arts and Culture teachers at SMP N 12 Bengkulu Utara, as follows:

A : Assalamualaikum Mrs. Haya.
HO : Waalaikumsalam Annisa.
A : I'm sorry, mom, I want to interview you for an Ethnomathematics assignment about Kejai dance. Are you willing to question us?
HO : Yes, I'm ready.
A : Thank you, okay ma'am, Nisa permission to ask ma'am what?
Do you know Bengkulu's special musical instrument?
HO : Of course, Bengkulu's typical music includes dol, redap, tambourine, tassa, and long drum.
A : Have you ever used this musical instrument?
HO : for dhol, long drums, chrysanthemums, and tassa.
A : Do you know the size of each of these musical instruments?
HO : The biggest dol is not less than 70 cm with a height of 80 cm, and other musical instruments are not bigger than a dol
A : I see, ma'am; what is this musical instrument made of, ma'am?
HO : On average, this traditional musical instrument is made of wood, rattan, and animal skins.
A : Okay, mom. Those are my questions; I apologize if there are many wrong words in this interview. Again, I thank you for taking the time with me to be interviewed me. God willing, Ma'am, we will continue our discussion at another time with material about other traditional musical instruments.
HO : Oh, thank you, too, because I enjoyed being interviewed.

The following are excerpts from interviews with other sources, namely F.

Q : How long has this studio been established, Sis?
F : It's been a long time, maybe around 20 years

Q : What do you think are the shapes of the dhol, long drum, serunai, and tassa musical instruments?

F : This musical instrument, when viewed from its shape at first glance similar to a percussion instrument. However, the sound produced by this dhol instrument is not the same as a percussion instrument.

Q : In general, what is this dhol made of?

F : Dhol is made of wood or coconut husk, which is known to be strong but light. The stump of the coconut tree is then given a hole at the top. Finally, it is covered with goat skin or cow skin.

Q : Alright, while the interview is enough, God willing, we will continue the interview about other Bengkulu traditional musical instruments.

F : Yes, thank you, see you later.

The data obtained were then analyzed using qualitative analysis with content analysis methods, namely content about basic mathematical concepts and mathematical values contained in dhol, tasa, long drum, serunai, and kelintang musical instruments. The results of the research data analysis are as follows.

1. Bengkulu Traditional Musical Instrument 'Dhol'

Dhol is a tradisional Bengkulu musical instrument made from the head of a coconut tree and bamboo bark. The percussion tool used is made of wood covered with cloth. Dhol is played during the tabot ceremony on 1-10 Muharram, as shown in Figure 1.

Figure 1. Dhol

Figure 1 shows 4 Dhol musical instruments. The cross-section of the top base is made of animal skin. While on the side, there is woven bamboo that forms colorful patterns. Dhol is a traditional Bengkulu musical instrument in the form of a beheaded ball with the bottom in the format of a flat circular plane, as well as at the top in the form of a flat circle (Widiarti et al., 2019). The top circle is more significant or wider than the bottom circle. Therefore, from the dhol shape, the concept of a truncated ball and circle is obtained with the following image.

Based on the dhol image, the notion of a ball is a curved side space limited by one curved plane (Roth, 2011), as shown in Figure 2.

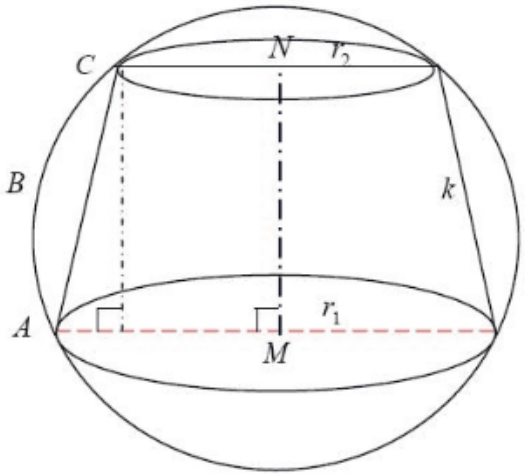

Figure 2. Beheaded Ball

Figure 2 shows the dhol musical instrument in the form of a beheaded ball inspires students' creativity in finding other basic mathematical concepts, namely circles, spheres, and their area and volume. Ramón & Chacón-López (2021) suggests that music has an impact on students' creative thinking. The creative elements are extensiveness, flexibility, originility, and syntax. The basic mathematical concept obtained through dhol is a circle as a set of points equidistant from a certain point (Eisenbud & Harris, 2000). This point is called the center of the circle. The basic mathematical concepts can be developed through the following concepts: the area of the ball blanket and the volume of the ball.

$$\text{Area of ball} = 4\pi r^2$$

$$V_{ball} = \frac{4}{3} \times \pi r^3$$

These basic concepts can be used as a source of learning mathematics on the topic of spheres and circles for junior high/high school students. In addition, it can be used as a medium for learning mathematics to make it easier for students to understand ball and circle material (Apridiansyah & Pahrizal, 2019). Another mathematical concept is the universe. The universe of the musical instrument is a geometric shape consisting of flat and space shapes. Another concept is a pattern. Patterns and values are related to the same form and rules of various forms of woven found on dhol. The values of the dhol musical instrument are obeying the rules, consistency, creativity, and cooperation. The importance of following the rules can be seen in the rules for forming triangles and kites on webbing on dhol. The consistency value can be seen from the consistency of the pattern formed. The creative value can be seen from the creativity in the formation of patterns on the webbing on the dhol. Musical instruments are able to develop the creativity of humans who use them (Haslbeck et al., 2020). At the same time, the value of cooperation is seen in the relationship of triangles, kites, and circles that form a beautiful configuration. From the curved plane of the dhol musical instrument, several basic geometric concepts are obtained: points, lines, angles, triangles, and kites. Points, bars, and angles are found in plane shapes, triangles, and kites, as shown in Figure 3.

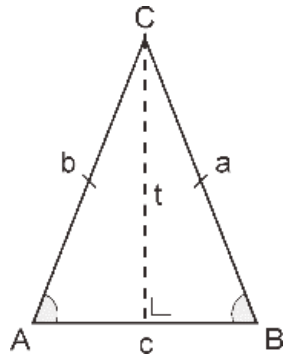

Figure 3. Triangle ABC

Figure 3 shows a triangle ABC contains: (1) Points A, B, and C, (2) Lines AB, BC, and AC, and (3) Angles: ∠ ABC, ∠ BCA, ∠ CAB. Based on the BAC triangle, the basic concept of angle is obtained, namely the combination of two rays whose starting points are in common (French, 2004). In addition, the basic concept of line segment length is obtained as the distance between the two ends of the line segment (Smith et al., 2005). The connection between the basic concepts of mathematics is built through traditional musical instruments. Van Vugt et al. (2021) explain the impact of music on students' connection skills. The mathematical concepts obtained from the ABC triangle can be developed to obtain other concepts in the triangle, namely about the area and perimeter of the triangle, namely:

$$\text{Area of triangle ABC} = \frac{1}{2} \times \text{base} \times \text{height}$$

$$\text{Perimeter of triangle ABC} = a + b + c$$

Another basic understanding is about a kite as a quadrilateral whose pairs of adjacent sides are the same length (Gibson, 2003), as shown in Figure 4.

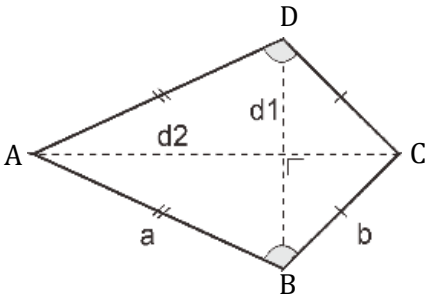

Figure 4. ABCD Kite

Figure 4 shows a Kite ABCD contains: (1) Points A, B, C, and D. (2) Lines AB, BC, CD, and AD, (3) Angles: ∠ ABC, ∠ BCD, ∠ CDA, and ∠ DAB. These mathematical concepts can be developed to obtain other concepts in the kite, namely the area and circumference of the following kite.

$$\text{Area of kite} = \frac{1}{2} \times d1 \times d2$$

$$\text{Perimeter of kite} = 2\,(a + b)$$

2. Bengkulu Traditional Musical Instrument 'Tassa'

Tassa is a traditional Bengkulu musical instrument made of iron plates and animal skin in cross-sections. How to play it by beating on the cross-section. This musical instrument is often used at the Tabot ceremony, as shown in Figure 5.

Figure 5. Tassa

Figure 5 shows a musical instrument, 'Tassa'. The cross-section of this musical instrument is in the form of a circle made of animal skin. On the edge of the cross-section, there are round iron plates as a binder. Tassa is a musical instrument in the shape of a hemisphere with a circular cross-section. Tassa blankets have small objects on the edges of their cross-section, which are a point concept. So that the mathematical concepts contained in the tassa are as follows: point, half sphere, and circle. Other concepts in tassa instruments are the universe and pattern. The concept of the universe is in the form of a hemispherical shape. The concept of a pattern to form a half ball.

The values contained in the dhol musical instrument are obeying the rules, consistency, creativity, and cooperation. The value of obeying the rules on tassa is the rule of determining the same distance between small metal objects that surround the tassa musical instrument, which functions as a bond reinforcement. The value of consistency in the placement of the same distance between the placement of these small metal objects. The creative value can be seen from the shape of the binder in the form of small metal objects. At the same time, the value of cooperation can be seen in the combination of these small metal objects with a circular cross-section of the tassa, which forms a semi-spherical shape.

Tassa can be used as a source and medium for learning mathematics on balls and circles in elementary school. Musical instruments can be used as media and learning resources in basic education (Ruokonen & Ruismäki, 2016). Next, too, learning media can clarify the message of mathematical concepts (Sundayana & Komariah, 2016). The values it contains can motivate in learning mathematics. The geometric shapes found in tassa are described below, as shown in Figure 6.

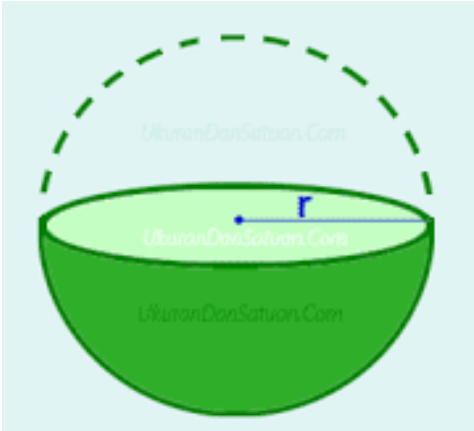

Figure 6. Half Ball

Figure 6 shows a half ball. A half ball can be expanded from these basic concepts to obtain the following ideas about the area and volume of a $\frac{1}{2}$ sphere.

$$\text{Area of half ball} = \frac{1}{2}(4\pi r^2) = 2\pi r^2$$

$$\text{The volume of half ball} = \frac{1}{2}\left(\frac{4}{3}\pi r^3\right) = \frac{2}{3}\pi r^3$$

3. Bengkulu Traditional Musical Instrument 'Long Drum'

The long drum is a traditional Bengkulu instrument made of wood and leather with a side part made of wicker made of rattan. The woven rattan forms a pattern. This instrument is used at weddings and welcoming, as shown in Figure 7.

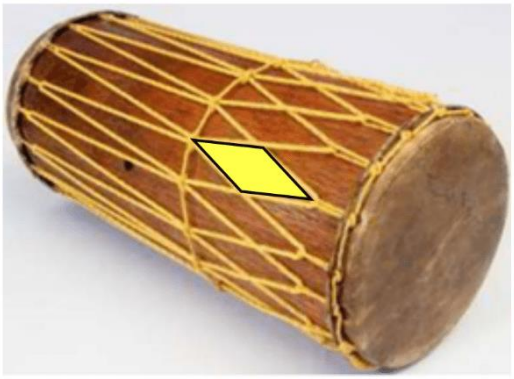

Figure 7. Long Drum

Figure 7 shows a traditional Bengkulu musical instrument called a long drum with a cross-section on the right and left in the form of a circle. On the side, there is woven rattan that forms an isosceles triangle and parallelogram. The long drum is shaped like a cylinder because the cross-sectional area of the circle in the two parts (left and right) is not the same size. This cylindrical-like concept occurs in the Tifa musical instrument, a traditional musical instrument for the Biak-Papuan people (Sroyer et al., 2018). Therefore, the shape of the long drum inspires the shape of a cylindrical space, as shown in Figure 8 below. From the shape of the cylindrical space, it can be further developed on the concept of cylinder volume and cylinder cover area, as shown in Figure 8.

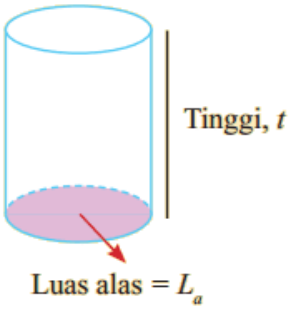

Figure 8. Cylinder

$$\text{Cylinder volume} = L_a \times t$$
$$= \pi r^2 \times t$$
$$\text{Cylinder surface area} = 2\pi r(r+t)$$

Figure 8 shows a cylinder. The mathematical concept contained in the long drum is a circle. In addition, the blanket includes woven rattan, which functions as a binder for the central part. The mathematical concepts contained in the blanket are points, lines, angles, triangles, and kites. Gendang Panjang and its mathematical concepts can be used as media and sources for learning mathematics for elementary school students. As a source of learning mathematics, it can complement the mathematics learning resources that have been used so far, namely mathematics textbooks. As a medium for learning mathematics, the long drum can be used as an intermediary for concrete objects to help understand abstract mathematical concepts, namely circles, tubes, points, lines, angles, triangles, and kites. Based on the long drum musical instrument, the basic concept of a tube or Cylinder is obtained as a form of space formed by two parallel and equal circles and a rectangle that surrounds the two circles (Roth, 2011).

Other concepts contained in the long drum are the universe and patterns. The scope of the universe is to build space. At the same time, the patterns are triangles, kites, and circles. The values contained in the long drum are obeying the rules, consistency, creativity, and cooperation. The value of obeying the rules can be seen in the rules for placing triangles and kites on woven rattan in a long drum blanket. Assess the consistency in the shape of the triangle and kite on the same webbing all over the place. The creative value is in the sharp triangular shape found in the woven long drum blanket. Creativity is also seen in the combination of triangles with kites in a series woven on a long drum blanket. Denissa et al. (2015) explain that artistic creativity is needed to obtain beauty. At the same time, the value of cooperation is the relationship of points, lines, angles, kites, and circles that form a cylindrical-like shape. These values can motivate students to learn mathematics to improve their attitudes toward mathematics. Triangle ABC contains $\angle$ A, $\angle$ B, and $\angle$ C.

Based on the triangle BAC, the basic concept of angle is obtained, namely the combination of two rays whose starting points are in common (Eisenbud & Harris, 2000). In addition, the basic concept of line segment length is obtained as the distance between the two ends of the line segment (Smith et al., 2005). Another basic understanding is about a kite as a quadrilateral whose pairs of adjacent sides are the same length (Gibson, 2003). Furthermore, the knowledge of a triangle is obtained as a flat shape limited by three sides and has three angles (Roth, 2011).

4. Bengkulu Traditional Musical Instrument 'Serunai'

Serunai, is a wind instrument originating from Bengkulu. This wind instrument is made of wood and contains six holes. The Serunai musical instrument is used in traditional wedding ceremonies, as shown in Figure 9.

Figure 9. Serunai

Figure 9 shows the traditional musical of Bengkulu, Serunai. This instrument is a wind instrument. The length of the Serunai musical instrument is about 20-30 cm. The front of the Serunai is in the form of a conical shape that is cut off at the end. This shows that the Chrysanthemum musical instrument contains the concept of a truncated cone. Other concepts are point, line, universe, and pattern. The concept of the universe is in the form of a space structure that includes a truncated cone. At the same time, the concept of the pattern on the chrysanthemum stem contains small, regular balls. Based on the musical instrument chrysanthemum, the basic mathematical concept of a cone is obtained as a shape that is limited by a curved side and a circular base side (Eisenbud & Harris, 2000).

The values contained in the Serunai are obeying the rules, consistency, creativity, and cooperation. The value of obeying the rules can be seen in the rules for placing small balls on the chrysanthemum stem. Consistency is valued on the distance between the small balls on the chrysanthemum stem. Creative value can be seen in the shape of small balls on beautiful chrysanthemums. The value of cooperation can be seen in the arrangement of small balls on the chrysanthemum stem with the most conical shape at the tip of the chrysanthemum. The values contained in these musical instruments show the values contained by the people who use the musical instruments they make (Pa & Tapsir, 2013). Serunai can be a medium and source of learning mathematics, especially pyramid material. The following truncated cone image, as shown in Figure 10.

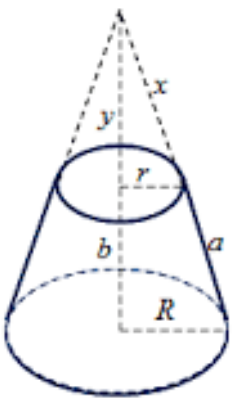

Figure 10. Beheaded Cone

Figure 10 shows a beheaded cone. The effectiveness of using Bengkulu traditional musical instruments as a medium and source of learning mathematics in elementary schools needs to be supported by a learning approach that can accommodate these needs. The learning approach is a realistic mathematics approach (PMR). Because the PMR approach is related to the context, and model and oriented to student activities (Arsaythamby & Zubainur, 2014). Based on the description above, the mathematical concepts and values contained in Bengkulu traditional musical instruments can be summarized as follows.

$$\text{Area of cone blanket} = \pi rs$$
$$\text{Volume of cone} = \frac{1}{3} \times \pi r^2 t$$

Table 1. The Fundamental Concepts And Mathematical Values Of Traditional Bengkulu Musical Instruments

No.	Musical Instrument	Basic Concept	Value	Functions in learning mathematics
1	Dhol	Points, lines, angles, triangles, quadrilaterals, circles, tubes, truncated hemispheres, universes, and patterns.	Obey the rules, consistency, creativity, and cooperation	Mathematics learning media and resources
2	Tassa	The point, hemisphere, and circle	Obey the rules, consistency, creativity, and cooperation	Mathematics learning media and resources
3	Gendang Panjang	The point, line, angle, triangle, circle, kite, tube, the universe, and pattern.	Obey the rules, consistency, creativity, and cooperation	Mathematics learning media and resources
4	Serunai	The point, line, truncated pyramid, universe, and pattern	Obey the rules, consistency, creativity, and cooperation	Mathematics learning media and resources
5	Dhol, Tassa, Gendang Panjang, Serunai	Points, lines, angles, triangles, quadrilaterals, kites, circles, tubes, hemispheres, truncated spheres, truncated pyramids, universes, and patterns.	Obey the rules, consistency, creativity, and cooperation	Mathematics learning media and resources

The findings in this study are as follows, the basic concepts of mathematics found in traditional Bengkulu musical instruments (Dhol, Tassa, Long Drum, and Serunai) are triangles, quadrilaterals, kites, circles, and tubes. The new findings in this study are as follows. The basic concepts of mathematics contained in traditional Bengkulu musical instruments are points, lines, angles, half balls, truncated balls, truncated balls, truncated cones, universes, and patterns. While the mathematical values contained in traditional Bengkulu musical instruments are the values of obeying the rules, consistency, creativity, and cooperation.

Based on the results of this study, it is recommended that elementary school teachers who will teach geometric concepts in flat shapes and shapes use learning resources and media that

utilize traditional Bengkulu musical instruments. For further researchers, they can develop other mathematical concepts found in Bengkulu traditional musical instruments that have not been revealed through this research. In addition, other researchers can develop mathematical concepts found in other Bengkulu traditional musical instruments, which have not been studied in this study. Overall recommendations are shown in Figure 11.

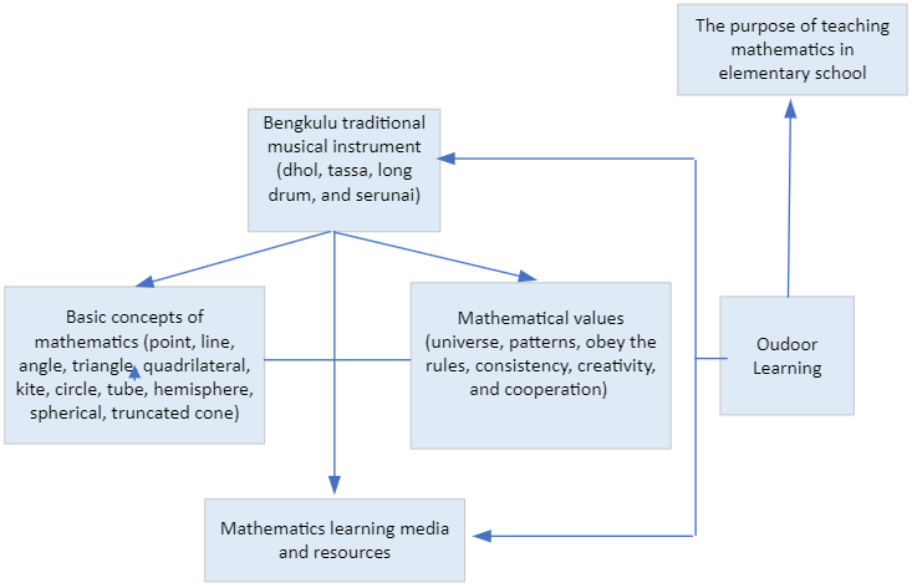

Figure 11. Facts and hypotheses for further research

Figure 11 shows that in Bengkulu traditional musical instruments, there are basic concepts and mathematical values. These musical instruments can be used as media and sources of learning mathematics through learning outside the classroom to achieve the objectives of learning mathematics in elementary schools.

D. CONCLUSION AND SUGGESTIONS

The basic mathematical concepts found in Bengkulu traditional musical instruments are points, lines, angles, hemispheres, truncated balls, truncated cones, universes, and patterns. At the same time, the mathematical values contained in traditional Bengkulu musical instruments are obeying the rules, consistency, creativity, and cooperation.

Elementary school teachers should use Bengkulu traditional musical instruments as a medium and source for learning geometry. For researchers to develop further about the effectiveness of learning geometry using traditional musical instruments Bengkulu in instilling geometric concepts in elementary schools.

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