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THE NEED ANALYSIS OF MATHEMATICS TEACHING MATERIALS BASED ON MATHEMATICAL PROFICIENCY IN MADRASAH IBTIDAIYAH

ANALISIS KEBUTUHAN BAHAN AJAR MATEMATIKA BERBASIS KEMAHIRAN MATEMATIS DI MADRASAH IBTIDAIYAH

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Abstract

This research aimed to describe the need to analyze mathematics teaching materials based on mathematical proficiency in Madrasah Ibtidaiyah. Qualitative research was used in this research. The research was conducted in one of the Private Madrasah Ibtidaiyah in South Tangerang, Indonesia. The subject consisted of two mathematics teachers. The data collected through interview and documentation techniques consisted of curriculum and mathematics teaching materials. The data were analyzed using triangulation consisting of data reduction, presentation, and conclusion and verification. The result showed that the need analysis of mathematics teaching materials consisted of: (1) the curriculum of mathematics needed to be arranged about the sequence of materials, (2) teachers needed mathematics teaching materials in various types, and (3) the mathematics concepts based on mathematical proficiency in teaching materials needed to be improved. These results can be a reference for developing teaching materials based on mathematical proficiency for mathematics teaching and learning.

Keywords: *Need Analysis, Teaching Materials, Mathematics*

Abstrak

Penelitian ini bertujuan untuk mendeskripsikan analisis kebutuhan bahan ajar matematika berbasis kemahiran matematis di Madrasah Ibtidaiyah. Penelitian kualitatif telah dilakukan dalam penelitian ini. Penelitian ini dilakukan di salah satu Madrasah Ibtidaiyah Swasta di Tangerang Selatan, Indonesia. Subjek penelitian terdiri dari 2 orang guru matematika. Pengumpulan data dilakukan melalui wawancara dan dokumentasi pada kurikulum dan bahan ajar matematika. Analisis data menggunakan teknik triangulasi yang terdiri dari reduksi data, penyajian data, serta penarikan kesimpulan dan verifikasi. Hasil penelitian menunjukkan bahwa analisis kebutuhan bahan ajar matematika di antaranya yaitu: (1) perlu adanya penyusunan urutan materi yang tepat pada kurikulum matematika, (2) guru membutuhkan berbagai jenis bahan ajar matematika, dan (3) perlu adanya perbaikan pada isi konsep matematika berdasarkan kemahiran matematis siswa. Hasil penelitian ini dapat menjadi acuan untuk mengembangkan bahan ajar berbasis kemahiran matematis pada pembelajaran matematika.

Kata Kunci: *Analisis Kebutuhan, Bahan Ajar, Matematika*

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1. Introduction

Learning mathematics in elementary education in the 21st century has reformed educational aspects. The holistic educational reform is a form of a new educational paradigm in the 21st century, which includes reformation towards the direction of education that provides curriculum and assessment changes, further teacher training and recruitment strategies, development of leadership patterns, and collaborative integration of technology (Malik, 2018). This reformation of education in the 21st century also aims to achieve the targeted skills of students, consisting of critical thinking, problem-solving, metacognition, communication, collaboration, innovation and creation, information literacy, and various other skills. Therefore, learning mathematics in the 21st century is not only intended and focused on students mastering mathematical operations. Learning mathematics also aims to prepare students with various mathematical skills to solve problems in the current era.

As a consequence of the education paradigm in the 21st century, mathematics learning has big demands and challenges. Learning mathematics should develop the mathematical proficiency of students. Mathematical proficiency is a concept that describes the abilities that support the achievement of mathematics learning objectives. Mathematical proficiency combines the five components, including conceptual understanding, strategic competence, fluency of procedures, adaptive reasoning, and productive dispositions that form a unity for students learning mathematics. By mastering these components, students have mathematical proficiency as a powerful tool to face the challenges of the 21st century.

Mathematics education, especially in Indonesia, still faces various problems. The PISA test results of Indonesian students in 2018 showed that around 28% of students in Indonesia achieved Level 2 or higher in mathematics (OECD, 2019). At a minimum, these students can interpret and recognize, without direct instruction, how simple situations can be represented mathematically. In addition, about 1% of students scored at Level 5 or higher in mathematics. These students can model complex problems mathematically and select, compare, and evaluate appropriate problem-solving strategies. Based on the results, the percentage of students who can solve the PISA test is less than those who can not solve the problems. These results show that many students still need to improve their mathematical proficiency. It indicates that the achievement target of learning mathematics in schools is still not at the maximum.

The development of students' mathematical proficiency can be done by learning mathematics that is presented well in all learning components by a teacher. Teaching material is one of the learning components that can support the mathematics learning process based on mathematical proficiency. Teaching materials are all forms of systematically arranged materials that allow students to learn by being designed according to the applicable curriculum (Yuberti, 2014). In learning mathematics, teaching materials provide benefits for teachers and students. Mathematics teaching materials can support mathematics learning to achieve the goals. Through the use of teaching materials, mathematics learning can be more focused. Students can explore knowledge and support students' understanding in mastering mathematical concepts and skills.

Currently, education in Indonesia uses the 2013 curriculum as a national curriculum in elementary schools such as Madrasah Ibtidaiyah. In implementing this curriculum, most of the teachers use the teaching materials, which is a textbook of the 2013 curriculum. However, the teaching materials used by teachers still found some limitations. This case was found in one of the private Madrasah Ibtidaiyah in South Tangerang. In this school, teachers have difficulties using the teaching materials. The variation of teaching materials is still limited causes the achievement of mathematics learning is still not maximum in this school.

Several researchers found the teachers' difficulties in teaching mathematics. Previous research found that the difficulties experienced by teachers in learning mathematics included the use of thematic books, which were less effective for learning mathematics, and teachers having difficulty developing the material contained in the books (Fauzi, Sawitri, & Syahrir, 2020). Another previous research showed a lack of thematic teaching materials in elementary schools, which is learning materials that are less in-depth (Prabowo, Sarwanto, & Roemintoyo, 2018). This result shows that one of the teaching materials is textbooks that need to be reviewed to learn mathematics in schools. In line with those research, one of the things that need to be reviewed and reconsidered by teachers before starting mathematics learning is the scope and level of difficulty of teaching materials (Indrawati, 2019).

Mathematics teaching materials used by teachers still have not developed students' mathematical proficiency and thinking abilities. The teaching materials in mathematics textbooks containing tasks with low cognitive levels did not support students' mathematics learning because students were not accustomed to completing difficult tasks (Yang & Sianturi, 2017). Students find it difficult if they get challenging assignments because previously, students were used to working on tasks with low cognitive levels.

The previous research about analysis of the textbooks from the Ministry of Education and Culture of the Republic of Indonesia showed that the mathematics issue in the book consisted of mathematics problems that focused on procedural knowledge (Fuadah, Saud, Hadiyanti, & Nugraha, 2020). Teachers need appropriate teaching materials to develop students' mathematical proficiency based on these problems. It was found that there are no questions that contain representation skill, reasoning, and conceptual understanding. This result indicates that teaching materials in mathematics learning are essential to improve based on mathematical proficiency. The teachers' need for teaching materials is important to be studied in depth. The teaching materials should be suitable for the teacher's needs in teaching and for students to achieve the targeted mathematical proficiency skills.

Several works have been done related to the need to analyze teaching materials in mathematics learning. A research result about analyzing the mathematics teaching materials based on ethnomathematics in terms of elementary students showed that elementary school students need teaching materials in mathematics learning based on ethnomathematics (Sintawati, 2018). Other research has been done about need analysis on developing teaching instruments of mathematics for senior high school showed that developing teaching instruments can facilitate the teacher needs of teaching materials in mathematics learning (Wijayanti & Sungkono, 2017). Moreover, another research on the need analysis of mathematics teaching materials showed that students and teachers need teaching materials based on the contextual approach (Ningrum & Suparman, 2017). Further, the research about need analysis for developing various types of

mathematics teaching materials also has been done that showed there is a teacher need for e-module in mathematics learning (Qomalasari, Karlimah, & Respati, 2021).

Some researchers conducted studies related to the need for mathematics teaching materials. However, most analyzed the need for teaching materials viewed from different approaches, such as ethnomathematics and contextual approaches (Ningrum & Suparman, 2017; Sintawati, 2018). Another research also analyzed the need for teaching materials viewed from the different teaching materials, such as e-module (Qomalasari, Karlimah, & Respati, 2021). Those research focused on the need to analyze teaching materials viewed from mathematical proficiency in mathematics learning. This research focuses on the fact that the study exploring the teachers' need for teaching materials based on mathematical proficiency is limited, especially in elementary school. By analyzing based on mathematical proficiency, the teaching materials can be seen whether it is relevant to mathematical proficiency for elementary school students. This research analyses the teacher needs for more types of teaching materials. Therefore, the objective of this research describes the need analysis of mathematics teaching materials based on mathematical proficiency in elementary school.

2. Research Method

This research used qualitative research. The research was conducted in one private Madrasah Ibtidaiyah in South Tangerang of Banten, Indonesia. The subjects of this research are two teachers: a mathematics teacher from the upper grade (the 4^{th} grade until 6^{th} grade) and a mathematics teacher from the lower grade (the 1^{st} grade until 3^{rd} grade) of Madrasah Ibtidaiyah. Table 1 below shows the profile of the subject of this research.

Table 1. Profile of Research Subjects

Characteristics	Teachers	
	Ms. A	Ms. B
Grade of teaching	The 5^{th} grade	The 2^{nd} grade
Gender	Female	Female
Educational level	Bachelor	Bachelor
Experience of teaching	More than 8 years	More than 8 years

The data were collected through interview and documentation techniques. Interviews were given to mathematics teachers about mathematics teaching materials. Interviews were taken to describe the need for teachers to teach materials in mathematics learning.

Table 2. Interview Guidelines about the Need Analysis of Teaching Materials

Aspects	Questions
Needs of mathematics curriculum	5 Questions
Math learning problems in elementary school	5 Questions
The teachers' needed teaching materials	9 Questions
The type of teaching materials used by the teacher	12 Questions

The documentation technique conducted was for curriculum and mathematics teaching materials. Four stages analyzed the data: data reduction, presentation, and

conclusion drawing and verification. Data reduction was conducted by grouping the data collected according to the aspects of the research problem. The reduced data was then presented and displayed in the form of a description according to the research aspects. The presentation aimed at researchers to interpret the data and conclusions. To check the validity of the data in this study, the researchers used the following criteria: credibility, transferability, dependability, and confirmability.

3. Results and Discussion

3.1 Results

Teaching materials are essential components in teaching and learning mathematics, especially in elementary schools such as Madrasah Ibtidaiyah. By using the teaching materials, teachers can provide mathematics learning, especially for developing students' mathematical proficiency. The need for teaching materials is analyzed from the basic mathematics learning problems and basic needs of the mathematics teacher. The results of this research are described in detail below.

3.1.1 Problems of Mathematics Curriculum and Learning in Madrasah Ibtidaiyah

A curriculum is one of the fundamentals of mathematics teaching and learning. It contains a set of goals and teaching materials for mathematics learning as a guide for teachers in school. Interview results of this research indicated that this school used the curriculum of 2013 for teaching and learning mathematics. Actually, for the implementation, teachers had modified the curriculum of 2013 as needed. The modified curriculum of 2013 was conducted from the 3rd grade until the 6th grade of Madrasah Ibtidaiyah. The curriculum modification was conducted by developing a syllabus and lesson plans for mathematics learning. A teaching team of mathematics teachers carries out mathematics curriculum development.

Based on the collected data, the mathematics curriculum currently used by teachers has not covered all of the students' mathematics learning needs. The interview result between the interviewer (I) and the upper-grade mathematics teacher (UT) can be seen below.

I : How about the mathematics teaching materials in the upper grade?
UT : Actually, the mathematics teaching materials used are based on the curriculum of 2013, but it still has some limitations in content aspects.
I : Is the content of teaching materials following the curriculum?
UT : Some contents are not suitable for the curriculum, especially at students' cognitive level.
I : What mathematics content should be taught in the upper-grade focus?
UT : For students, mathematics should focus on achieving advanced mathematical concepts.

Based on the interview results, in the upper grade, the learning materials of mathematics were not following students' cognitive levels. Elementary school students have a specific cognitive level, especially in mathematics learning. The learning process should be supported by the teaching materials that consider the cognitive level from cognitive 1 (C1) until cognitive 6 (C6). Moreover, learning mathematics in the upper grade should be focused on more advanced mathematical concepts. In the upper grade,

students could develop the upper cognitive level from cognitive 4 (C4) until cognitive 6 (C6), which aimed to achieve high order thinking skills (HOTS).

On the other hand, the interview results in the lower grade mathematics teacher showed some findings. The interview result between the interviewer (I) and the lower grade mathematics teacher (LT) is below.

I : How about the mathematics teaching materials in the lower grade?
LT : The teaching materials based on the curriculum of 2013 have a lot of materials, but it is not relevant to the learning time in the lower grade.
I : Is the teaching materials relevant to the curriculum of 2013?
LT : Yes, relevant, but there are a lot of mathematics materials.
I : What mathematics content should be taught in the lower-grade focus?
LT : The contents in the lower grade should be focused on the achievement of basic mathematical abilities.

Based on the interview results, the material was quite a lot in the lower grade, while the learning time was very limited. According to teachers' perspectives, the process of learning mathematics should aim to achieve basic mathematical abilities in lower grades. The basic mathematical abilities prepared students for the basic mathematics concepts so that students would not find difficulties when studying mathematics in the upper grade.

Mathematics was difficult to understand, especially for those who had not mastered the basic operations of numbers. Besides that, there were some problems implementing mathematics teaching and learning in elementary schools. One of them was students still think that mathematics is difficult. In the upper grade, students had difficulty understanding word problems. In addition, students also lacked basic calculation skills consisting of addition, subtraction, multiplication, and division operation. These problems also come from the lower grade. Students in lower-grade had different skills in the basic operation of mathematics. Some of them had not mastered the basic operations. This condition caused students to have difficulties learning mathematics in the higher grade, especially in learning advanced concepts in mathematics.

The mathematics content also had different difficulties for teachers in teaching mathematics. According to the upper-grade teacher in mathematics, the fraction concept was one of the challenging concepts to teach and understand by students. On the other hand, from the lower grade teacher's perspective, the division operation concept was the most difficult content in mathematics. It was also found that mathematics learning in the upper grade had not developed mathematical proficiency in maximal. This condition was due to the limited learning time. In addition, the availability of teaching materials was also still not maximal in supporting mathematics learning in the classroom. In the lower grades, mathematics learning still focused on the basic operations of mathematics. Therefore, it was necessary to develop mathematical skills starting in the lower grades.

Teachers experienced difficulties presenting mathematics learning that could improve students' mathematical proficiency. According to the upper-grade teacher, the problem in developing mathematical proficiency was caused by the varied cognitive abilities of students. Teachers found it difficult to facilitate the diverse characteristics of students. In addition, the duration of learning was also quite limited. Meanwhile,

according to the lower grade teacher, the problem faced in developing mathematical skills was the lack of drills for students.

The mathematics learning curriculum was also directed so that students could master the ability to solve problems on the High Order Thinking Skill (HOTS). There were differences in the conditions and responses of students in class when faced with problem-solving questions, mathematical literacy, and HOTS problems. Students in the upper grade found it difficult, and they wanted to get the solution earlier without a deep understanding. Students in lower grades had not trained in problem-solving activities on mathematical literacy and HOTS questions. Based on this school's curriculum and mathematics learning findings, it was essential to analyze the teachers' needs regarding the types and characteristics of teaching material needed in mathematics, especially in elementary school.

3.1.2 Teachers' Needs of Mathematics Teaching Materials in Madrasah Ibtidaiyah

Based on the problems of curriculum and mathematics learning in Madrasah Ibtidaiyah, teachers need some components of teaching to prepare the mathematics learning for students. Here is the detail of the results of the need analysis of mathematics teaching materials.

3.1.3 The Curriculum of Mathematics Needs to be Arranged about the Sequence of Materials

At the beginning of the implementation of the 2013 national curriculum, mathematics was presented in the form of thematic learning in this school. However, mathematics through thematic learning was found to several problems from teachers', students', and parents' perspectives.

First, there were many complaints from parents. They argued that mathematics in thematic learning was not maximal in learning. The learning materials were less depth, so students could not explore more materials in mathematics. Parents thought that mathematics as a subject was more effective than mathematics using thematic learning. This criticism from parents became an input for schools to improve mathematics learning. Mathematics learning was presented separately as a subject in the 3rd grade to the 6th grade; it was not presented thematically.

Second, another problem came from teachers who showed the materials in the national curriculum of 2013 were not well structured. The interview result between the interviewer (I) and the upper-grade mathematics teacher (UT) can be seen below.

I : How about the contents of mathematics materials in the 2013 curriculum?
UT : In the upper grade, some mathematics materials are non-sequential.
I : Can you explain more what are those materials?
UT : The materials such as the fraction concept is still repeated in both odd and even semester in the upper grade.

According to the interview results, some materials of mathematics were non-sequential. The contents of mathematics in the curriculum had a random sequential. For example, in the odd semester, concepts of fractions had been taught in the classroom, but in the even semester, they still repeated the same contents. This case showed that the sequential contents were not well prepared in the curriculum. On the other hand, teaching mathematics as a subject matter was more adjustable for teachers. In thematic learning, the scope of mathematics content that could be taught was limited. Teachers

should adopt the theme of learning related to mathematics content so that some of the learning has been a misunderstanding concept for students.

Moreover, the interview result between the interviewer (I) and the lower grade mathematics teacher (LT) can be seen below.

I : How about the contents of mathematics materials in the 2013 curriculum?
UT : In the lower grade, there are so many contents that should be taught to students that it impacts the essential content that is not delivered well to students.
I : Can you explain more what is the materials?
UT : The materials such as multiplication and division can not be delivered well to students in mathematics learning.

In the lower grade, there were a lot of materials in the 2013 curriculum. Teachers found it difficult to manage the learning time. This problem impacted the essential materials such as multiplication and division that could not deliver well to students. The teachers argued that the mathematics materials in the lower grade should be less content so the teachers could focus on exploring the essential materials of mathematics.

Third, students' problems were about the mathematical proficiency that had not maximal in the output of learning. The random sequence of curriculum materials made students difficult to understand mathematical concepts. Moreover, the mathematics curriculum implementation component should be improved based on mathematical proficiency. Based on the curriculum problems in this school regarding the mathematics curriculum in Indonesia, teachers needed a curriculum of mathematics that was arranged about the sequence of materials. In addition, the component of the implementation of the mathematics curriculum should be provided based on mathematical proficiency.

3.1.3.1 Teachers Need Mathematics Teaching Materials in Various Types

Based on data analysis, some teaching materials were used by teachers in the upper and lower grades. The mathematics teaching materials are divided into printout and digital teaching materials. Table 3 below shows the detail of printout mathematics teaching materials.

Table 3. The Print-Out of Mathematics Teaching Materials Used by Teachers

Type of Teaching Materials	Upper Grade (5^{th})	Lower Grade (2^{nd})
Textbook of mathematics	√	√
Module of mathematics	-	-
Handout of mathematics	-	-
Practice book of mathematics	√	-
Student worksheet	√	√

Table 3 shows that the upper-grade teacher used more printout teaching materials than the teacher in the lower grade. The teacher of the upper-grade used textbook, practice books, and student worksheets, while the teacher in the lower grade used textbooks and student worksheets in teaching mathematics; module and handout were not used by both of them.

Another type of teaching material was digital mathematics teaching materials. According to the result, both upper and lower grades teachers have used digital teaching materials. Table 4 below shows the details of teachers' digital mathematics teaching materials.

Table 4. The Digital Mathematics Teaching Materials Used by Teachers

Type of Teaching Materials	Upper Grade (5^{th})	Lower Grade (2^{nd})
Digital textbook of mathematics	-	-
The electronic module of mathematics	-	-
Digital handout of mathematics	-	-
Digital practice book or mathematics application	√	√
Digital student worksheet	-	-
Video of mathematics	√	-

Table 4 shows that teachers have used various teaching materials, but it is still limited in some types of teaching materials. Based on the data in table 4, the teacher in the upper grade used more types of digital teaching materials than the teacher in the lower grade. The teacher in the upper grade used digital practice books or mathematics applications and videos of mathematics. In contrast, the teacher in the lower grade only used digital practice books or mathematics applications. Both of them did not use modules and handouts of mathematics because they seem not familiar to teachers in mathematics teaching.

Table 5. Types of Teaching Materials that Teachers Need

Type of Teaching Materials	Upper Grade (5^{th})	Lower Grade (2^{nd})
Textbook of mathematics	√	√
Module of mathematics	√	√
Handout of mathematics	-	-
Practice book of mathematics	√	√
Student worksheet	√	-

Table 5 shows that teachers in the upper and lower grades needed textbooks, modules, and practice books on mathematics. Teachers in the upper grade only needed student worksheets. Especially for the modules in mathematics, teachers were very needed because they rarely used modules in mathematics teaching and learning in their class. For the teacher in the upper grade, a module of mathematics was needed to support mathematics learning. In contrast, for the teacher in the lower grade, the mathematics module was needed to explore the concepts of mathematics and summarize mathematics materials. Both of them expected that the mathematics module for elementary schools could contain a learning approach from concrete to abstract and refer to the development of students' mathematical proficiency.

3.1.3.2 The Mathematics Contents Based on Mathematical Proficiency in Teaching Materials Need to be Improved

An elementary school such as Madrasah Ibtidaiyah was a basic education where students developed the basic mathematics concepts, so teaching materials should provide the appropriate mathematics concepts. However, the teaching materials used by teachers were still limited to mathematics concepts. The results showed that some concepts of mathematics were not appropriate in the teaching materials. For examples, in fraction concepts, it was found that teaching materials provided a wrong representation of fraction using picture and visual. This could be caused by a misconception in mathematics concept of students, so that it should be focused on the appropriate basic concepts of mathematics.

Based on the quality of teaching materials, the presentation of teaching materials was included in the sufficient category. Still, it needed to be improved various following the students' characteristics. Teaching materials were considered easy to use but still needed supporting teaching materials to help students. It meant that the quality of teaching materials quality required improvement.

The interview result between the interviewer (I) and the upper-grade mathematics teacher (UT) can be seen below.

I : How about the contents of mathematics teaching materials viewed from mathematical proficiency in the upper grade?
UT : The mathematics teaching materials have not contained mathematical proficiency in the upper grade.
I : what is the focus of teachers' current mathematics teaching materials in this school?
UT : Actually, the mathematics teaching materials are still focused on mathematics in procedural contents.

Moreover, the interview result between the interviewer (I) and the lower-grade mathematics teacher (LT) can be seen below.

I : How about the contents of mathematics teaching materials viewed from mathematical proficiency in the lower grade?
LT : The mathematics teaching materials have not focused on mathematical proficiency.
I : what is the focus of teachers' current mathematics teaching materials in this school?
LT : The mathematics teaching materials are still focused on procedural mathematics and routine problems. Students in the lower grade have not practiced more non-routine problems.

The interview results indicated that the teaching materials had not contained mathematical proficiency. Teaching materials that teachers used were limited to mathematics in procedural contents. The contents of mathematics provided in teaching materials did not concern mathematical proficiency. The example could be seen in mathematics problems provided in the teaching materials. There were a limited number of mathematics problems: problem-solving, literacy, and HOTS problems. Teaching materials provided more routine than non-routine problems, and the mathematics

problem focused on procedural solving problems. It lacked the students' exploration in solving the problems, so their mathematical proficiency had not optimally reached maximum results.

Teaching materials are expected to have learning materials suitable to student needs. Teachers need mathematics teaching material that contains mathematical proficiency. The display of teaching materials also needs to be designed attractively according to the mindset of students. By providing teaching materials based on mathematical proficiency, mathematics learning is expected to achieve the goals and develop students' mathematical proficiency.

3.2 Discussion

Teaching materials in mathematics was an essential component that teachers should provide-teaching materials used by teachers related to the curriculum and learning of mathematics in school. There were some problems in implementing the mathematics curriculum and mathematics learning. Generally, this school used the national curriculum of 2013 in mathematics learning, but teachers had modified some components. The implementation of the national curriculum was changed from the thematic approach to a separate subject. There were several difficulties for teachers in applying mathematics learning thematically. Teachers must be more creative in combining mathematics concepts into a theme. Teachers got difficult to find additional sources of books and evaluate mathematics learning (Widyastuti, 2015). Moreover, one of the obstacles experienced by teachers was the lack of time in the learning process (Sutisna, Fauziah, & Lestari, 2020).

Based on the results, the need analysis of mathematics teaching materials consisted of: (1) the curriculum of mathematics needed to be arranged regarding the sequence of materials, (2) teachers needed mathematics teaching materials in various types, and (3) the mathematics concepts based on mathematical proficiency in teaching materials needed to be improved-the details of the discussion of result findings explained as follow:

3.2.1 The Curriculum of Mathematics Needed to be Arranged regarding the Sequence of Materials

The implementation of the 2013 national curriculum had some problems. The thematic approach used in the 2013 curriculum was found to have some difficulties. Based on the research results by Retnawati, Munadi, Arlinwibowo, Wulandari, & Sulistyaningsih (2017), there were several teacher difficulties in implementing thematic learning, including teachers still did not understand the 2013 curriculum. The learning process was not implemented optimally, the learning content had not developed high order thinking skills, and there were limited facilities in the form of learning resources. and learning media (Retnawati, Munadi, Arlinwibowo, Wulandari, & Sulistyaningsih, 2017). This research result was in line with the findings in this result; teachers got difficult to connect each content from different subjects. The materials of learning also were less depth, so students could not explore more materials in mathematics. Mathematics was provided for students as a separate subject to respond to this condition. Mathematics learning was not presented thematically. Mathematics learning was now presented separately as a subject in the 3rd grade to 6th grade.

In addition to thematic learning problems in mathematics, the curriculum components also needed to pay attention to the order of mathematics learning materials. The research result indicated that the mathematics materials in the national curriculum

of 2013 were not well structured. There were some materials of mathematics that was non-sequential. The random sequence of curriculum materials made students difficult to understand mathematical concepts. It was necessary to select mathematics materials based on the scientific structure, the level of depth of the material, and the essential of the material and its use in everyday life (Nasaruddin, 2013). The structure of mathematics material was important to be provided well structured. It needed to pay attention to the sequence of materials so that the learning process could gradually follow students' cognitive development.

In teaching mathematics materials, the sequence of materials of mathematics should be well structured by teachers. The curriculum of mathematics as basic guidance for teachers in developing teaching materials also should be fixed in the sequence of mathematics materials. By using well-structured teaching materials, teachers could provide sustainable mathematics learning from each grade of class in elementary school.

3.2.2 Teachers Needed Mathematics Teaching Materials in Various Types

Based on the analysis results, some teaching materials were used by teachers in the upper and lower grades. Teachers have used both printout and digital teaching materials. The use of digital teaching materials showed that teachers could utilize technology in learning mathematics. Previous research showed that learning using digital teaching materials positively affects learning motivation better than learning using traditional teaching (Lin, Chen, & Liu, 2017).

The use of printout or digital teaching materials had its advantages. Research from Millar & Schrier (2015) about students' preferences for teaching materials and types of textbooks showed that students prefer printed textbooks over electronic textbooks. The reason was that printed textbooks were more convenient than electronic textbooks. However, some students prefered electronic textbooks because all the subject matter students needed was available in one place and easy to access anytime and anywhere. Although digital textbooks have some advantages, they also have some disadvantages. In general, digital textbooks were cheaper than printed textbooks. However, most digital textbooks have a limited license and may be lost due to limited access and time (Engbrecht, 2018). In summary, print out and digital teaching materials can be used to complete each other.

Teachers have used various types of teaching materials, but it was still limited in some types of teaching materials. They have used textbooks, practice books, student worksheets, and videos of mathematics learning. Modules and handouts of mathematics were rarely used for teachers in mathematics teaching, both in printout teaching materials and digital teaching materials. The interview results proved that teachers needed modules in mathematics. Modules were a set of teaching materials that were systematically arranged so that users could learn through the module with or without a facilitator (Ramdani, Syamsuddin, & Sirajuddin, 2019). Modules could help teachers teach mathematics so that students can explore their knowledge. The module helped students learn concepts independently without any intervention from the teacher.

3.2.3 The Mathematics Contents Based on Mathematical Proficiency in Teaching Materials Needed to be Improved

Mathematical proficiency was a concern in mathematics learning, especially in elementary schools such as Madrasah Ibtidaiyah. Teachers needed a device such as teaching materials well-structured in materials or mathematics concepts to develop this proficiency. Teaching materials should be contained the component of mathematical

proficiency. The mathematics teaching materials used by teachers contained a lot of concepts in mathematics. The teaching materials should provide the right concepts in mathematics so that students can avoid a misconception.

The results indicated some concepts of mathematics were not appropriate in the teaching materials. Some errors in mathematical content in the teaching materials used by the teacher were found. It was in line with the research of Valentino (2017) that the analysis of mathematical content errors in the thematic book of elementary school Class V Semester I, which contains 5 themes, was found that there were 3 errors of fact objects, 4 errors of concept objects, and 3 errors of principle objects. The results of this study served as a reference for solutions to improve mathematics content in the thematic Student Book for elementary schools.

Teachers needed mathematics teaching material that contained mathematical proficiency. However, the teaching materials used by teachers had not developed mathematical proficiency in maximum. Mizaniya's research (2020) on teacher and student books of the 2013 curriculum revised in 2018, in grade III MI/SD, 77% of the subject matter of mathematics was more dominant in Lower-Order Thinking Skills (LOTS). There was a need for teaching materials that contained activity steps that could accommodate students to find concepts through meaningful learning. Teachers need teaching materials that stimulate mathematical proficiency in mathematics learning. The accuracy of the teaching materials prepared by the teacher would help the students' reasoning process to understand basic concepts, develop student understanding, motivate students to develop their thinking, and foster creative thinking using mathematical procedures.

4. Conclusion

Teaching materials were essential in teaching and learning mathematics, especially in elementary schools such as Madrasah Ibtidaiyah. Based on the results, the need analysis of mathematics teaching materials consisted of: (1) the curriculum of mathematics needed to be arranged about the sequence of materials, (2) teachers needed mathematics teaching materials based on mathematical proficiency, and (3) the mathematics concepts in teaching materials needed to be well arranged. These results showed that teachers in learning mathematics should prepare the mathematics teaching materials based on mathematical proficiency so that the aim of mathematics learning can be achieved to the maximum. These results also can be a reference to developing teaching materials based on mathematical proficiency for mathematics teaching and learning, especially in elementary school. For further research, a researcher can develop teaching materials according to teacher needs in teaching mathematics, especially in Madrasah Ibtidaiyah.

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