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**SYSTEMATIC ANALYSIS OF MATHEMATICS TEXTBOOK  
BASE ON THE 2013 CURRICULUM IN TRIANGLES AND  
QUADRILATERAL MATERIAL**

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**Abstract**

*The purpose of this study is to analyze the systematic mathematics textbook that refers to the 2013 curriculum for the 2017 revised edition based on the following four components: (1) the discovery of triangles and quadrilateral definitions; (2) the discovery of the formula for the area of a triangle and a quadrilateral; (3) arrangement of triangles and quadrilateral; and (4) facilities to create concept maps for students. Type of this study was a descriptive study with a qualitative approach. The description given in this study was about the systematic mathematics textbook that refers to the 2013 curriculum for the 2017 revised edition by reviewing the four components. Data analysis in this study used content analysis. The conclusions of this study are (1) there is no facility to find definitions of the types of triangles and quadrilateral; (2) there are facilities to find the formula of triangles and quadrilateral use the help table, not by using the other quadrilateral area approach; (3) the arrangement of triangles and quadrilateral materials is not right yet; and (4) there is no the facility to create concept maps for students.*

**Keywords:** *analysis, systematics, curriculum 2013, triangles and quadrilateral*

**Abstrak**

Tujuan penelitian ini adalah untuk menganalisis sistematika dari buku teks matematika yang mengacu pada kurikulum 2013 untuk edisi revisi 2017 berdasarkan empat komponen berikut: (1) penemuan definisi segitiga dan segiempat; (2) penemuan rumus luas daerah segitiga dan segiempat; (3) susunan materi segitiga dan segiempat; dan (4) fasilitas membuat peta konsep bagi siswa. Jenis penelitian ini adalah penelitian deskriptif dengan pendekatan kualitatif. Deskripsi yang diberikan dalam



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penelitian ini adalah tentang sistematika buku teks matematika yang mengacu pada kurikulum 2013 untuk edisi revisi 2017 dengan meninjau empat komponen. Analisis data pada penelitian ini menggunakan analisis isi. Kesimpulan dari penelitian ini adalah (1) belum terdapat fasilitas untuk menemukan definisi jenis segitiga dan segiempat; (2) terdapat fasilitas untuk menemukan rumus segitiga dan segiempat menggunakan tabel bantuan, bukan dengan menggunakan pendekatan area segiempat lainnya; (3) urutan materi segitiga dan segiempat belum benar; dan (4) tidak ada fasilitas untuk membuat peta konsep untuk siswa..

**Kata Kunci:** analisis, sistematika, kurikulum 2013, segitiga, dan segiempat.

## **INTRODUCTION**

In curriculum 2013 implementation, teachers and students were given a handbook as a source of teaching and learning material from the Ministry of Education and Culture. The math book for the seventh grade of SMP was last revised in 2017. The 2013 curriculum mathematics textbooks for junior high school students still have mistakes (Rizkianto & Santosa, 2017). The mistakes were in the form of writing mistake and math concept mistake. There were also facts and mathematical operations errors (Sari, 2016). For triangles and quadrilateral material, it was found that the order of indicators was inappropriate and the placement of self-assignments is not right (Fitriana, 2016).

The results of Yuwono (2016) research show that students have difficulty in understanding the concepts and definitions of the base and altitude of the triangle and identify the relationship between the concepts of isosceles and equilateral triangles. Students also have difficulty in determining and distinguishing between types of triangles (Ali, et al.,

2016; Hasibuan, 2015). In addition students also have a lack of understanding of the concepts and properties of quadrilateral (Sholihah & Afriansyah, 2017).

Another problem experienced by junior high school students is the difficulty in memorizing formulas and solving problems related to the circumference of a triangle (Hasibuan, 2015). Yuwono (2016) research results state that students have difficulty in proving the formula for the area of a triangle and the area of a parallelogram. The junior high school students also still have difficulty in completing circumference problems and rectangular area (Darlia, et al., 2017). There are three types of students' mistakes in solving quadrilateral problems, namely errors in translating problems, concept errors and calculation errors (Hadiyanti, 2016). Errors in translating questions include mistakes in determining what is known and what is asked about the problem. Concept errors include errors using formulas. Calculation errors are errors in multiplication and division of two numbers.

Prerequisite material from all prerequisite materials must be placed on the initial material. For example, in quadrilateral material, the type of quadrilateral that needs to be introduced first to students is parallelogram (Kusni, 2008). The parallelogram is then used as a prerequisite material to determine the definition of a rectangle by modifying the angle to 90 degrees. The rectangle is then used as a prerequisite material to find the definition of a square by modifying the sides to be the same length. To be able to determine certain definitions or formulas required relevant prerequisite material. For example, to find the definition of a rhombus, it is necessary to modify the parallelogram by making the dimensions of the four sides the same (Kusni, 2008). Another example is to be able to find the formula for the area of a triangle, then a rectangular area approach is needed by modifying two concurrent triangles into rectangular shapes. After the definition and formula of the area of a triangle and a quadrilateral are found, we need a graphical media to link the relationships between the quadrilateral and to link the relationship between the area of the triangle and the rectangular area in the form of a concept map. The concept map is intended to assist students in memorizing rectangular area definitions and formulas. The using of concept maps in learning can overcome students' misconceptions (Juhji, 2017).

The following is the identification of problems in this study based on the information that has been presented. Mathematics books that refer to the 2013 curriculum for the 2017 edition still have errors Rizkianto

& Santosa (2017), such as writing error, concept error, fact error and mathematical operations Sari (2016), and the order of indicators that are not appropriate (Fitriana, 2016). Therefore, it is necessary to conduct research to analyze the systematics of quadrilateral and triangle material contained in mathematics textbook base on the 2013 curriculum for the 2017 revised edition. Middle school students are still having difficulties in understanding the concepts and definitions of the base and height of the triangle Yuwono, et al. (2016), determining and differentiating the types of triangles Ali, et al. (2016), understanding of the concepts and properties of quadrilateral (Sholihah & Afriansyah, 2017). Therefore, it is necessary to do an analysis of the mathematics textbook whether or not there is a discovery of the definitions of the types of triangles and quadrilateral. Middle school students are still having difficulties in proving the formula of area triangle Yuwono, et al. (2016), solving problems about the circumference of a triangle Hasibuan (2015), proving the formula for the area of parallelogram Yuwono, et al. (2016), solving circular and rectangular area problems (Darlia et al., 2017). Therefore, it is necessary to analyze whether the mathematical textbook whether or not the discovery of the formula for the area of a triangle and a quadrilateral area. In the mathematics textbook, there are two sequences of learning indicators that do not match the order of the material presented which can make students confused in learning (Fitriana, 2016). To be able to find certain definitions or formulas required relevant prerequisite material, including to find definitions

or formulas from triangles and quadrilaterals (Kusni, 2008). So that the arrangement of triangles and quadrilateral material can be made systematically to facilitate students in learning. Therefore, it is necessary to do an analysis of the mathematics textbooks about whether the arrangement of the triangular and rectangular material is correct or not. Learning that utilizes concept maps allows students to connect the concepts they have learned with the concepts they have just learned (Yuwono, et al., 2016). The using of concept maps in learning can overcome students' misconceptions (Juhji, 2017). Therefore, it is necessary to do an analysis of the mathematics textbook whether or not there are facilities to make concept maps for students.

Based on the identification of the problems that have been submitted, the purpose of this study is to find out: (1) whether or not there is a discovery of the definitions of the types of triangles and quadrilateral; (2) whether or not the discovery of the formula for the area of a triangle and a quadrilateral area; (3) whether the arrangement of the triangular and rectangular material is correct or not; and (4) whether or not there are facilities to make concept maps for students.

## **METHODS**

This type of research is a descriptive study with a qualitative approach. The purpose of the qualitative approach is to understand phenomena by focusing more fully on the phenomenon being studied (Rahardjo, 2010). The description given in this study is about the systematic mathematics textbook that refers to the 2013 curriculum for the

2017 revised edition by reviewing the four components that have been mentioned in the research objectives.

Data analysis in this study used content analysis. Content analysis requires text and analysis, reducing and interrogating it in the form of balance through the use of pre-existing components with themes that emerge to produce a theory (Cohen, et al., 2007). Pranyoto and Sujadi's (Pranyoto & Sujadi, 2015) research also used an analysis similar to that analysis. The steps of Pranyoto and Sujadi's (Pranyoto & Sujadi, 2015) analysis are (1) identifying each unit, then coded; (2) create categories and label them; (3) linking categories one with other categories; and (4) formulating a proportional statement related to the research question. Following are the steps of the analysis used in this study.

- (a) Determine the components to be analyzed about the systematic material of triangles and quadrilateral in the 2013 curriculum mathematics book for the 2017 revised edition. These components are in accordance with the objectives of the study.
- (b) Determine the unit of text taken. The 2013 curriculum math book section for the 2017 revised edition that will be analyzed is the rectangular and triangular chapters found on pages 185-298.
- (c) Determine the unit of analysis. The unit of analysis taken for this study is sentences, tables or figures contained in the rectangular and triangle chapters.
- (d) Conduct data grouping. This stage is carried out by carefully reading the rectangular and triangle material from the beginning to the end of this chapter. Every time

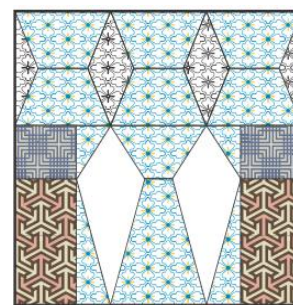
there is a sentence, table or picture that matches the specified component, the data is grouped according to these components.

- (e) Make research conclusions. After grouping the data into the appropriate components, researchers can make conclusions by identifying the relationships between the data in each component.

## RESULT AND DISCUSSION

The rectangular and triangular material in the 2013 curriculum math book for the 2017 revised edition is located in chapter 8. The material is contained on pages 185 to 298. This material is divided into seven sub material, namely (1) recognizing quadrilaterals and triangles, (2) understanding types and the nature of the quadrilateral, (3) understanding the circumference and area of the quadrilateral, (4) understanding the type and nature of triangles, (5) understanding the width and width of triangles, (6) understanding special lines in triangles, and (7) estimating the width of the building not regular (As'ari, et al., 2017).

In sub-material 1, students are introduced to the concepts of triangle and quadrilateral by identifying the shapes of triangles and quadrilaterals from Figure 8.2 found on page 186.





Gambar 8.2 Susunan bangun datar

Buatlah kreasi/hiasan lainnya dari selembar karton atau kertas yang terbentuk dari kombinasi bermacam-macam bangun datar segiempat dan segitiga seperti Gambar 8.2. Kemudian datalah bangun datar apa saja yang membentuk hiasan tersebut.

The activity on sub-material 2 is to recognize the type and nature of quadrilateral. At the beginning of sub-material 2 students are asked to observe Table 8.2 in the book which is located on pages 194-195.

Tabel 8.2 Jenis-jenis Segiempat

No.	Gambar	Segiempat/ bukan segiempat	Keterangan
1.		Segiempat	Segiempat beraturan atau persegi
2.		Bukan segiempat	Empat garis sama panjang yang terbuka/terputus

194 Kelas VII SMP/MTs Semester 2

Based on Table 8.2 information can be obtained that through this table students only observe whether the picture presented in column 2 is a quadrilateral or not a quadrilateral and after that the type is mentioned. After that students are invited to explore information about the properties of each type of quadrilateral by using Table 8.3 in the book on pages 196-197.

Tabel 8.3 Sifat-sifat segiempat

No.	Sifat-sifat Segiempat	PP	P	JG	BK	TR	LL
1.	Setiap pasang sisi berhadapan sejajar	✓				x	
2.	Sisi berhadapan sama panjang						
3.	Semua sisi sama panjang						
4.	Sudut berhadapan sama besar						
5.	Semua sudut sama besar						
6.	Masing-masing diagonal membagi daerah atas dua bagian yang sama						

196

Kelas VII SMP/MTs

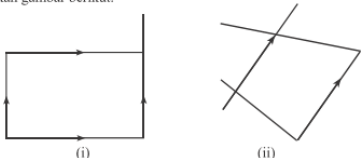
Semester 2

Based on Table 8.3, information can be obtained that students are asked to fill in the properties of quadrilateral in accordance with the type of quadrilateral that exists.

After students are asked to work on questions about the properties of quadrilateral, in the next activity students are invited to reason to look for similarities and differences in the nature of one type of quadrilateral with other types of quadrilaterals as shown in Figure 1.

**Ayo Kita Menalar**

Perhatikan kembali gambar bangun datar segiempat yang telah kalian buat pada kegiatan mengamati dan pada Tabel 8.1 dan 8.1. Kemudian diskusikanlah beberapa hal berikut ini:  
 Perhatikan gambar berikut.



1. Apakah kedua gambar tersebut merupakan segiempat beraturan? Jelaskan.
2. Simpulkan apa saja sifat-sifat dari persegi, persegipanjang, jajargenjang, trapesium, belahketupat, dan layang-layang? Uraikan.
3. Apakah persamaan dan perbedaan sifat-sifat persegi dengan persegi panjang?
4. Apakah persamaan dan perbedaan sifat-sifat jajargenjang dengan trapesium?
5. Apakah persamaan dan perbedaan sifat-sifat belah ketupat dengan layang-layang?
6. Apakah persamaan dan perbedaan sifat-sifat persegi dengan belah ketupat?
7. Apakah belah ketupat dapat dikatakan persegi? Jika iya, dalam kondisi bagaimana? Jika tidak, dalam kondisi bagaimana juga? Jelaskan.

Figure 1. Screenshot of page 203  
 (As'ari, et al., 2017)

In observing page 246, students are given the opportunity to give the name of the type of triangle in

accordance with the questions mentioned. The observing activity is contained in Figure 2.

**Ayo Kita Amati**

Lakukan kegiatan berikut untuk menentukan jenis-jenis segitiga.

1. Gambar segitiga yang sisi-sisinya tidak ada yang sama panjang. Bangun apa yang terbentuk?
2. Gambar segitiga yang dua sisinya sama panjang. Bangun apa yang terbentuk?
3. Gambar segitiga yang ketiga sisinya sama panjang. Bangun apa yang terbentuk?
4. Gambar segitiga yang semua sudutnya kurang dari  $90^\circ$ . Bangun apa yang terbentuk?
5. Gambar segitiga yang salah satu sudutnya adalah  $90^\circ$ . Bangun apa yang terbentuk?
6. Gambar segitiga yang salah satu sudutnya lebih dari  $90^\circ$ . Bangun apa yang terbentuk?

Figure 2. Screenshot of page 246 (As'ari, et al., 2017)

Based on the observations of the book, the submitter understands the types and properties of quadrilaterals on pages 194 to 205 obtained the following information. There is an introduction to the types of quadrilaterals through Table 8.2, but it has not provided an opportunity for students to find definitions of the types of quadrilateral. Based on the information obtained on page 246, it can be said that students are given the opportunity to find definitions of the types of triangles in terms of the size of the sides and angles.

On page 260 of the book there is a Table 8.14 to help students find the formula for the circumference and area of a triangle.

**Table 8.14. The Circumference and Area Of a Triangle**

No.	Gambar	Sisi Panjang (alas)	Sisi Lebar (tinggi)	Keliling	Luas
		8 cm	6 cm	$2(8 + 6) = 28$	$8 \times 6 = 48$
		8 cm	6 cm	$8 + 6 + 10 = 24$	$\frac{1}{2} \times 8 \times 6 = 24$
		10 cm	6 cm	$2(10 + 4\sqrt{2}) = 20 + 8\sqrt{2}$	$10 \times 6 = 60$
		10 cm	6 cm	$10 + 10 + 4\sqrt{2} = 20 + 4\sqrt{2}$	$\frac{1}{2} \times 10 \times 6 = 30$

Through Table 8.14 students are asked to look for a relationship between the area of a triangle with the area of a rectangle and the area of a triangle with the area of a parallelogram. Perhaps what the author intended was for students to know that the formula for the area of a triangle can be obtained by using the formula for the area of a rectangle and parallelogram. In Table 8.14, the operation of numbers of the base size and altitudet are shown. The operation of these numbers already leads to the formula.

On pages 223 to 224 of the book, there is Table 8.9a to assist students in finding the circumference formula and area of parallelogram.

**Tabel 8.9a Keliling dan luas jajargenjang**

No.	Gambar Jajargenjang	Sisi Alas	Sisi Tinggi	Keliling	Luas
1.		9 cm	4 cm	$2(9 + 6) = 28$	$9 \times 4 = 36$
2.		15 cm	6 cm	$2(15 + 10) = 50$	$15 \times 6 = 90$

3.		14 cm	12 cm	$2(14 + 9) = 54$	$14 \times 12 = 168$
4.		....	....	....	....

Through Table 8.9a students are asked to look for patterns found in the first row, second row and third row. The goal is that students can fill in the contents contained in the third row, so students can find the circumference formula and area of the parallelogram. In Table 8.9a, the operation of numbers of the base size and altitude size are already displayed. The operation of these numbers already leads to the formula. The activity of finding the rectangular area formula as in Table 8.9a also applies to other types of quadrilateral, such as trapezoid, rhombus and kite.

Based on the results of the 2013 curriculum mathematics analysis book for the 2017 revised edition of class VII on pages 206 to page 244 about the circumference and area of the quadrilateral area and the results of the analysis on pages 257 to page 273, it can be said that there is already a table that facilitates students to find the area formula of quadrilaterals and triangles. Trough these tables students in finding the area formula area of a third only merely observing the pattern of operations of numbers which are the size of the side units used in calculating the area of quadrilaterals and triangles. But, students have not been facilitated in finding the area formula of a triangle or a type of quadrilateral using the area approach of other quadrilateral types.

Through the process of finding definitions of the types of triangles and



quadrilaterals, including the formula for the area of triangles and quadrilaterals, students can learn constructively (Yuwono, et al., 2016). Constructivistic learning requires students to actively think and carry out activities in order to develop concepts and give meaning to the things they learn (Sumarsih, 2009). Constructivistic learning can improve student learning outcomes (Mulyati, 2016). Constructive learning can also improve student achievement and problem solving abilities (Pandey & Ameta, 2017). However, in this study information was obtained that the mathematics textbook had not yet facilitated students to learn constructively. This is because in the mathematics textbook there is no discovery of the definition of the types of triangles and quadrilateral. Other than that, students have not been facilitated in finding the area formula of a triangle or a type of quadrilateral using the area approach of other quadrilateral types.

Based on the results of the analysis on pages 194 to page 205 about the types and properties of quadrilateral obtained information that has not been found the correct arrangement of material about the types and properties of quadrilatera. The correct arrangement of matter in question is the presentation of material types of quadrilaterals that are systematically started from one type of quadrilaterals and then developed to other types of quadrilaterals. The development in question is the process of modifying the size of the angles or sides of a quadrilateral type so as to form another type of quadrilateral. Students are instantly introduced to the types of quadrilaterals through Table

8.2. Students are also asked to directly fill in the properties of each type of quadrilateral through Table 8.3. Fitriana (2016) research results stated that in the mathematics textbook that refers to the 2013 curriculum for the topic of triangles and quadrilateral there are two indicators whose order is not incompatible with the order of the material presented. Whereas in this study, the arrangement of triangles and quadrilaterals is not right yet. Presentation of material types of triangles and quadrilaterals do not start from a type of triangle or quadrilateral and then expanded to other types.

Based on the results of the analysis on pages 194 to page 205 about the type and properties of quadrilaterals obtained information that facilities have not been found for students to make a concept map about the types and properties of quadrilaterals. Based on the results of the analysis on pages 206 to page 244 about the circumference and area of the rectangular area obtained information that there are no facilities that provide opportunities for students to make a concept map about the area of the quadrilateral and triangle.

The use of concept maps for students can improve concept understanding in the learning process (Yunita, 2014). Through concept maps, students can improve their writing skills (Suyanto, 2015). Learning with the concept map strategy is more effective than conventional learning (Eryanti, 2015). The use of concept map techniques in collaborative learning can increase student participation and skills in learning (Rubiyah, et al., 2018). Utilization of concept maps can improve skills in making learning



plans for teachers (Purwaningsih, et al., 2018) However, the mathematics textbook does not yet have facilities for students to make concept maps. So the advantages of concept maps that have been mentioned by these studies will be difficult to obtain.

### **CONCLUSION AND SUGGESTION**

The conclusions of this study are (1) there is no facility to find definitions of the types of triangles and quadrilateral; (2) there are facilities to find the formula of triangles and quadrilateral use the help table, not by using the other quadrilateral area approach; (3) the arrangement of triangles and quadrilateral materials is not right yet; and (4) there is no the facility to create concept maps for students.

Based on the conclusion of the research, the following suggestions can be given to the authors of the mathematics textbooks: (1) facilities need to be provided for students to find definitions of the types of triangles and quadrilateral; (2) facilities need to be provided for students to find the formula for the area of triangles quadrilateral using the area approach of other quadrilateral; (3) the arrangement of triangles and quadrilateral should be arranged properly; and (4) facilities need to be provided for students to make concept maps.

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