ETHNOMATHEMATICS MAKES LEARNING MATHEMATICS MORE MEANINGFUL

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Abstract. Mathematics has been given from the first grade of elementary school to twelve secondary schools. These subjects are the main subjects in each education unit. There are various delivery methods used by the teacher with the aim to be more easily accepted by students. Mathematics has become a subject that is considered difficult for school students so that these subjects and their teachers are feared by students. Based on observations made, students assume that mathematics subjects are difficult and boring. Students contend that mathematics is rigid, abstract, theoretical, full of difficult symbols and formulas. Mathematics is also considered far from everyday life. This assumption contributes to students' negative perceptions of mathematics. If a student wishes to remember something without connecting with other things, both the process and the results of his learning can be declared as memorizing and will not be meaningful to him. Learning can be meaningful if the activities carried out by students are fun and moreover if it is relevant to everyday experiences. Therefore, so that mathematics learning is meaningful students are advised to take ethno mathematics based tutoring. With the opening of ethno mathematics based tutoring, it can help improve student learning with meaning followed by increasing numbers of entrepreneurs in Indonesia.

Keywords: mathematics; ethno mathematics; tutoring.

I. INTRODUCTION

Mathematics has been given from the first grade of elementary school to the twelfth grade of middle school. These subjects are the main subjects in each education unit. There are various delivery methods used by the teacher with the aim to be more easily accepted by students. Mathematics has become a subject that is considered difficult for school students so that these subjects and their teachers are feared by students. In fact, often the cause of the failure of the national exam is due to the value of subjects in mathematics. The Ministry of Education and Culture revealed that the national math test scores had decreased. At the high school level of the Natural Sciences department, Totok said, the average score of the 2018 Mathematics National Examination National Examination reached 37.25. That number has decreased by 4.67 compared to 2017 with an average value of 41.92. Meanwhile, for a high school, Social Studies majors, the decline in the value of the Mathematics National Exam in 2018 reached 4.73. For high school language majors, the decline in the value of the Mathematics National Exam reached 2.48. One measure of success in the field of education is the result of the National Examination (UN). Although in terms of student graduation rates are very high, the graduation rate in mathematics subjects has decreased in 2018 from 2017.

According to Munaka, Zulkardi & Purwoko (2009), one of the factors causing low mathematics learning achievement experienced by students is because of the abstract nature of mathematics which makes most students think mathematics is difficult so mathematics is far from the lives of students. According to him also, students often assume mathematics is a subject that is difficult to understand because it only uses formulas and calculations and is less related to daily life so they do not realize that in real life they actually use mathematics. Whereas according to Suharta (in Munaka, Zulkardi & Purwoko, 2009) states

that in mathematics learning in Indonesia today, problems related to daily life are only used for the application of concepts and are less used as a source of inspiration for the discovery or formation of concepts that result in mathematics learned in class with outside class (in everyday life) as if-if separated, so students do not understand the concept.

According to Shadiq (2009), the process of learning mathematics in the classroom is less directly related to everyday real life, which is lack of application, less grounded, less realistic, or less contextual. Therefore, need to be introduced contextual mathematics learning with introduced culture. Learning mathematics with culture is called ethno mathematics. Informal schools, especially mathematics, they rarely learn mathematics by introducing culture. Introducing culture is very important, especially preserving it. Especially in this age of the 21st century that is all technology, we should not be complacent and carried away by the flow of technology but forget about culture. Therefore I propose to make an ethno mathematics based tutoring to make it easier for students to learn mathematics so that learning is more meaningful.

II. BASIC THEORY

The term ethno mathematics was mentioned in the previous section. Ethno mathematics was introduced by D'Ambrosio, a Brazilian mathematician in 1977. D'Ambrosio's definition of ethno mathematics is: *The prefix ethnic is today accepted as a very broad term that refers to the social-cultural context and includes language, jargon, and codes of behavior, myths, and symbols. The derivation of mathematic is difficult but tends to mean to explain, to know, to understand, and to do activities such as ciphering, measuring, classifying, inferring, and modeling. The suffix is derived from techno and has the same root as technique* (Rosa & Orey, 2011: 35). In language, the prefix "ethnic" is interpreted as something

very broad that refers to the socio-cultural context, including language, jargon, codes of behavior, myths, and symbols. The basic word "mathema" tends to mean explaining, knowing, understanding, and carrying out activities such as coding, measuring, classifying, concluding, and modeling. The suffix "tics" comes from techno, and means the same as technique. So ethno mathematics has a broader understanding than just ethnic (ethnics) so ethno mathematically language can be defined as cultural anthropology of mathematics from mathematics and mathematics education.

In line with the opinions above, there is also the opinion of Powel (1997: 16) which states that "*The mathematics which is practiced among identifiable cultural groups such as national tribe societies, labor groups, children of certain age brackets and professional classes*". So the opinions of Powell and Orey are almost similar. But there is an addition from Powel who states that mathematics is practiced among identified cultural groups such as tribal national communities, labor groups, children of certain age groups and professional groups.

From this definition, ethno mathematics can be interpreted as mathematics practiced by cultural groups, such as urban and rural communities, labor groups, children of certain age groups, indigenous peoples, and others. The purpose of ethno mathematics is to recognize; there are different ways of doing mathematics by considering the knowledge of academic mathematics developed by various sectors of society and by considering different modes where different cultures negotiate their mathematical practices (how to group, count, measure, designing buildings or tools, playing and more).

Thus, as a result of the cultural history of mathematics can have different forms and develop according to the development of the user community. Ethno mathematics uses broad mathematical concepts related to various mathematical activities, including numerical activities, measuring activities, explaining activities, and so on. According to Sirate (2011: 125-130), there are several ethno mathematics activities, these activities are activities of counting, measuring, activities to make designs, activities to determine the location, activities of play, and activities explained.

1. Missing Activity
   Counting activities are related to the question of "how much". The forming elements of the activity say like the media of stones, leaves, or other natural materials. Counting activities generally indicate activities of using and understanding odd and even numbers and others.

2. Measuring Activities
   Measuring activities are related to the question "what". In ethno mathematics, traditional measuring instruments such as bamboo pieces and tree branches are very often found. But generally, traditional societies use their hands as the most practical and effective measuring instruments.

3. Location Determination Activities
   Many basic geometry concepts are initiated by determining the location used for the route of travel, determining the direction of the destination or returning home correctly and quickly. Determination of location serves to determine the point of a particular area. Generally, traditional communities use natural boundaries as boundaries of land, annual crop use is still often used as land boundaries.

4. Building Design Activities
   Another idea of ethno mathematics that is universal and important is the activity of creating designs that have been applied by all types of culture that exist. If the activity of determining the location relates to the position and orientation of a person in the natural environment, the design activities of the building are related to all factory objects and tools produced by culture for residential, trading, jewelry, warfare, games, and religious purposes.

5. Play Activities
   Playing activities learned in ethno mathematics are fun activities with grooves that have certain patterns and have tools and materials that have relevance to mathematics

Activities that have been mentioned earlier come into one's vision ka n common form of activity in etno mathematics. This activity can certainly be done in ethno mathematics based learning.

III. DISCUSSION

Activities in ethno mathematics can be seen in the life or customs of the Dayak Kanayatn people as follows;

A. Missing Activity

Counts related to questions "How many". Some types of tools that are often used by the Dayak Kanayatn tribe to say are fingers, hands, stones, sticks, and ropes (rattan and roots). For example, the thumb shows 1, the index finger shows 2, the middle finger shows 3, etc. The use of body parts in counting is a culture and problem-solving in the burden of human memory.

In addition, there are number of words that are often uttered by the Dayak Kanayatn people when doing activities. The sequence of words spells like *asa, rua, talu, ampat, lima, anam, tujuh, dalapan, sambilan,* and *sapuluh*. The spelling can be interpreted by writing the symbol number 1,2,3,4,5,6,7,8,9,10, and 11. In this case, the sequence shows a place value about the existence of the number itself. The sequence shows a certain value.

B. Measure

Measuring is generally related to questions "what (length, width, height, length, and lots)". In the Dayak Kanayat community, the measuring instruments used vary greatly both in type and usage.

Measuring instruments that are often used include: for the size of many use the terms: angel / one tie salongkop / one rod, and salonggo / satutumpukan of angels. There is. also, the term Tapak, to state the number of pieces produced usually for meat and firewood. In practice, for example, two (2) add 3 (three) ties equal to 5 ties; 3 telescopes plus 6 telescopes equal to 9 telescopes, etc. Likewise in reduction; as for other measures that contain elements of mathematics in the Dayak ethnic tradition such as length, volume size or contents.

C. Determining Location

In the habits of the Dayak Kanayat'n people, there are many basic geometric concepts that begin with determining

the location. Location determination is used to use travel routes, determine the direction of the destination or the way to go home correctly and quickly or connect one object to another object. Most Dayak Kanayat'n people seek livelihoods in the forests, whether they are laboring, farming, looking for vegetables and so on.

The Dayak Kanayatn community has dev le are the same. They have no concept of getting lost. They always state that we can eloped a way to give a code or symbol to the place of their environment. Like the Aboriginal tribes who have their own way of determining the direction of travel, the Dayak Kanayatn peop return home as far as the journey into a forest. Determining the location of navigation, its expansion has an important role in the development of mathematical ideas. Likewise, to determine the boundaries of areas, fields, fields, gardens, or areas that are considered sacred. This sacred area is considered sacred and taboo.

D. Build a Design

Another important and universal source of ideas in mathematics is designed activities that have been applied by all types of tribes and cultures. If the activity of determining the location relates to the position and orientation of a person in the natural environment, the design activities of the building are related to all factory objects and activities that are produced.

The Culture for residential homes, commerce, jewelry, game warfare, and religious purposes. The mathematical concepts especially say in building design activities can be seen in the planning and implementation. In planning they make sketches on the ground or stone, then they calculate how much material is needed, for example how many poles, roofs, doors, walls and so on.

E. Play Activity

Several types of games are found in the Dayak Kanayat'n community which contains elements of mathematics such as the Tapakng game. This game is performed when there is a party and is sometimes contested. The shape is a rectangle containing 6 small rectangles. The rules of the game for each player must pass each box, but moving from one box to another is guarded by the other party. If an opponent who is playing is touched by a group that is guarding it is considered a loser.

The number of players per team can be 3, can be 5 people, and can be 7 people each contingent or team and all men. Other traditional games are playing tapangnt and playing galah branches containing mathematical concepts especially in the field of geometry such as straight-line concepts, flat-build concepts (squares and rectangles), point concepts, angle concepts, corner concepts, symmetry concepts, and rotation concepts and so on.

III. DISCUSSION

In the customary activities, they unconsciously apply mathematical knowledge in the style of the local community by giving limits according to their agreement. For the Dayak people, rites are expressions, or expressions of "servant" attitudes to the Transcendent and rituals — showing the formalization of human behavior when dealing with sacred objects. Ethno mathematics in simple levels is widely used by Dayak people in living their daily lives.

The concept that is often used is the concept of counting, counting, measuring, weighing, determining the location, designing, making symmetrical constructs. This community activity with ethno mathematics can be developed as contextual-realistic school mathematics learning resource.

The ethno mathematics used by this community has the potential to be developed into material for mathematics learning. The concepts include the 3-dimensional and 2-dimensional geometry concepts. The 3-dimensional geometry concept contained in that webbing is cone, while 2-dimensional concepts include: (a) Straight lines contained in Anyam two; (b) Curved lines contained in the motif of the sawak curve; (c) Closed curves contained in motifs of mooring manuk, kiarak nyulur, elbow remaung, and Pangkak; (d) An isosceles triangle contained in the Angkong motif; (e) A square contained in a flower motif (f) Cleavage contained in the motif of Ati lang; (g) Kites contained in Lang Berangan motifs; (h) Symmetry; (i) Regular eighths contained in the motifs of the sky and moon; (j) Circles contained in the Sulau motif.

IV. CONCLUSION

Ethno mathematics interpreted as mathematics practiced by cultural groups, such as urban and rural communities, labor groups, children of certain age groups, indigenous peoples, and others. The purpose of ethno mathematics is to recognize that there are different ways of doing mathematics by considering the knowledge of academic mathematics developed by various sectors of society and by considering different modes where different cultures negotiate their mathematical practices (how to group, count, measure, designing buildings or tools, playing and more). Thus, as a result of the cultural history of mathematics can have different forms and develop according to the development of the user community. Ethno mathematics uses broad mathematical concepts related to various mathematical activities, including numerical activities, measuring activities, explaining activities, and so on.

Based on the above discussion, it is clear that ethno mathematics has influence in the formal school mathematics learning, ethno mathematics provide the necessary contextual meaning to a lot of abstract mathematical concepts. Nuanced forms of community activity math arithmetic operations are practiced and developed in the community as a way - how to add, subtract, count, measure, determine the location, design the wake, the kinds of games that practiced by children, the language is spoken, symbol- written symbols, images, and physical objects are mathematical ideas that have mathematical values that can be developed in learning in some mathematics subjects, especially elementary. Learning with activities will certainly be meaningful to the culprit because it will create a new experience so that it is better understood than what is learned. It is strongly recommended to make Institute of Ethno mathematics a-based tutoring.

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