Ethnomathematics exploration on tourism in the rice field of pematang johar as a mathematics lesson

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ABSTRACT

This research aims to find out, examine, and describe what are the elements of applying mathematics, as well as explore the mathematical concepts that exist in the Spatial Planning of Taman Sawah Tourism in Pematang Johar Village. This research took place in Pematang Johar Village, Labuhan Deli District, Deli Serdang, North Sumatra. The type of research that the author examined was descriptive qualitative research, in which the collection of data was taken through a process of documentation, direct observation, and literature review. The documentation and observation are used to explore ethnomathematics and mathematical concepts in the Taman Sawah Tourism in Pematang Johar Village, while literature review is used to find out about the cultural values that exist in the Sawah Park Tourism in Pematang Johar Village. Based on the results of data collection, several mathematical concepts were obtained in the rice field garden tour, namely (1) Flat Shape Concept, (2) Line Concept, (3) Geometry Transformation Concept, (4) Set Concept. These tourist attractions can be used as a medium for learning mathematics, especially at the elementary and secondary levels, in order to increase interest in learning mathematics.

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INTRODUCTION

Mathematics is a subject that must be taught in educational facilities (Utami et al., 2018). Because basically, mathematics is one of the subjects that has a significant role in education. From year to year, it is known that the development of mathematics continues to increase according to the changing times (Sawita & Ginting, 2022). Because it is the changing times that are able to encourage people to be more active, creative, and able to create new things, in developing or applying mathematics as a basic science. What is meant by the development of mathematics itself is one of them is the problem of learning mathematics.

Related to the planting of mathematical concepts and the application of mathematical concepts to students, learning mathematics has a significant role. Because later it is the students who will participate in the development of mathematics in everyday life. But related to this, we still often encounter obstacles in the classroom when learning mathematics takes place. One of them is that students are not able to understand the material presented and the learning strategies delivered by

educators are still not suitable and less effective. Therefore, educators must be able to overcome this by finding learning solutions, especially in learning mathematics from these problems.

Therefore, there is an interesting technique or method that can make students more interested in learning mathematics, namely by linking all mathematics learning with everyday life, local culture, or what is also called Ethnomathematics (Simbolon, 2020).

An approach that can be used to explain the reality of the relationship between environmental culture and mathematics when teaching is ethnomathematics (Rusliah, 2016). The study of culture based mathematics is ethnomathematics (Pathuddin & Raehana, 2019). According to (Irawan & Kencanawaty, 2017), ethnomathematics is a cultural element contained in mathematics learning. Meanwhile, according to (Nursyahidah et al., 2018), ethnomathematics is mathematics that arises from human activities in an environment that is influenced by culture. So, from some of these definitions of ethnomathematics, it can be concluded that ethnomathematics is a way of learning that can be used as a strategy for learning mathematics related to cultural elements that exist in our daily lives.

Ethnomathematics has become a discipline that has received widespread attention recently because of the formal teaching of mathematics (Huda, 2018). The existence of the term Ethnomathematics certainly has a specific purpose, in simple terms the purpose of this is to explore all mathematical concepts in a culture so that we can make that culture a vehicle for someone to learn mathematics. This can also be applied in our lives. In human life, we can meet so many cultures. For example, in the area of North Sumatra, Deli Serdang Regency, there are many cultures and tourist destinations that can be found. One of the destinations is Rice Field Tourism in Pematang Johar Village, Labuhan Deli District.

This rice field tour is very suitable to be used as a learning medium, especially in mathematics lessons. In every part of the structure of the building unconsciously that the form has applied concepts from mathematics. As well as preparing the spatial layout of the tour, it describes mathematical concepts that we didn't even know before. Mathematics and culture are an integral part of everyday life. From this, a contextual learning strategy can be applied by an educator. When educators can associate all learning materials with students' real-world conditions, this will enable students to learn more deeply about mathematical concepts because the object for learning is the surrounding culture, and also students are able to make difficult mathematical perceptions less because of the richer learning media. concrete use. Because in this Taman Sawah tour the concept of building layout and spatial planning is related to mathematics, the authors are interested in examining what mathematical concepts have been applied in the spatial planning or concept of building placement in the Sawah Park tourism in Pematang Johar Village.

METHOD

Research is defined by many authors as a systematic process (Hermawan, 2019). The type of research used in this research is descriptive qualitative research with an ethnographic approach. Where qualitative research is data collection in a natural environment with the intention of interpreting phenomena that occur where the researcher is a key instrument, sampling data sources is carried out purposively and snowball, data collection techniques are triangulation (combined, data analysis is inductive/qualitative and the results of qualitative research are more emphasizing meaning rather than generalization) (Anggito & Setiawan,

2018). Qualitative research is a research method based on the philosophy of postpositivism, used to examine the condition of natural objects (Sugiyono, 2016).

This research explains what are the mathematical elements contained in the placement or layout of the Sawah Tourism Area in Pematang Johar Village, so that the object of this research is the Sawah Park Tourism in Pematang Johar Village, while the subject of this research is spatial planning in Tourism Paddy Field Park in Pematang Johar Village. Spatial planning is a form of spatial structure and spatial patterns arranged hierarchically, namely nationally, regionally, and locally. So that in this research, the author will explore what are the mathematical concepts contained in the concept of spatial planning or layout of the Sawah Park Tourism in Pematang Johar Village. The procedures in this research are described in Figure 1.
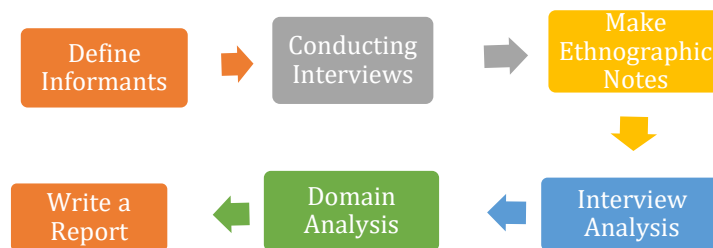
Figure 1. Research Procedure using Ethnographic Design

In line with that, the data collection techniques in this research were observation, documentation, and literature study. The data collection is observed directly from the field where it will be studied (Nurjannah et al., 2020). In this research, the authors made observations in October 2022 regarding the research location, and whether it was suitable to be used as a research object. Then after that, authors observed back to the field to find out how the spatial planning of the Taman Sawah Tourism Village of Pematang Johar is, and whether there is anything related to mathematical concepts. Then the researchers conducted interviews with visitors and one of the tour guards to get information about the arrangement of the Sawah Park Tourism location. In the documentation process of this research, the aim was to collect data regarding the placement of existing buildings in the Taman Sawah Tourism Village of Pematang Johar which are related to mathematical concepts. This documentation can also be used as supporting evidence for the research conducted so that the results of this research are more reliable. These results will be the collection of primary data, while the secondary data collection is carried out by looking for reference material which is used as a literature review from several articles, scientific journals, and others. Then the final stage of drawing conclusions.

RESULTS AND DISCUSSION

One of the newest tourist attractions on the outskirts of the city of Medan which provides beautiful natural scenery, typical of the countryside, is called the Pematang Johar Rice Field Tour, which is located in Hamlet 6 Rawa Badak, Labuhan Deli District, Deli Serdang. This tourist village is a new tourist attraction that has an area of 1750 hectares of rice fields which are managed to become a tourist attraction, in which this tour has succeeded in increasing the community's economy. On this tour, visitors can enjoy the green rice field as a photo spot and can walk around the rice fields without having to be afraid of stepping on the mud.

Based on the results of the exploration carried out by researchers at Taman Sawah Tourism in Pematang Johar Village by making observations, as well as direct observation and by carrying out documentation, researchers found several objects in the arrangement of buildings in Taman Sawah Tourism in Pematang Johar Village which are related to mathematical concepts.

The form of location arrangement in the Paddy Field Tourism Village of Pematang Johar is as Figure 2.

Figure 2. Portrait of the Tourist Location of the Pematang Johar Rice Field Park

Figure 2 is the portrait of the location arrangement on a rice field tour, where at that location we will know the layout of the buildings there, from these pictures the author examines the layout of the huts, then other buildings such as prayer rooms, libraries, parking lots, and others. From this, the researchers found a mathematical concept in structuring the location of the Johar rice field tour, namely the basic concept of a flat shape.
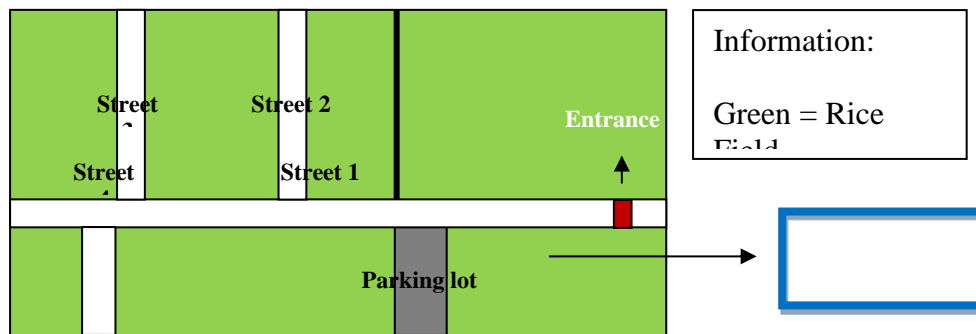
Rectangle

Figure 3. Location Plan Illustrations

The picture above is a sketch of the road route and land on a rice field garden tour, from the picture it can be seen that the shape of the parking lot and the road that is there illustrates the concept of a rectangular flat building. A rectangle is a two-dimensional building or flat building that has length and width and has 2 pairs of parallel sides (Lumbantoruan, 2021). Figure 3 is a picture of the fence on buildings and huts in the Pematang Johar rice field tour which illustrates the concept of a rectangular flat wake.

The characteristics of a rectangle are that it has four edges or sides, where the opposite sides are the same length, has four angles that measure 90°, has 2 axes of symmetry, and the diagonals are the same length. The formula for determining the perimeter of a rectangle is $K = p + l + p + l = 2p + 2l$ while the formula for finding the area of a rectangle is $L = p x l$.
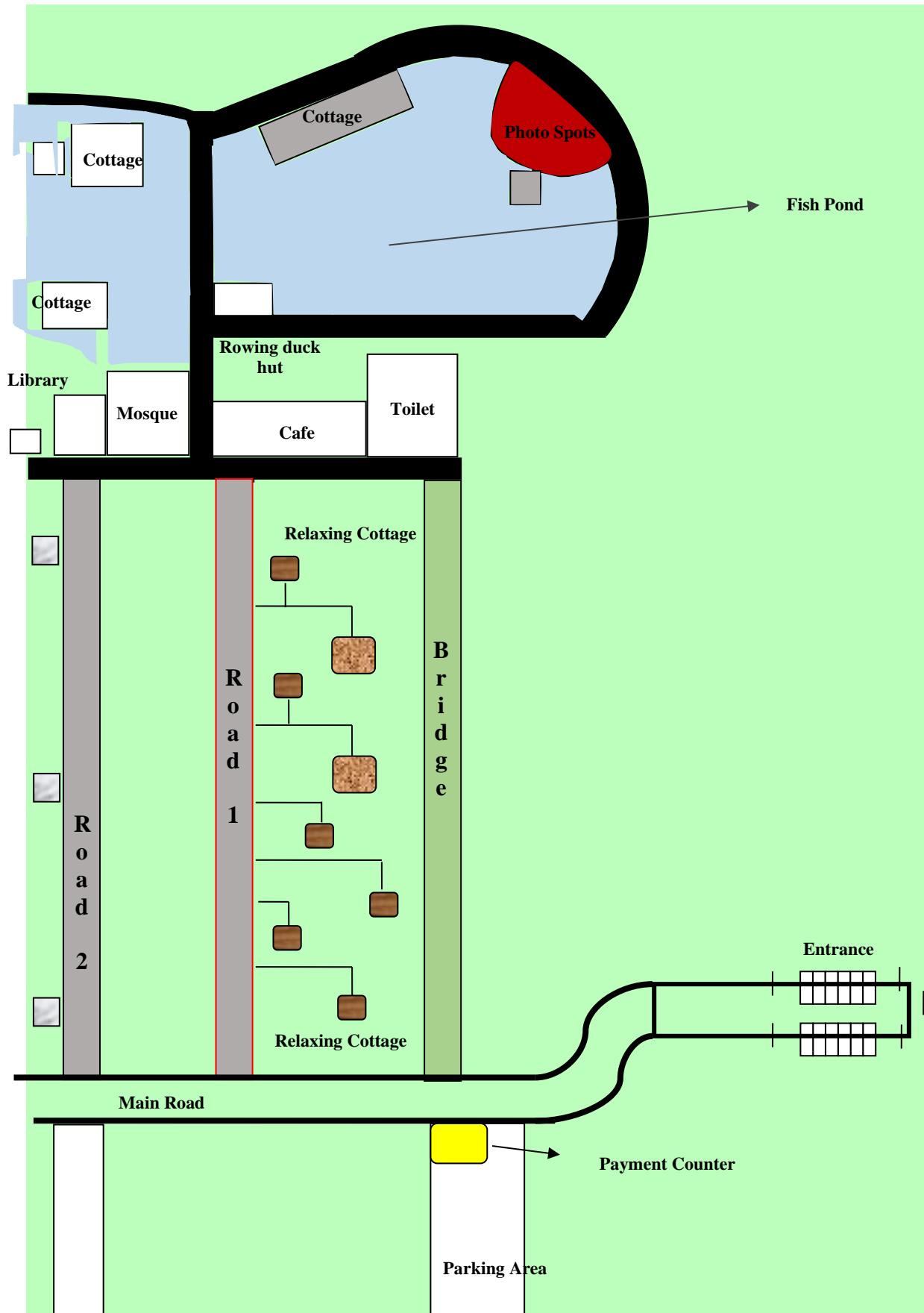
Figure 4. Arrangement of Rice Field Tourist Sites

Figure 4 is a picture of the arrangement of the Sawah Park Tourism in Pematang Johar Village, where in the picture it is clear the locations on the tour, such as where the photo spots are located, there is a fishing pond, we can find out where the prayer room and the library have located another place. In Figure 4, there is a broad green color, which indicates that it is a wide-spread rice field whose existence is the highlight of the tour.

In addition to the flat wake concept found in the layout of the Pematang Johar rice field tour, it turns out that the line concept is also found in the Pematang Johar rice field tour, namely:

Parallel line
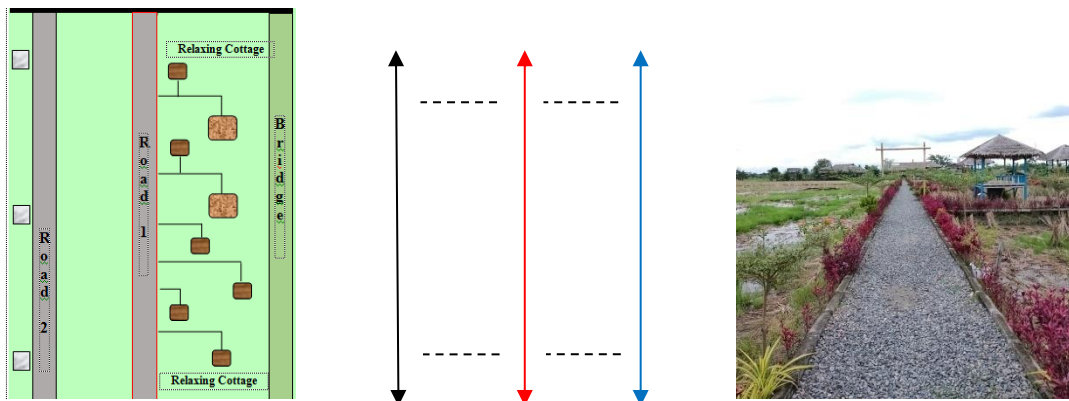
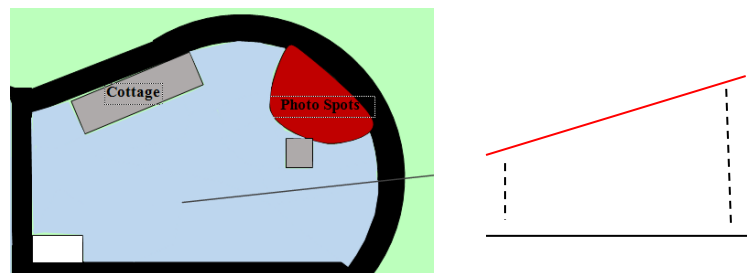**Figure 5.** Modeling the Concept of Parallel Lines

The picture above is a picture of the road in the rice field garden tour, where the roads and bridges that are there are just straight roads that are side by side and in the same direction, so the road illustrates the concept of parallel lines. Parallel lines are two or more lines that are in one plane and are the same and do not intersect even though they are extended continuously. In Figure 5, it can be seen that the bridge is parallel to Road 1 and parallel to Road 2.

Lines are said to be parallel if they meet the following properties:

1. Two or more lines do not intersect because the distance between any two points on the line is always the same.
2. Will be in the same field.
3. If the line is parallel to two other lines, then the two lines are parallel to each other.

Unparalleled Lines
The following image is a non-parallel line modeling image that we can see from the road sketch on the rice field garden tour.
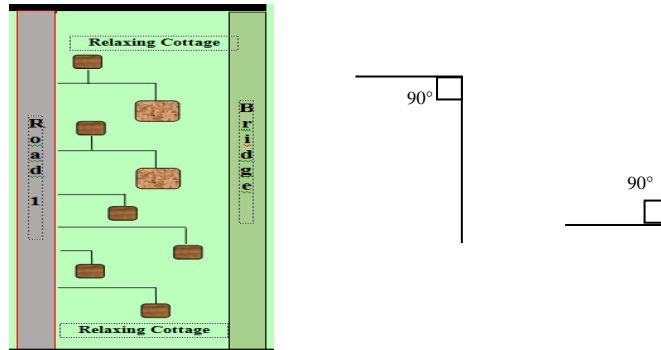

Figure 6. Modeling the Concept of Non-Parallel Lines

Figure 6 is the road from the rowing duck hut and the road leading to the hut to the photo spot, where the travel route illustrates the concept of non-parallel

lines. A line is said to be non-parallel if two lines whose points are at different distances, intersect or do not intersect.

Perpendicular Line

Figure 7. Modeling the Perpendicular Line Concept

Figure 7 is a conceptual model of a perpendicular line, in which Figure 7 is an image of a bend towards relaxed huts on a rice field tour. Perpendicular lines are lines that intersect to form right angles. Perpendicular lines are also known as parallel lines or perpendicular "⊥".

existing buildings in the tourist attraction of the rice field garden in Pematang Johar village. Some of the geometric transformation concepts in question such as translations, reflections which have been summarized in the following examples:

The Concept of Geometry Transformation in the Arrangement of Rice Field Garden Tourist Sites

Geometry transformation is an exchange of position and size of a plane, line, point, or curve that can be expressed in a matrix or image. The concept of geometric transformation can also be linked to several forms, the position of the

Translation

Translation is a geometric transformation concept that moves all points in a plane/build along a straight line with the same direction and distance. From the exploration carried out by researchers on rice field tourism, several concepts have been found to apply geometric transformation translations.
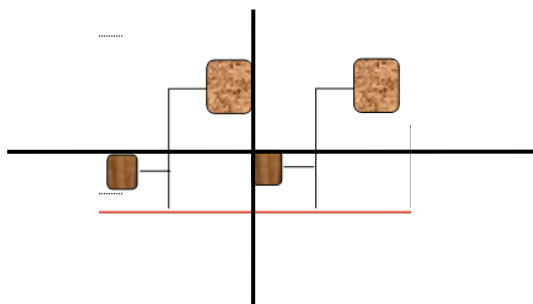
Figure 8. Modeling the Translation Concept

Figure 8 is the arrangement of the huts in the rice field tour of Pematang Johar village, if we go through Road 1 on the route above, we will see many huts arranged neatly from the right. The huts are arranged as well as possible, starting

from the place, atmosphere, and direction so as to provide comfort for visitors when they are there. From the results of observations that have been made, the location of the building applies the concept of translation to geometric

transformation, this can be seen from the displacement in the layout of the building, which has the same shape, same size, and the same direction and distance.

Reflection

Reflection or reflection is a transformation that moves a plane point

through the image properties of a mirror. As for the exploration of mathematical concepts in rice field tourism in Pematang Johar village, several geometric transformation reflection concepts have been found.

Figure 9. Reflection Concept

Figure 9 shows a row of huts located to the left of Road 2, where there are only 3 huts arranged neatly with the same shape and size, and the distance between

the 3 huts is also the same. From the observations made, if we make hut 2 a reflection point then the hut illustrates the concept of reflection in huts 1 and 3.
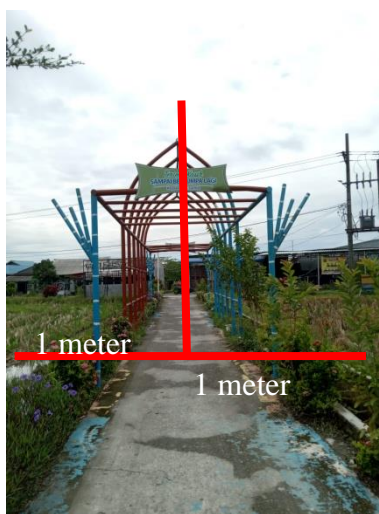
Figure 10. Rice Field Tourism Entrance

Figure 10 is the entrance gate that is in the rice field tourism village of Pematang Johar. Every time we enter and exit, we will definitely pass through a gate that looks like a tunnel, made of iron arranged in such a way that it looks very beautiful. The distance between the poles is 2 meters and some are 1 meter. From the results of this research, the entrance gate applies the concept of reflection that can be seen from objects that are reflected

at each point of the object field on a certain line, the size of which is 1 meter to the line of reflection.

Set concept

In addition to the concept of flat shapes, the concept of lines, and the concept of geometric transformation, it turns out that in the exploration carried out in rice field tour, there is also the concept of a set. A set is any collection that can be clearly expressed in the form of an

object. In this research, several sets of concepts were obtained for the types of plants that exist in rice field tourism, which will be described in Figure 11.

Figure 11. Collection of Red Flowers

Figure 11 is a road filled with red flowers. If we pass through that lane, along the way we will only see red flowers, other than that there are none. We will only find that type of flower in that place. This research describes the concept of a set, namely a set of red flowers because that is where there is a collection of red flowers.

Figure 12. Collection of Purple Flowers

Figure 12 is a picture of a road filled with purple flowers. If we pass that road, then along the way we will only see purple flowers, other than that there are none. This flower is often called the trumpet flower. We will only find that type of flower in that place. This research describes the concept of a set, namely a collection of purple flowers because in that place there is a collection of purple flowers. This arrangement of flowers in the Johar Pematang Tour can illustrate the concept of the set. Previously, there were red flowers that only existed on Road 1, while these purple flowers only existed on the main road. If we continue to pass through the main road, then after there are purple flowers, we will find a collection of white flowers to go to Road 2.

Then if we continue on to Road 2 we will see a fish pond filled with various kinds of beautiful trees which are again soothing. The trees in question are red shoots, ketapang trees, and bonsai trees.

Figure 13. Collection of Trees

From Figure 13, it appears that there are several kinds of trees near the fishing pond. The first is the ketapang tree, which grows along the road to the fishing pond and is planted neatly at a distance of 3 meters for each tree, then the second is the bonsai tree which is in the courtyard of the fishing pond with its unique shape, and the last is the red shoot tree which surrounds the pool.

Based on this, it can be assumed that the collection of trees is a subset concept, which is registered as:
$A = \{Red\ Shoot, Bonsai, Ketapang\}$.
$A(n) = 3$

Figure 14. Collection of Pictures of Paddle Ducks

Figure 14 is a collection of several rowing ducks in the Paddy Field Tourism Village of Pematang Johar. Visitors can ride the duck while enjoying the pond and the green rice field there. From this research, the collection of rowing ducks illustrates the concept of a set, namely a set of rowing ducks consisting of many rowing ducks that vary in color.

From these findings, we can see that Taman Sawah Tourism in Pematang Johar Village contains many mathematical concepts that can be explored as a source of learning mathematics. We know that there has been a lot of research on ethnomathematics which is applied to the learning process. The results of the research found that the application of ethnomathematics can motivate students so that it has a positive impact on students' mathematics learning outcomes (Maulida, 2020).

This research is in line with previous research on Tongke-Tongke Mangrove Forest Tourism, Sinjai Regency, South Sulawesi. This research found mathematical concepts in the material concept of flat shapes, geometric shapes, and straight-line concepts (Sari et al., 2022). These findings are the reference for the author to explore ethnomathematics in the Paddy Field Tourism in Pematang

Johar Village, but the findings in this research explore the layout of buildings, the placement of existing buildings in the rice field tourism, whereas previous studies explored the forms of buildings in the tour. This research can be used as material for learning mathematics through elements of culture, including frequent tours, so that it makes it easier for students to understand mathematics materials.

CONCLUSIONS AND SUGGESTIONS

The result of this research indicates that there is an application of mathematical concepts to spatial planning in Taman Sawah Tourism, Pematang Johar Village. This is proven because of the existence of mathematical concepts in spatial planning, arrangement, and buildings on the tour, which include the Flat Shape Concept, the Line Concept, the Geometry Transformation Concept, and the Set Concept.

The hope of this research is that in the future it can be an inspiration to create a unique learning style so that students feel pleasure in new things such as learning mathematics in real life that they encounter in everyday life.

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