

Ethnomatematics Studies: *Poda* Lessons to *Markobar* in Mandailing Culture

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Abstract. This research was initiated by the idea that learning mathematics cannot be separated from the application or relation of mathematics to human life, including culture. This is so that students can understand that mathematics is close to life and meaningful. Therefore, the study of the relationship between culture and mathematics is important and interesting. One of the cultures in Indonesia that can be used as an object of study is the Mandailing culture, especially the *Markobar* activities which mean speaking or giving speeches at traditional events. In *Markobar*, a *parkobar* (a person who gives a speech) usually uses *poda* lessons (a teaching containing advice). In the *poda* lessons that are often delivered by a *parkobar*, many mathematical concepts are found. The mathematical concepts contained in *poda* lessons in the *Markobar* Mandailing culture are very interesting things to study, which can ultimately be used as contexts and learning resources in learning mathematics, especially in schools where the majority of students are ethnic Mandailing. This research is the exploratory qualitative research on the ethnomatematics of *poda* lessons to *Markobar* in the Mandailing culture, using the Spradley approach. The results obtained are that there are several mathematical concepts in *poda* lessons to *Markobar* in Mandailing Culture, namely the concepts of equations, inequalities, subtraction and addition operations, numbers and numbers, curved lines or curves, examples and non-examples, the truth value of a proposition, infinity, induction mathematics, circles, ellipses, limits, folding symmetries, measurements, integers, fractions, and reflection. In addition, there is also one characteristic of mathematics, namely that mathematics material has a strict hierarchy.

Keyword: *Poda* Lessons, *Markobar*.

1 Introduction

Culture-based learning resources are very important to be applied in 21st century learning. Recognition of culture is the basis for culture-based learning. This includes learning mathematics. Laksana [1] identifies that culture as a learning center allows students to be motivated in applying knowledge and understanding. The meaningful culture-based learning process uses culture to make students able to create meaning, penetrate the boundaries of imagination, and creativity to achieve a deep understanding of the subjects they study [2]. Culture-based learning has 3 types namely: 1) learning with culture; 2) learning with culture;

3) learning through culture [3]. This culture-based learning aims to achieve an integrated understanding, which in the end can avoid students' misconceptions and can make students understand the meaning of mathematics. Therefore, to optimize student learning outcomes, culture-based learning is an alternative that can be chosen in learning mathematics.

The role of culture in learning as a first step in implementing culture-based learning, it is important for us to know, understand, and explore that culture first. Indonesia as a large country has people belonging to 1331 ethnic categories [4]. This ethnic diversity gives rise to cultural diversity. Getting to know and exploring the culture of tribes in Indonesia is an interesting study and is widely open as an element of novelty or novelty in a study. This is because there are so many things that can be explored in the culture itself. Koentjaraningrat [5] differentiates culture into four forms which form a subset (proper subset) from the outermost to the deepest, namely based on the following order: 1) as an artifact or physical object; 2) human behavior; 3) ideas; 4) value. A variety of content and cultural contexts can be integrated into learning resources.

The Mandailing tribe is one of the tribes on the island of Sumatra, specifically North Sumatra, Indonesia. One of the cultures in the Mandailing tribe is a form of behavior called *Markobar*. *Markobar* is an activity which means "talking" or "making a speech". *Markobar* is always carried out at every traditional event, both joy (*siriaon*) and sorrow (*siluluton*) [6]. This *Markobar* is carried out by someone based on their kinship position in the family of the party holding the event. The kinship system that places kinship positions in the Mandailing tribe is known as the *Dalian na Tolu* system, namely there are 3 kinship positions: 1) *mora* (wife's family), 2) *kahanggi* (parties who are related by blood or clan), and 3) *anak boru* (child family of a man who marries a *Mora* woman) [7]. These three kinship positions must take part in *Markobar*, because this *Markobar* makes the degree or glory of the party who carries it out respected.

Markobar means "to speak" or "speech". The content of the speech is adjusted to the ongoing traditional event, whether *siriaon* (joy) or *siluluton* (condolence). In essence, the things conveyed in the *Markobar* are to provide advice. The Mandailing tribe has a patrilineal kinship system (following the father's lineage), where marriages between clans in Mandailing will follow the clan of the father of the child born as a result of the marriage. From marriage between clans, 3 elements of kinship will emerge which are interrelated, mutual giving and receiving. The three elements of kinship are known as *Dalian Na Tolu*, which means three furnaces [8]. In general, *Dalian na tolu* is interpreted as three foundations consisting of *kahanggi*, *anakboru*, and *mora*. This kinship system is the basis of cultural life which implies unity, solidity and politeness. Therefore, each element in *Dalian Na Tolu* must take their respective roles in the *Markobar* event. The variety of Mandailing language that appears in this *Markobar* activity is *poda* language which is often referred to as *ajar poda* (sentences of advice). Many of the *poda* teachings that are often delivered in *Markobar* contain mathematical concepts. This can be explored more deeply, namely by analyzing the concepts and misconceptions contained therein, as well as mathematical principles and procedures.

A concept is a mental image of an object, process, or anything that exists outside of language, which is used by the mind to understand other things [9]. Concepts are also defined as abstract ideas that can be used to carry out classifications or classifications which are generally expressed by a term or series of words [10]. The word concept is often associated with ideas. Ideas are lingual entities (words or combinations of words written or spoken, or in

the form of symbols. Concepts are meanings associated in our minds with ideas [11]. Misconception according to the Big Indonesian Dictionary is a misunderstanding; misunderstanding [12].

2 Method

This research is the qualitative research. Qualitative research aims to answer questions related to developing an understanding of the dimensions of meaning and experience of human life and the social world. Creswell [14] defines research as a gradual, cyclical process that begins with the identification of the problem or issue to be studied, reviewing reading material or literature review, collecting and analyzing data, interpreting the data obtained. Meanwhile, qualitative research is defined as an approach or investigation to explore and understand a central phenomenon. To understand these central symptoms, researchers interviewed informants. The information received can be in the form of text or words. Meanwhile, the results of the analysis can be in the form of a description. The informant involved was Bakhsan Parinduri, a Mandailing traditional leader who has the title Jasinaloan, and already has several books discussing Mandailing culture, especially regarding the teaching of *poda* on the *Markobar* tradition.

3 Discussion

In *Markobar*, several sentences or proverbs often appear as teaching *poda* delivered by a *pakkobar* to the party organizing the event or to people attending the event. This *poda* teaching is delivered as advice that is expected to be implemented and understood by all those present. Often the *poda* teachings delivered from one *pakkobar* and another *pakkobar* are the same *poda* teachings (delivered over and over again) as the intention that we must always remind each other of goodness. Here it can be seen that the Mandailing culture is in line with Drill learning that learning or practice must be done repeatedly so that the results can be maximum and last a long time.

The following are several *poda* teachings that contain mathematical concepts and misconceptions that occur in them.

1. *Aek sinoli angkon aek do pargarna*

Aek sinoli angkon aek do pargarna means "water is borrowed so water is also paid". The meaning of this *poda* teaching is that if other people do good to us then we must try to repay that kindness with good deeds. Here it can be seen that the Mandailing tribe really appreciates the good deeds of other people, and does not want to have debts of gratitude because that will cause a person to feel embarrassed or inferior to the person who has given him a debt of gratitude.

In this *poda* teaching there is the concept of mathematical equality. Similarity is a relationship between two quantities, or a mathematical expression that states that the two quantities have the same value, or that both expressions represent the same mathematical object.

2. *Buang sambilan*

When *parkobar* mentions ajar *poda buang sambilan* which means throwing away nine, then this means that of the ten contents of the discussion, only one can be acknowledged as authentic, the others are just jokes or lies.

This means that when speaking, people often say things that are jokes, the more they talk, the greater the chance of saying jokes or lying. This means that only one can be trusted or is the truth (fact).

This shows that Mandailing culture has recognized and used the concept of inequality, such as ">" and "<". That is, of the many conversations, only a few contain the truth, and more are jokes or banter. So, in learning, determining which number is larger or smaller is meaningful in life, students can apply the concept of inequality to behave better.

Apart from the concept of "inequality", the concept of "subtraction operations" is also contained in this *poda* teaching. Discarding nine out of ten talks means we should be able to perform subtraction operations on integers. In mathematics learning, this concept can be developed into the concept of "examples" and "counter examples" because students must be able to choose nine non-examples from the 10 examples given. For example: "All prime numbers are odd numbers", is this proposition TRUE. In this case, this statement is a universal quantified proposition. This universal quantifier proposition is FALSE. Therefore, to show that the proposition is FALSE, an example must be shown to refute it. The refuting example is 2, because 2 is not an odd number but 2 is a prime number.

3. *Bungkulan silengkung dolok*

Bungkulan silengkung dolok means a ridge like a curved mountain. This *poda* teaching describes the majesty of the past Mandailing palace so that its roof was long and curved like an arch on a mountain. *Bubungan* means the top of the house. Mandailing Palace is called *bagas godang*, which means a large house characterized by a curved roof forming a triangle or mountain shape. In this *poda* teaching there is the concept of curved lines or curves.

4. *Bujing Sambilan Bolit; Bujing Sambilan Jeges*

Bujing Sambilan Bolit means nine winding girls. The nine coils in this *poda* teaching mean nine virtues. *Bujing sambilan bolit* means a girl with nine intelligences, very smart and wise. Why should it be denoted by nine? Because nine is the largest unit number. This means that this girl really has good qualities because she is filled with various advantages. A girl like this is certainly an individual who is highly desired by every man or family.

This *poda* teaching has another equivalent meaning, namely *bujing sambilan jeges*. *Bujing sambilan jeges*, means girl of nine beauties. This means that the girl is very beautiful, elegant and charming. In these two *poda* teachings there is the concept of numbers and numbers.

5. *Burangir Na Opat Ganjil Lima Gonap*

Burangir na opat ganjil lima gonap means betel which is four odd and five even. A unique philosophy in Mandailing culture that many misinterpret. The traditional betel equipment consists of the five elements of betel, tobacco, areca nut, gambier and soda. If it only consists of four elements, the *sirih* is considered odd or incomplete, then five new elements must be said to be even or complete.

In the Mandailing culture, *Markobar* is accompanied by a number of paraphernalia, including betel nut which will be eaten by the participants of the *Markobar*. The equipment for eating betel itself consists of 5, namely betel (*burangir*), gambier (*sontang*), whiting (*soda*), areca nut, tobacco (*timbako*). There are five of these ingredients that have a spicy taste (ie betel and whiting), chelate (ie *gambir*), intoxicating (ie areca nut and tobacco) when eaten in excess. These five materials must be put together or completed in a *burangir* as a symbol that humans are of different nature but can be put together in a *Markobar* to consult each other to reach a consensus [13].

In this *poda* teaching there are misconceptions about even and odd. In the Big Indonesian Dictionary (<https://kbbi.kemdikbud.go.id/entri/genap>), even means full; intact (not less); complete while odd means not even, different from the others; not as usual; Strange; wonderful. The meaning of even and odd in this case is different from the meaning of even and odd in mathematics. An even number means a natural number that can be written in the form $k = (2n)$, $n =$ natural number. Meanwhile, an odd number means a natural number which can be written in the form $k = (2n-1)$, $n =$ natural number. This *poda* teaching also describes contradictory sentences, namely logical truth values that negate each other. The number 4 is said to be odd even though it is even. This means that the proposition has the truth value FALSE. Likewise, the proposition "the number 5 is said to be even" means that this proposition is also FALSE. It means, this sentence is a negation of the actual understanding, so that teaching *poda* "burangir na opat odd lima gonap" can be understood as a proposition worth FALSE, so that the negation can be clearly determined, namely a proposition worth TRUE.

6. *Utang sabahat ni obuk i simanjujung*

This *poda* teaching is usually conveyed in *Markobar* as advice not to have debt, let alone a lot of debt. *Utang sabahat ni obuk i simanjujung* means debt as much as the hair on your head. The meaning is the same as being in a lot of debt. Of course, it is very difficult to calculate exactly how many strands of hair are on a person's head. Maybe no one has been able to calculate it and no one has ever calculated it. Mathematically, the number of strands of hair on the head is definitely a finite number. However, because there are so many strands of hair on the head, it is almost difficult to count them, so it is also difficult to find the right number to indicate the number of strands. Therefore, it can be assumed that the number is quite large, especially if a person's hair is very thick. The meaning is, in this context, this teaching method also contains the concept of "infinity" as a way to say the number of strands of a person's hair, even though it can be understood that the number must be finite.

7. *Dolok Pe Sude Muda Pupu Nigargaran*

This *poda* teaching is usually conveyed in *Markobar* as advice to be frugal. *Dolok Pe Sude Muda Pupu Nigargaran* means "even mountains will be finished if they are continuously eroded", with the meaning that even large amounts of wealth or money will disappear if they are not used wisely and carefully. Therefore, everything must be planned well. Therefore, it is clear that this *poda* teaching contains the concept of subtraction operations.

8. *Dua Antuk Tolu Robona*

Dua antuk tolu robona means two touched by three that collapsed. The meaning of teaching *poda* is to do something while being able to complete other things. The meaning of the

proverb is that once you reach for an oar, two or three islands are lost. This *poda* teaching context can be used to explain the domino effect in mathematical induction. Mathematical induction is a valid proof using induction (not deduction). This applies specifically to the universe of positive integers. Positive integers or natural numbers have a well-ordering principle where "Every non-empty subset of \mathbb{N} has the smallest member". That is, if we arrange a set of dominoes standing upright

arranged neatly with the distance between each adjacent domino less than the height of the domino, then we topple the first domino, then the second domino will also fall. If this process continues, when we topple the k th domino, the $(k + 1)^{\text{th}}$ domino will also fall. So, in the end we will see that all the dominoes will fall. Or in other words, dominoes that have the serial numbers of all the natural numbers will fall down. With this explanation the principle of mathematical induction can be explained easily.

9. *Marbanjar Umaliang*

Marbanjar umaliang means line up around. This means sitting in rows around according to their function and position in deciding on customary councils. This *Poda* teaching gives advice so that a person can play a role in his function and position in the adat assembly when the *Markobar* event is carried out. In *Markobar*, each role from *dalian na tolu* will sit in its place and will form a circle. This teaching method contains the concept of a circle. Where, the sitting position of each *Dalian Na Tolu* element at the *Markobar* event is the circle line. However, in *Markobar*, there is often a seating arrangement that does not resemble a circle but rather resembles an ellipse. This depends on the shape of the room used to carry out the *Markobar* event.

10. *Tango Lamot*

Tango lamot means chopped into small pieces. This teaching method gives advice that a problem should be studied in as much detail as possible in order to produce wise, wise and satisfying conclusions. This *poda* teaching contains the concept of division. In addition, it is very relevant to explain the concept of limits. Chopping it into small pieces will produce very small parts, the part that has been chopped, can always still be chopped into even smaller pieces. In the abstract in our minds or thoughts, if the process of chopping the part is carried out countless times then of course the final part of the result of the chopping process will be in the form of very small parts, almost nothing. That is the concept of limits. With this context, an understanding of the definition of limits can be abstracted by students.

11. *Tiang Tonga*

Tiang tonga means middle pole. The middle pole is different from the surrounding poles and has a greater load. This *poda* teaching is usually conveyed to give advice so that someone can behave like a center pillar, namely not being partial or preferring to be a mediator.

Mediator means in the middle so that everything is balanced. This *poda* teaching contains the concept of folding symmetry. Fold symmetry is a type of symmetry that will produce the same area and shape if a shape can be folded with an axis on the fold symmetry line. This teaching analogy can be used to explain to students that the mathematical concept of folding symmetry is useful in solving life problems.

12. *Ulos Na Tolu Eto*

Ulos na tolu eto means a blanket with three fathoms. The blanket, which was only three fathoms long, was in dire condition. This means that if you cover it up to your head, your feet will be exposed. If you pull it over your legs, your head will be exposed, completely covered. This teaching method is usually conveyed to give advice that sometimes humans face confusing and difficult conditions, which challenge humans to find the best solution from the solutions they face.

This *poda* teaching contains the concept of measurement. *Depa* according to the Big Indonesian Dictionary (<https://kbbi.web.id/depa>) means the length of both hands stretched out from the tip of the middle finger of the left hand to the tip of the middle finger of the right hand. The use of the word fathoms in this teaching method can be used as a context to explain that measurements using fathoms are measurements that produce invalid measurement results because the measuring instrument is not steady. The length of 1 fathom will certainly be different for each person, so whose fathom will be the benchmark. Therefore, measurements must be carried out using precise and steady measuring instruments. This context can be presented when teaching mathematics on the topic of measurement.

13. *Mardua Satonga*

Mardua satonga means both and half. The meaning is having an ambivalent heart about doing or deciding something. This *poda* lesson contains the concepts of whole numbers and fractional numbers.

14. *Martading-Tading Dua Marlumpat Lumpat Sada*

Martading-tading dua marlumpat lumpat sada means leaving two and jumping one. The meaning of this *poda* teaching is that more is lost than remembered. Have unbroken knowledge.

In this *poda* teaching, one of the characteristics of mathematics is contained, namely its very strict hierarchy of material. To be able to master a mathematics topic optimally, a student must be able to master the prerequisite topics of the topic being studied. As an example of the strictness of this mathematical hierarchy, it is described as follows: to study integrals, you must have studied the prerequisite topic, namely derivatives, to study derivatives, the prerequisite topic is function limits, function limits have prerequisites, namely functions, functions have prerequisites, namely relations, relations have prerequisites, namely sets, and sets have a prerequisite, namely numbers. Like a ladder (hierarchy), it is difficult to climb the rung at the top if we do not step on the rung directly below the rung. Likewise, in studying mathematics, it is difficult to understand a topic if the prerequisite topics are not well understood.

15. *Martamba Bilangan; Murak Bilangan*

Martamba bilangan means increasing numbers, while *murak bilangan* means decreasing numbers. Increasing the number means having a child, having a son-in-law, or increasing the number of family members. A decreasing number means a family member has died. The mathematical concepts contained in this teaching *poda* are addition and subtraction operations.

16. *Na Mamboto Na Lidang Na Geduk*

Na mamboto na lidang na geduk means who knows what is straight and what is crooked. It means someone who is believed to be wise and wise. Straight and curved in mathematics are graphic manifestations of a function.

17. *Ombang Ratus Ombang Ribu Sayur Matua Bulung*

Ombang ratus ombang ribu sayur matua bulung means growing hundreds and thousands. It means someone who multiplies very much, multiplies and lives long. The concept of number is very clearly seen in the teaching of this *poda*

Several other teaching pods also contain the concept of numbers, namely:

a. *Pagonop gonop bilangan*

Pagonop gonop bilangan mean fulfilling numbers. In the Mandailing tradition, something that is only said to fulfill a number is something whose function is not that important because it is just fulfilling. Therefore, it is taboo if someone's presence in a gathering or family does not have a good nuance if they are said to fulfill the number.

b. *Poda na lima*

Poda na Lima means five advices. There are 5 tips that are usually conveyed to the bride in the *Markobar* tradition. The 5 advices are: (1) *Paia rohamu*, cleanse your soul, (2) *Paia pamatangmu*, clean your body, (3) *Paia parabitonmu*, clean your clothes, (4) *Paia bagasmu*, clean your house, and (5) *Paia parabitonmu*, clean your yard.

18. *Sormin di Jolo Papatar Pataridaon Daki di Boi*

Sormin di jolo papatar pataridaon daki di boi means the mirror in front shows the forehead. The purpose of this *poda* is that the aura of the face, the way of speaking, and the behavior can be an indication of the secrets of a person's character. Reflecting is a very appropriate example to explain the concept of mirroring or reflection. When something or someone is in front of a mirror, what is seen in the mirror is that something or someone, both the size and the distance of that something to the mirror. Mirroring or reflection is a type of transformation that moves each point on a plane or geometric figure using the properties of objects and images in a plane mirror.

19. *Ata-Ata Dupang-Dupang Ata Ata Panggarar Utang*

Ata-ata dupang-dupang ata-ata panggarar utang means words can be a debt payer. Property debt or debt of gratitude can be repaid with polite greetings. Words have the power to amaze people, but speech can also threaten people.

In teaching this pod there is the concept of mathematical equations. A mathematical equation is an equation consisting of at least 2 different variables on each of the left and right sides. The "debt property" variable is not the same as the "kind words" variable. However, these two variables can form an equation.

4 Result

From the ethnomathematics study of the teachings of *Poda* in the Mandailing culture, several concepts can be found, namely: equations, inequalities, curved lines or curves, numbers, finite and infinite numbers, mathematical induction, circles, ellipses, folding symmetries, reflection, number operations, limits, functions. In addition to these mathematical concepts, *Poda*'s teaching on *Markobar* also contains mathematical characteristics, namely a very strict material hierarchy, and also contains misconceptions about even and odd numbers. Given this, there are quite a lot of concepts contained in teaching *Poda*, so of course learning mathematics can use this Mandailing culture in its implementation, both as a context or a source of learning.

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