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**INTERNATIONAL JOURNAL OF ENGINEERING SCIENCES & RESEARCH  
TECHNOLOGY****ANALYSIS OF GEOMETRIC MISCONCEPTIONS OF GRADE 7<sup>TH</sup> STUDENTS IN  
THE CONCEPTS OF TRIANGLES AND QUADRILATERAL****Antonio Bili<sup>\*1</sup>, Gede Suweken<sup>2</sup> & I Nengah Suparta<sup>3</sup>**

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**ABSTRACT**

This study aims to determine the causes of misconceptions that occur in students, especially in understanding the concepts of triangles and quadrilateral concepts. The population in this study were eighth-grade students of SMP Negeri 2 Wewewa Timur. The research subjects were 32 students of Class 7<sup>th</sup> A. This research method is descriptive qualitative by analyzing students' answers to the questions given. The instruments in this study were written tests and interviews. The results of this study indicate that misconceptions occur in students (1) Associative thinking, (2) Lack of learning interest, (3) Intuitive thinking, (4) Incomplete / wrong reasoning, (5) Student ability. Based on this research, it can be concluded the need to analyze the results of student work to determine misconceptions experienced by students, so that later students don't repeat the same mistakes.

**KEYWORDS:** misconceptions, triangles and quadrilateral.**1. INTRODUCTION**

Mathematics is a lesson learned in every level of school education. One of the main objectives of mathematics learning to be achieved is to understand mathematical concepts well. Understanding the concept needs attention to be more developed. Misconceptions in mathematics will result in the weak mastery of the material as a whole, moreover misconceptions on the basic concepts will make it difficult to master the next higher concept. This is because the order of mathematics subject matter is arranged in a hierarchical manner, one concept being the basis for understanding the other concepts.

Misconceptions can take the form of initial concepts, incorrect connection relationships between concepts, ideas or wrong views. Novak & Gowin (1984) states that misconception is an interpretation of concepts in an unacceptable statement.

Meanwhile, Brown (Suparno, 2005) states that misconceptions are an incorrect explanation and an idea that is not in accordance with the scientific understanding accepted by experts. Brown and Zembat (in Cansz, Küçük, Iyen, 2011) stated "misconception as a perception or conception that is not compatible with opinions commonly agreed on by experts on a particular subject", misconceptions as perceptions or conceptions that are not in accordance with opinions that are generally agreed upon by experts on a particular subject. In detail according to Fowler and Jaoude (1987) states that what is meant by misconception is the understanding of an incorrect concept, wrong in using the concept name, wrong in classifying examples of concepts, doubts about different concepts, not appropriate in connecting various concepts in their hierarchical structure or making generalizations of concepts that are excessive or unclear.

The concepts of triangles and rectangles are geometry study material in school mathematics, where most students still experience difficulties, even for simple things like sorting and drawing triangles and rectangles according to their type. Clements and Battista (1992) revealed the results of their research, that students assume that each shape which has four sides is square. Hanifa (2015) students experience misconceptions in explaining the facts of the concept on the triangular flat figure.

Learning geometry can also increase children's interest in mathematics, improve problem-solving skills, reasoning and ease in learning various mathematical topics and other sciences.



According to Usiskin (1980), there are three reasons why geometry needs to be taught:

- Geometry uniquely connects mathematics with the real physical world.
- Geometry uniquely allows ideas from other mathematical fields to be illustrated.
- Geometry does not generally give examples of mathematical systems.

Watson (2012) states that one of the key components in mathematics is geometry. From what was stated, it was seen that the role of geometry in the field of mathematical studies was very important.

However, the reality is that not all students understand this material well, even if it is understood that a little mastery is not comprehensive and is quickly forgotten because when given different questions students still experience difficulties. According to data from trends in mathematics and science studies (TIMSS) from 2000 to 2015, Indonesia's ranking is still at the bottom with an average still far from international scores. The results of the 2015 PISA show that mathematics achievement in Indonesia ranked 62nd out of 70 countries with a score of 386 (OECD, 2018).

Herawati (in Nuraeni, 2010) reports the results of her research that there are still many elementary school students who do not understand the basic concepts of geometry. (Ratna, 2016) The results showed that 24.1% of students mastered the concept, while the remaining 6.2% of students guessed or were not confident in the answers, 22.2% of students did not understand the concept and 47.5% of students experienced misconceptions. Students experiencing the lowest misconceptions in the subconcepts solve the problem of the proposition of triangles and line segments 36.5% and the highest misconceptions experienced by students in the subconcepts explain the symmetry and angles of 59.5%.

Budiarto's research shows that there are students' misconceptions in understanding geometrical concepts and students' misconceptions of geometry courses that cannot use geometry gained in high school or basic geometry to solve geometry problems. Soedjadi's findings (in Nuraeni 2010: 29) include the following: 1) Students find it difficult to recognize and understand geometric shapes, especially geometric shapes and their elements, 2) Students find it difficult to mention the elements of geometric shapes, for example students state that the notion of space-building ribs same as the flat side of the wake. Misconceptions that occur in students will never be separated from the causes of the discrepancy in the concept.

Suparno (in Ratna 2016) argues that the causes of misconceptions held by students can originate from false prior knowledge (preconceptions) that they had previously through their own life experiences, which were formed due to incomplete information they received previously Ausubel (in Ratna 2016).

Based on the description above, the writer is interested in designing and conducting research with the title "Analysis of geometric misconceptions of Grade 7<sup>th</sup> students in the concepts of triangles and Quadrilateral".

## 2. RESEARCH METHODS

This research is a qualitative descriptive study, a type of research aimed at describing a situation or phenomena that occur as they are (Sukmadinata in Samo, 2011, p.40). The research subjects were students of class Grade 7A<sup>th</sup>, the class concerned had studied material in the geometry of triangles and squares. Then the researchers gave the ability test questions to students in the class that had been determined. Test scores become a reference for classifying students based on their abilities.

This qualitative research is research that emphasizes process and results. And as for the main instrument in this study is the researcher himself who is involved in all activities, namely starting planning, implementation (in this case data collection), until finally compiling research reports.

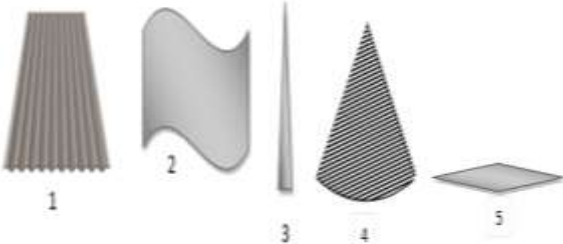
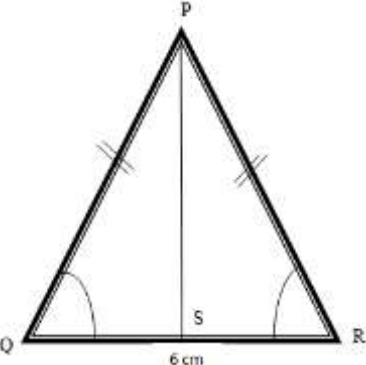
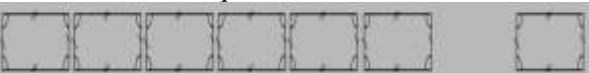
Data collection in this study was carried out with two techniques, namely using written tests and interviews. The process of collecting written test data and obtaining written test results. Furthermore, researchers conducted interviews with research subjects.

To guarantee the validity of the data in this study, a data validity testing technique is needed. The data validity testing technique is triangulated. Triangulation used in this research is technique triangulation. Data analysis is divided into two parts, namely data analysis of mathematical problem-solving tests and interview data analysis.

**2.1 Data Analysis**

Data collection was carried out at the junior high school (SMP) 2 Wewewa Timur and lasted from 20 June 2019 to 22 June 2019. Activities undertaken included observations, through discussions with subject teachers to determine which classes would be the subject of research, giving tests geometry of geometrical shapes of triangles and rectangles, analysis of work results and subject interviews. The data obtained in the form of student work and subject interviews recorded. The class used was one of the VII classes in the school, namely class VIIA, the number of students in this class was 32 students, but 5 students did not participate during the test and interview so that in total 27 students participated. The subjects chosen to be interviewed were 6 students. The subjects are students who make the most mistakes and make the fewest mistakes. Taking this subject also pay attention to high and low groups which are classified based on the work or student answers. the results obtained are an average student score of 30 and a standard deviation of 22.7444.

**3. RESULTS AND DISCUSSION**

Test Questions for Geometry Materials in Triangles and Squares	Misconceptions experienced
<p>1. Attention to the picture below!</p>  <p>Which of the pictures above are triangles and rectangles?</p> <p>2. The area of a triangle whose base length is 30 cm is known to be 180 cm<sup>2</sup>. Calculate the height of the triangle.</p> <p>3. Attention to the picture below!</p>  <p>It is known that the circumference of an isosceles triangle PQR is 16 cm. If the side length of the QR is 6 cm, what is the area?</p> <p>4. The picture below shows a square divided into 6 equal parts. Each section is a rectangle that has a circumference of 70 cm. The area of the square is..</p> 	<p>1. Reasoning is incomplete. Subjects can determine triangles and rectangles but are difficult to communicate</p> <p>2. Misconceptions of students' abilities. The subject understands the triangle area formula but in operating the formula.</p> <p>3. Lack of interest in learning and intuition. Subject In solving the problem the subject immediately multiplies PQR with QR.</p> <p>4. Incomplete reasoning. In solving problems. The subject only worked around the square but did not understand how to solve the area of the</p>



<p>5. Andi has a square garden with a size of 34 m x 16 m. Around the garden, Andi will plant a mango tree with a distance of 2 m. Many mango trees that Andi can plant are</p> <p>6. The surface of a triangular isosceles wall decoration with the same side length as 15 cm and the other side length 24 cm. If the height of the wall decoration is 9 cm, specify:</p> <p>a. Round the surface of the wall decoration</p> <p>b. The surface area of wall decoration</p>	<p>square.</p> <p>5. Lack of interest in learning. The subject cannot solve the given problem.</p> <p>6. Associative thinking. The subject considers that the circumference of a triangle is equal to the area of a triangle.</p>
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Based on the results of the analysis of written test data and interviews, stated that there were a number of misconceptions experienced by class VIIA students on triangular and rectangular flat figure material. Misconceptions that occur in each subject of this study vary. Among them are associative thinking, incomplete reasoning, wrong intuition, students' abilities, and also students' interest in learning.

#### A. Associative thinking

Associative thinking is a type of thought that considers one concept the same as another concept (Suparno, 2013: 36). based on data analysis, the experience of associative thought misconceptions is that of a moderately capable subject (S2), ie Determining the formula around a triangle and the area of a triangle. In this case the subject states that the formula around the triangle is equal to the area of the triangle (problem number 6b) the circumference of the triangle side + side + side = area of the triangle side + side + side) the circumference formula of the triangle equals side + side + side while the area formula of triangle  $\frac{1}{2} ax t$ .

#### B. Lack of interest in learning

Some forms of attitudes of students who are not interested in a lesson are less attention to the teacher, do not want to listen to the teacher and do not want to learn on their own. The attitude of students is the main cause of misconceptions so students experience misconceptions namely the attitude of students who do not want to study alone at home.

#### C. Intuitive thinking

Intuition is a feeling in a person, which spontaneously expresses his attitude or ideas about something before being objectively and rationally examined, in this case, intuition occurs in all research subjects. For example, the intuition that occurs in subject S2 in question number 6 subjects says that to find the circumference area is the same as the formula to find the area of a triangle, namely  $K = S + S + S$ , and  $L = S + S + S$ .

#### D. Incomplete/wrong reasoning

According to Comins (in suparno, 2013: 38), misconceptions can also be caused by students' reasoning or reasoning which is incomplete or wrong. Incomplete reasons can be caused by the information obtained or the data obtained is incomplete. As a result, students draw conclusions wrongly and this causes misconceptions. In this case, the wrong reasoning occurs in subjects with low ability, namely subject S3 in questions number 3 and 4, and subject S4 in problem 3. For subjects S3 in questions 3 and 4, subject S3 only writes what is known and immediately reduces the numbers the number contained in the problem, while for question number 4 the subject S3 works to find the value of y (around the square). Whereas the subject S4 experienced reasoning in question number 3, where the subject in answering the question was not right and only wrote a PQR 6 cm QPR 16 and immediately reduced 16-6 and obtained a result of 9 cm<sup>2</sup>.

#### E. Student abilities

The ability of students is also influential in this study. Students who are less able to learn mathematics, often have difficulty capturing the correct concepts in the learning process. Based on data analysis, those who experience misconceptions about students' abilities believe that students with moderate abilities (S1) and students with a low ability (S3).



#### 4. CONCLUSION

The types of misconceptions that occur in class VIIA students of SMP N 2 in 2018/2019 can be concluded as follows:

##### A. Associative thinking

Students experience associative thinking in problem number 6, where students say that the formula around a triangle is the same as the formula for the area of a triangle.

##### B. Lack of interest in learning

Student learning interest in learning mathematics is still lacking so that in working on problems that hinder the students' understanding of the concept.

##### C. Intuitive thinking

Students spontaneously express their attitudes or ideas about questions that were worked on without being understood or researched before.

##### D. Incomplete/wrong reasoning

The information obtained or data obtained is incomplete so students draw conclusions wrongly and this causes misconceptions.

##### E. Student ability

The factor of myself, namely the ability of students to understand the concept is still lacking so that students still have difficulty in answering questions.

Based on the conclusions obtained, the researchers conveyed several suggestions to overcome the problems regarding misconceptions experienced by students, including:

- This research is still limited to looking for types of misconceptions that occur in students on certain material that is the material of flat triangle and quadrilateral. Further research should be developed to look for ways to reduce or prevent misconceptions.
- Future studies are suggested to use other material that can bring up other types of misconceptions.

#### REFERENCES

- [1] Çelen Yeliz. *Misconceptions about the Ratio of Proportion of 7th Grade Students*.
- [2] Dahar, Ratna Wilis. 2011. *Teori-Teori Belajar & Pembelajaran*. Jakarta: Erlangga.
- [3] Fowler, T. W. & Jaoude, S. B. (1987). Using hierarchical concept/proposition maps to plan instruction that addresses existing and potential student misunderstanding in science. *Proceeding of the second international seminar misconception and educational strategies in Science and Mathematics*. 1. Ithaca, New York: Cornell University.
- [4] Istiyani, Ratna dkk (2016). analisis miskonsepsi siswa pada konsep geometri menggunakan *three-tier diagnostic test*. Bandung: Jurnal IAIN Syekh Nurjati Cirebon.
- [5] Mertodiharjo, Kadiyono dan Mulyono. 1980. *Mengajarkan Konsep Ilmu*
- [6] *Pengetahuan Sosial*. Jakarta: Departemen Pendidikan.
- [7] Nuraeni, Hj. Epon. 2010. *Pengembangan Komunikasi Geometris Siswa Sekolah Dasar Melalui Pembelajaran Berbasis Teori Van Hiele*. Bandung : Jurnal Saung Guru Vol I No 2.
- [8] Nurlaili, Wahyu Eka. Analisis miskonsepsi siswa kelas VII smp negeri 16 surakarta tahun ajaran 2011/2012 pada pembelajaran matematika materi pokok segitiga. *Skripsi*. Surakarta: Fakultas Keguruan Dan Ilmu Pendidikan Universitas Sebelas Maret.
- [9] Novak, J.D. & Gowin, D.B. 1984. *Learning How to Learn*. Cambridge: Cambridge University Press.
- [10] OECD, "PISA 2015 Results in Focus," *Oecd*, hal. 5, 2018.
- [11] Samo Damianus. (2011). *Kreativitas Siswa dalam Memecahkan Masalah Matematika Ditinjau dari Kemampuan Matematika Siswa*. Tesis. Universitas Negeri Surabaya.
- [12] Suparno, P. 2013. *Miskonsepsi dan perubahan konsep pendidikan fisika*. Jakarta: PT Gramedia.
- [13] Suparno, Paul. (2005). *Miskonsepsi dan Perubahan Konsep dalam Pendidikan Fisika*. Jakarta : Gramedia.



- [14] Suwanto. 2013. *Pengembangan Tes Diagnostik dalam Pembelajaran Panduan Praktis Bagi Pendidik dan Calon Pendidik*. Yogyakarta: Pustaka Pelajar.
- [15] Usiskin, Zalman. 1980. What Should Not Be in the Algebra and Geometry Curricula of Average College-Bound Students? *Mathematics Teacher*, vol 73.
- [16] Watson, Cononiah, "A Comparison of van Hiele Levels and Final Exam Grades of Students at The University of Southern Mississippi" (2012). *Honors Theses*. Paper 88.

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