

Research Article

The process of achieving the principles of the triangle area of middle school students through Youtube assisted learning during a pandemic

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ABSTRACT

The purpose of this study was to describe the achievement of the triangular principles of junior high school students through YouTube-assisted learning during the COVID-19 pandemic. It is exploratory research. The subjects of this study were elementary school students in Bengkulu City, Indonesia. We conducted task-based interviews with twenty-one people. The data from the completion of the task was analyzed early to determine their level of thinking. It was using its genetic decomposition. We classified them into five levels of schema development. We selected students who were at the trance level for further in-depth interviews. We use audio-visual recorders to get complete and accurate data. Data were analyzed by applying qualitative data analysis techniques. The results of this study were 19% of the research subjects were at the intra level, 33% were at the semi-inter level, 33% were at the inter level, and 10% of the subjects were at the inter level, and only one person who was at the trance level (= 5%). The conclusion of this study is that students who are at the highest level are able to build relationships between actions, processes, objects, and previous schemas so that a mature schema is formed about the area of the triangle.

Keywords: area of triangle; youtube; rectangle: covid-19; middle school students

1. INTRODUCTION

There is currently a COVID-19 pandemic that has lasted almost a year. This pandemic has greatly affected the learning process in schools. During this pandemic all schools are closed. According to (Mailizar, Almanthari, Maulina, & Bruce, 2020) that school closures in Indonesia during the COVID-19 pandemic have left 45.5 million school students and 3.1 million teachers dependent on online teaching and learning. Online teaching and learning are an unprecedented experience for most teachers and students; consequently, they have limited experience with it. The results showed that student-level barriers had the highest impact on the use of e-learning. In addition, student-level barriers show a strong positive correlation with school-level barriers and curriculum-level barriers. The study showed that the teacher's background had no impact on the level of inhibition. This study stimulates further discussion on how to overcome barriers to e-learning while maximizing the benefits of E-learning during this pandemic and beyond by highlighting the importance of student voices. (Mailizar et al., 2020). The COVID-19 pandemic has had an impact on the world of education. Learning strategies change rapidly from face-to-face learning to online learning. Research result (Kusumaningrum & Wijayanto, 2020), It was found that online lectures are often constrained by the internet network which is difficult to reach. Online learning activities are not running smoothly. As a result, students cannot understand the material well. Students want online learning videos and discussions conducted through the WhatsApp or Google Classroom application.

Technological advances also touch the world of education where learning technology becomes more effective and efficient. Therefore, the term e-learning is an electronic-based learning model that is supported by various kinds of hardware, software and various advanced features that can be used by teachers in the learning process. One of the media that can be continuously and at any time used in learning is through YouTube. This media makes it easy for math teachers to interact with students or other YouTube users. According to Horstman, educators need an adequate level of technological knowledge to be able to confidently combine various forms of technology through YouTube channel (Nugroho, Widada, & Herawaty, 2019). Thus, this paper describes students' cognitive processes in understanding the triangle principle and determining alternative syntax for learning mathematics during the COVID-19 pandemic with the help of YouTube. A triangle is a geometric figure which is a combination of three-line segments that meet at the ends. This concept is often difficult for students to understand (Widada, Herawaty, Hudiria, Prakoso, et al., 2020; Jumri & Murdiana, 2019; Widada, Herawaty,

Jumri, Zufadli, & Damara, 2019). In learning it through the YouTube channel, it makes it easier for students to learn at any time. Students can learn mathematics through the development of their cognitive processes anytime and anywhere in arithmetic-algebra, measurement-geometry and probability-statistics sequences (Lehmann, 2018). Measurement-geometry is a difficult subject for students to learn (Widada, Herawaty, Jumri, & Wulandari, 2020). One of the most difficult principles for elementary school students is finding the area of the triangle. Students often experience dis-equilibration about the concepts and principles of triangles. The imbalance occurs as a result of the exposure of the triangle image and its real form which is seen from several components that do not produce a single triangle scheme (Sarama & Clements, 2016). Therefore, sequential reasoning is needed. The reasoning is used to describe and rearrange each successive form that arises from the previous form. It was reasoning to reinvent the method for decomposing and rearranging a trapezium (parallelogram-triangle-rhombus-kite-trapezium) (Lehmann, 2018).

In Geometry learning, content is studied about fields, as well as solid shapes and their properties. A plane shape is a geometric object with length, width and height. It is a 2D (2-Dimensional) shape. These shapes are squares, rectangles, circles, polygons, triangles, and other flat shapes (T.R., 2017). Geometry is an important branch of mathematics. The surroundings we see and use are geometric shapes. These geometric objects can be used as a basis for thinking to achieve geometric concepts [9]. Therefore, the use of resources from the environment, local content and various cultural forms can be used as starting points in learning geometry (Sunzuma & Maharaj, 2019; Widada, Agustina, Serlis, Dinata, & Hasari, 2019; Ma'Rifah, Widada, Aida, Yulfitri, & Effendi, 2019; Widada, Herawaty, Andriyani, Marantika, & Yanti, 2020; Herawaty, Khrisnawati, Widada, & Mundana, 2020). For example, ethnomathematics is applied to the classroom as a mathematical activity in a cultural context (Lipka & Andrew-Irhke, 2009).

Mathematics learning needs to accommodate continuous and ongoing changes in student culture and school mathematics subjects (Rosa & Orey, 2011). Today, modern mathematics is emerging as a diverse cultural group trying to solve real-world problems (Orey & Rosa, 2004)(Jumri & Murdiana, 2022). Mathematics culture and education are closely related (Widada, Herawaty, Jumri, Wulandari, et al., 2020)(Widada, Herawaty, Lusiana, Afriani, et al., 2020)(Jumri & Murdiana, 2022). Mathematics education can be more effective if the starting point is from a particular cultural context. It was to explore the relationship between the thought processes of cultural groups, and mathematics education (Barton, 1996). On the other hand, Geometry is one of the compulsory subjects for students. It is having an abstract object, by utilizing primitive elements (i.e. points, lines, and fields)(Widada, Herawaty, Hudiria, Prakoso, et al., 2020). The triangle is a concept. It is a geometric object that is limited by a sense. Triangle as a geometric figure consisting of three-line segments that meet at the ends. The restricted area has an area. Therefore, students are asked to be able to find the area. Area is one of the measurement domains about area. The area of a composite shape can be calculated by breaking it down into simpler forms. That is to use the area of each of the simpler shapes and add them up to find the total area (Lehmann, 2018). Therefore, to determine the area of a triangle can be determined by adding up the area of the unit square. It is the area that covers the entire area of the triangle. Thus, we want to describe how students determine the area of a triangle using simple media. Students can be described through their genetic decomposition. It is an activity based on the action-process-object-schema. Thus, this paper discusses the process of achieving the principle of the area of a triangle after learning with the help of YouTube.

2. RESEARCH METHOD

This type of research is development research with qualitative methods through applying task-based interviews (Widada, Herawaty, Lusiana, Afriani, et al., 2020a). The research subjects were given the same task in the form of problems about the concept and principle of the triangle. The subject of this research will be taken purposively from elementary school students in Bengkulu City who have received lessons on the concept and principle of triangles. The selection of research subjects was carried out in stages according to needs. The results of direct interviews were analyzed so that the characteristics of students in achieving the principle of the area of a triangle could be determined. The main instrument in this research is the researcher himself, guided by several guide sheets. The guide sheets are student assignment sheets and interview guide sheets. The student assignment sheet contains problems about the principle of the triangle.

Subjects are given questions about triangles to solve. Subjects were given the opportunity to complete the task and were then immediately interviewed with interview questions according to their completion. The research data were analyzed, namely the analysis of genetic decomposition of the abstraction process carried out by the subject (Widada, Herawaty, Hudiria, Prakoso, et al., 2020; Widada, Herawaty, Lusiana, Afriani, et al., 2020b). Genetic decomposition is a structured collection of mental activities carried out by a person to describe how mathematical concepts/principles can be developed in his mind (Widada, Herawati, Fata, Nurhasanah, et al., 2020). The genetic decomposition that will be analyzed in this study is more specifically on the mental and physical activities of the subject related to the process of achieving concepts or principles. The results of this analysis will be used to determine the characterization of the research subject.

3. RESULTS AND DISCUSSION

Learning geometry in a system provides its own challenges for students. When faced with learning Euclidean geometry for flat planes, students still have a fairly good understanding, but when they start studying non-Euclidean geometry, they begin to have difficulty understanding it. During the COVID-19 pandemic, students are taught online. In this study, learning geometry, especially learning triangles, uses the help of YouTube with the link: <https://www.YouTube.com/watch?v=ebpdE0Uvub0>

Based on the data on the results of student work through paper-and-pencil from 21 students, the classification of students' abilities in finding the area of a triangle was obtained. Research subjects are given the freedom to find the area of the triangle. The analysis of the student's paper-and-pencil results can be presented in a pie chart as can see in **Figure 1**.

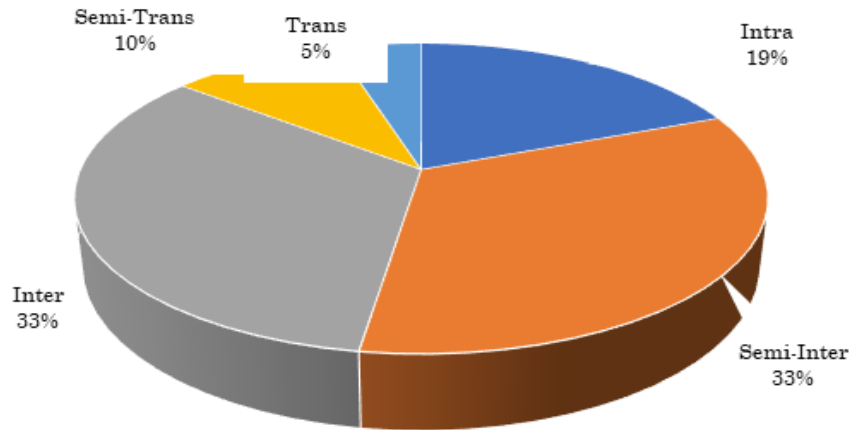


Figure 1. Subject percentage data based on the level of triad+

Figure 1 shows that 19% of the research subjects were at the intra level, 33% were at the semi-inter level, 33% were at the inter level, and 10% were at the inter level (2 people) subjects were at the inter level, and only one person was at the trance level (= 5%). These results indicate that students who are at the highest level tend to be less (Wahyu Widada, Herawaty, Jumri, Wulandari, et al., 2020). It was a student who had good cognitive abilities. Based on this classification, we are interested in exploring research subjects who are at the trance level (only 1 subject, namely Ps). Based on the assignment given to the research subject, it was found that students found the area of a right triangle. He found through the area of the rectangle. Subject Ps recalled the formula for the area of a rectangle. Look at Figures 2 and Figure 3.

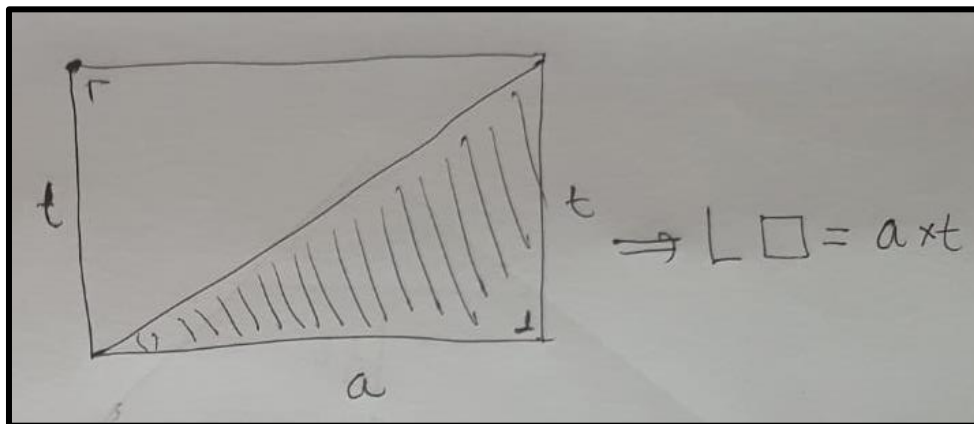


Figure 2. Subject PS remembers the area of the rectangle

Based on paper-and-pencil as shown in Figure 2, Researcher (R) conducted an interview with Ps. Excerpts from the interview are as follows.

- R : How do you get the area of a triangle?
- PS : I tried from the area of the rectangle. I remember that the area of a rectangle is the length times the width.
- R : Okay...
- PS : Look at the picture of a rectangle (Figure 2),...for example, the length is a and the width is t, then the area of the rectangle is a x t.
- R : Ok continue...
- PS : You can see the picture again, ... the shaded area is the area of a right triangle.... Its area is equal to the area of the unshaded upper triangle...
- R : Alright....
- PS : That means that the area of the rectangle is equal to twice the area of the right triangle...
- R :
- PS : I can conclude that the area of the right triangle is equal to half the area of the rectangle. So, the area of the triangle is equal to (½a x t) You can see it in Figure 3.

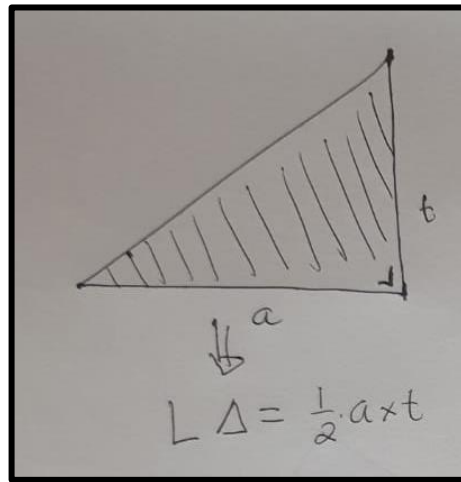


Figure 3. Area of triangle = 1/2 (a x t)

Based on the interview excerpts, Figures 2 and Figure 3, it shows that Ps is able to find the area of a right triangle through drawing actions and the process of recalling the area of a rectangle. Ps makes use of the rectangular area $a \times t$. It is an encapsulation of a rectangular object and using a rectangular diagonal scheme divides the rectangle into two equal parts. Those are two right triangles. Ps is able to achieve a new scheme where the area of the triangle is of the area of the rectangle (See Figure 3). Next, Ps finds the area of a triangle through an acute triangle (See Figure 4).

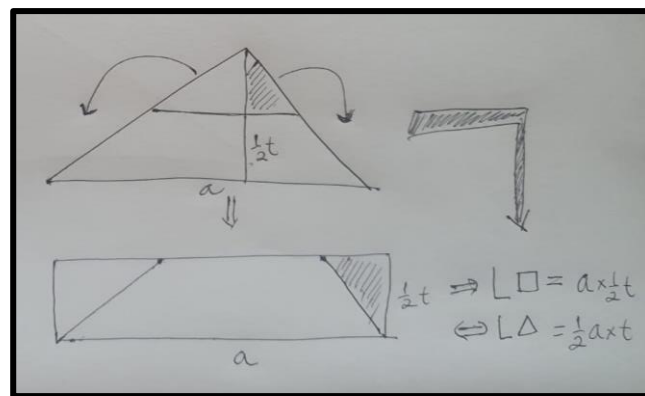


Figure 4. PS finds the area through the acute triangle

Based on the description and Figure 4, Ps is able to build links between actions, processes, objects, and previous schemas so that a mature schema is formed. This is in accordance with previous research found that there are students who carry out the process of encapsulating the properties of functions or intervals in the domain so that objects are formed (W. Widada, Herawaty, Nugroho, & Anggoro, 2019), and for the context of the properties of real numbers (Herawaty, Widada, Herdian, & Nugroho, 2020). That is the beginning to reach a mature scheme (Wahyu Widada, Herawaty, Nugroho, & Anggoro, 2019). When we refer to several models of student cognition, there is a sequence of proving the area of a triangle that is expected to increase their level of thinking. It is a sequence by utilizing a simple medium as follows. Look at Figure 5.

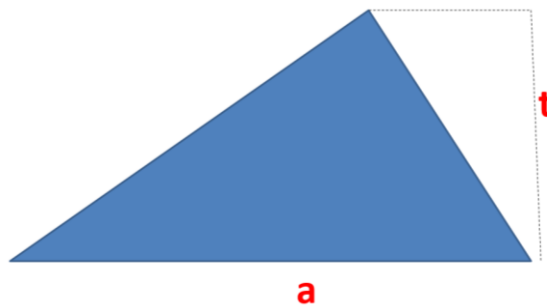


Figure 5. A triangle with base a and height t

Based on Figure 5, cut the triangle parallel to the base with height t. Draw a high line through the top and cut the base. That is forming one trapezoid and two triangles (ie red and yellow). Look at Figure 6.

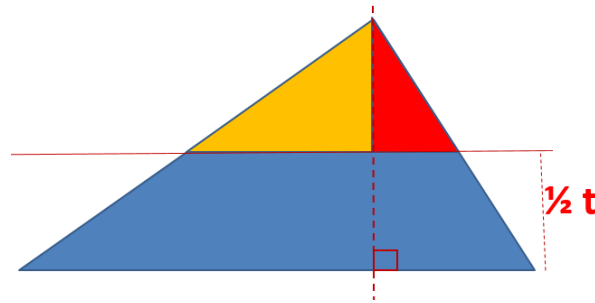


Figure 6. The triangle is divided into 3 other shapes

Based on Figure 6, we separate into 2 triangles and 1 trapezoid. It looks like Figure 7. The three shapes each have a height of t .

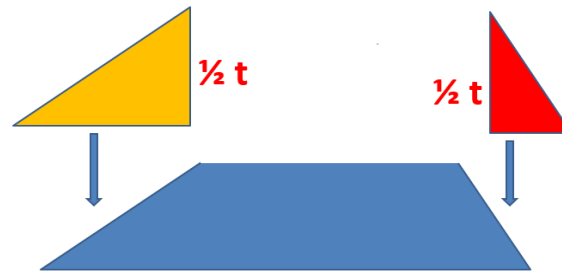


Figure 7. Two triangles and one trapezium

Two triangles and one trapezium as can be seen in Figure 7, then a new shape is formed. This is done via the blue arrow. The yellow triangle rotates, as does the red triangle. The newly formed building can be seen in Figure 8.



Figure 8. Rectangle is a new shape formed

Based on Figure 8, the new shape formed is a rectangle. It is a shape that has length a and width t . Students are able to remember that the area is $(a \times \frac{1}{2} t) = \frac{1}{2} (a \times t)$. The rectangle is having the same area as the triangle that made it up. Thus, the area of the triangle = the area of the rectangle formed from the triangle = $\frac{1}{2} (a \times t)$. Therefore, students return to their original shape, namely a triangle (See Figure 9).

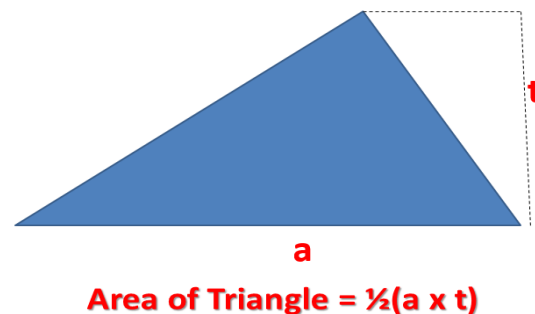


Figure 9. Area of a triangle

Based on the steps in Figure 8 and Figure 9, students are able to conclude that the area of a triangle whose base is a and the height is t is $\frac{1}{2} (a \times t)$. It is a strategy of discovering the principle of the triangle through simple media. This strategy can also be seen through online media. We can see this process through YouTube media shows with the link: <https://www.YouTube.com/watch?v=wW0Vm3h3beA&t=3s>. Therefore, the right learning strategy can make it easier for students to do cognitive activities well (Widada, Herawaty, Widiarti, Aisyah, & Tuzzahra, 2020) (Widada, Herawaty, Hudiria, Prakoso, et al., 2020)(Widada, Herawaty, Widiarti, Aisyah, et al., 2020).. This can be done through a

more contextual approach, also utilizing media that are close to the minds and culture of students (Widada, Herawaty, Pusvita, Anggreni, et al., 2020). Thus, simple learning media are able to trigger students to carry out action-process-object activities in such a way as to achieve a scheme about the triangular principle. Also, it can be extended to other mathematical concepts and principles.

4. CONCLUSION

The results of the study concluded about the geometric activity in "Rumah Tuo". These activities are calculating, measuring, and designing the Rumah Tuo of the Rantau Panjang Batin as a mathematization process through an ethnomathematical approach. Counting activities are found in traditional objects, namely Gantang Biheh to calculate rice yields and the amount of zakat issued and fines from traditional sanctions of one hundred. That means that all things must be sanctioned as much as one hundred, such as one hundred bushels of rice, one hundred kilos of meat, and one hundred kajang cloth. The measuring activity is found in the house pole which was built based on the number of people who lived at the beginning in the Rumah Tuo, and the designing activity is in the form of the house that was built designed in the form of an ancient means of transportation, namely a ship.

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AUTHOR'S CONTRIBUTIONS

The authors discussed the results and contributed to from the start to final manuscript.

CONFLICT OF INTEREST

There are no conflicts of interest declared by the authors.

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