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On how students read mathematics textbook and their view on mathematics

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Abstract. The aimed of this paper is to investigate the correlation between reading stages on mathematics textbook and students' view of mathematics through reading textbook. A questionnaire survey and interview were administered to secondary 3 students at SIS Palembang. The data shows that there are three different type of stages on reading mathematics textbook such as Type 1; defined by (1) Read the definition and/ or rules; (2) Get into worked example; (3) Do the exercise; Type 2; defined by (2) Get into worked example; (1) Read the definition and/ or rules; (3) Do the exercise; Type 3; defined by (3) Do the exercise (1) Read the definition and/ or rules; (2) Get into worked example. The finding result shows that there are correlation between types of reading stages and the student's view on mathematics. The correlation is influenced by reading objectives, student's prior knowledge and student's perspective.

1. Introduction

The importance of mathematics textbooks and tasks is significant in mathematics education practices, especially for students [1]. Reading can help people to get the main point that written in the books or textbook. Reading mathematics textbook is a crucial part since the method of reading is different with reading manuscripts in general. In reading mathematics textbook, ones need to comprehend the meaning of the text, hence, it takes longer time and requires more concentration [2].

In other hands, reading activities and reading comprehension in mathematics textbooks is key in mathematics education because understanding in reading mathematics will help students to be able to solve every mathematical problems [3]. Korpershoek H, Kuyper H, & Werf G V also states that the student's reading ability is related to their understanding of mathematics [4]. Furthermore, most of the work of reading mathematics has been directed to improve problem solving skills [5]. There are some phases in reading a mathematics textbook: (1) Scanning the text to obtain the common idea on the topics. Scanning is usually done by reading the chapter introduction and conclusion; (2) while scanning, mark the unfamiliar words that you do not recognize; (3) Focus on the reading. Highlight the material that you find necessary. This action aims to emphasize the significant of some materials for future learning. Never skip reading phase; (4) when you get to the examples, go through each step; (5) mark the concepts and words that you do not know. Never leave the passage without thorough comprehension on all words concepts; (5) Note all the unknown words and concepts in the glossary of your notebook; (6) assimilate the new information and your prior knowledge [2]. These phases indicates that mathematics should be learned by doing; it's not something that one can learn passively without thinking things over or actively trying to internalize the process. Its mean that when people



read a mathematics textbook, they have to try to work things out to get the meaning and build their mathematical understanding.

Mathematical understanding skill is a main point as a foundation to understand other abilities, without understanding skill students were unable to solve problems. Therefore, Mathematical understanding skills are important for students [6]. There are five mathematical proficiency (1) Conceptual understanding: emphasizing on mathematical concepts, relations, and operations; (2) Procedural fluency: the flexibility, accuracy, efficiency, and appropriateness in performing mathematical procedures; (3) Strategic competence: the ability of formulating, solving and representing mathematical problems; (4) Adaptive reasoning: the ability to think logically, reflect, explain, and justify; (5) Productive disposition: a belief to see mathematics as discreet, beneficial, and helpful, added with an attitude of diligence and self efficacy [7]. Mathematical understanding can also be assessed from the students' ability to (1) define mathematical concepts, both written and verbal, (2) determine and construct example, counter example, and nonexample, (3) represent a particular concept in models, diagrams or symbols, (4) create alternative representation, (5) recognize and interpret certain concepts, (6) identify the properties of a concept, (7) compare and distinguish mathematical concepts [8].

Mathematical understanding is also influenced by students' strategy in reading mathematics books. Each student has a different strategy in reading mathematics textbooks [9]. This is also supported research by Doer and Temple that each student has a different perspective in reading mathematics textbooks [10]. The strategy used by students when understanding new mathematical concepts in mathematics textbooks, namely understanding concepts by reading definitions, then reading mathematical questions how mathematical concepts are used in problem solving, then solving mathematical problems [11].

As mentioned in above, students' experiences in learning mathematics influence their view about mathematics [12, 13]. Student's view on mathematics will be important reflection in learning mathematics. Student's view is important because its affect the way they learn mathematics [14]. So in this paper, we will investigate the linkages of reading stages on mathematics textbook and students' view of mathematics through reading textbook. In the finding will present a reflection and recommendation of learning mathematics.

2. Method

The study used description method to describe about reading type student's in read mathematics textbook and mathematics understanding. The research subjects were 9 participants of secondary 3 students at Singapore Indonesian School, Palembang. Data collection techniques used in this study was questionnaires and interviews. The questionnaire and the interviews was used to determine the stages of students on reading a mathematics textbook and also to know student's perception on understanding mathematics after reading the textbook. This study is using records and photos as documentation. In designing the questionnaire instrument, the researcher compiled a number of questions about how to identify the stages of reading a school mathematics book by giving serial numbers to the boxes according to the students' answers. Then the researcher makes multiple choice questions about students' perceptions in understanding mathematics. While in the interview, the researcher compiles questions that refer to questionnaire questions that aim to reveal students' mathematical understanding abilities in greater depth and facilitate the course of the interview so that the interview does not widen everywhere. Interviews were conducted to all research subjects one by one, so researchers got data to be analyzed.

3. Result and Discussion

3.1. Result of Reading Stages on Mathematics Textbook

This study was conducted in secondary 3 students at Singapore Indonesian School (SIS) Palembang. There are 9 students that participated in this study. This research aimed to get the description about how the stages of students in reading mathematics textbook. In this paper, there three indicator of the stage in reading mathematic textbook [11], such as:

- Read the definition and rules; all mathematics textbook provides definition and / or rules in chapter introduction or each section summary.
- Go into worked example; reader can get into the examples and go through each step until they understand and get the main point, and
- Do the exercise; reader can reflect on what they have read by trying to do the exercise.

The data collected through questionnaire and interview the participant in this study can be seen in following Table 1.

Table 1. Reading stages on mathematics textbook

Indicator	Stages		
	1	2	3
Read definition and rules	67%	22%	11%
Go into worked example	33%	67%	0%
Do exercise	0%	11%	89%

From the data in above, shows that 67% of students or 6 out of 9 students start reading mathematics textbook by reading the definition and/or rules. After that, they get into worked example and they finishing by trying to do exercise. Most of students state that doing the exercise is the last stages in reading mathematics textbook. This stage of reading mathematics textbook is considered as the tool to promote student's problem solving skills [5].

From the data collected, we get three difference type of reading stages on mathematics textbook. The types of reading stages in secondary 3 SIS Palembang; in ordered are:

- Type 1; defined by (1) Read the definition and/ or rules; (2) Get into worked example; (3) Do the exercise.
- Type 2; defined by (2) Get into worked example ;(1) Read the definition and/ or rules; (3) Do the exercise.
- Type 3; defined by (3) Do the exercise (1) Read the definition and/ or rules; (2) Get into worked example;

Table 2. Type of reading stages on mathematics textbook (in ordered)

Type of Reading stages on Mathematics Textbook (in ordered)	Total students	Percentage
1 – 2 – 3	6	67%
2 – 1 - 3	2	22%
3 – 1 - 2	1	11%

The Table 2 shows that there are 67% of students or 6 out of 9 students use type 1; 22% of students or 2 out of 9 students use type 2; and 11% of students or 1 out of 9 students use type 3 for the reading stages on mathematics textbook. The stages of reading mathematics textbook depend on student's prior knowledge and very students have their own opinion and strategies.

In the interview also shows the reason why they choose to start read the definition and/or rules. Every student has their own opinion about the reading stages. From the interview, we get that reading stages depend on the topics. If the topic is new topic and they never learn before, they start read the textbook from the definition and/or rules in chapter introduction or each section summary. For instated, Clea opinion in bellow.

“Kalau Clea udah ngerti topiknya, Clea gak bakal baca lagi ini (menunjuk definisi dalam buku), jadi kalau misalnya Clea udah ngerti, Clea gak lihat basic nya lagi, jadi lihat for example biasanya yang gini-gini (menunjuk contoh pada buku)”

“If Clea already understand the topics (means she have prior knowledge about the topics, its not a new topic), Clea will not read the definition or rules in the chapter introduction), So, if Clea already understand, Clea will skip the material, then go into worked example”

The statements in above shows that the stages of reading mathematics textbook depend on student’s prior knowledge and very students have difference opinion about this. In other words, the reading stages on mathematics textbook are depend on the needs of students or the purpose of students when they read the book. From the data on the table 1 and table 2 also show that every student have different way or stages on reading mathematics textbook. Reading activities and reading comprehension in mathematics textbooks is the main point in mathematics lesson because will help students to be able to solve every mathematical problems [3]. Furthermore, it will help mathematics teacher to decide the teaching strategies and learning style of students that can be applied in this class based on the reading stages and mathematical understanding to reach the learning objectives.

From the data interviews, we also found that only few of students have initiative to read mathematics textbook. Some of them states that they will read mathematics textbooks only when they have to take an exam. Students think that reading mathematics textbook only crucial in preparing for completing tasks or examination [15]. The following are the results of an interview as an example of the research subjects:

*Researcher : Often don't study math books?
Subject : Not really, when there is a chapter test, just read it, because usually if you don't really understand it, you will read it yourself at home.*

There are many factors or reason why the students did not have their own initiative to read mathematics textbook. As we read from the research that conducted by Butler [16] students often assume that mathematics textbooks are not useful because they have and need listened to the teacher's explanation for the details. Whereas, the combination of listening to the teacher's explanation well and also supported by initiative to read mathematics textbooks, it will produce deeper mathematical understanding and reasoning to provide a good arguments with better mathematical communication. This behavior promotes students’ mathematical communication skill [8].

This study suggests that every teacher to provide exercise type reasoning question and problem solving for their students. This is for adjust students' learning objectives in reading mathematics textbooks, so students will get initiative to read the mathematics textbook by their own even though they have been given an explanation by the teacher in class. The goal is students’ center, where students read more and find out the content in order to gain deeper knowledge. Mathematical reasoning offers powerful ways of developing and expressing insights about a wide range of phenomena [8]. Meanwhile, to support good reasoning skills, readings are also needed that lead to these abilities. One of reading supports in improving reasoning skills is able to read the definition and proof. Teacher as a facilitator can give the explanation how to read proof, because students are confused with the mathematical proof they read, and often cannot distinguish valid and invalid arguments [17-19]. Through the teacher explanations, it can provide students to improve their skills in proofing by reading strategies, so that students will be able to read proof and develop their reasoning [20].

3.2. Student's View on Reading Mathematics Textbook

There are three indicators that used in this study to get the information about student’s view toward mathematical understanding, they are able to:

- a. Understand and get the main point of every definition and rules;
- b. Investigate and comprehend the worked example by following every steps in the textbook.
- c. Do the exercise; reader are able to answer, to solved and to connecting to their prior knowledge.

The data collected through questionnaire and interview the participant in this point can be seen in following Table 3.

Table 3. Student's perception toward mathematical understanding

Indicators	Total students	Percentage
Able to do exercise	6	67%
Comprehend the worked example	2	22%
Understand the definition and/ or rules	1	11%

The data in Table 3 shows that 67% of students or 6 out of 9 students said they will get mathematical understanding when they are able to do every exercise in the textbook; 22% of students or 2 out of 9 students said they will get mathematical understanding when they comprehend the worked example; and only 11% of students or 1 out of 9 students said she/he will get mathematical understanding when she/he already understands the definition and/ or rules. In other words, most of the students state that they understand the content in a mathematics textbook if they are able to answer and to solve all the exercises in the textbook correctly. This statement indicates that their learning objectives on reading mathematics textbook are to be able to solve all exercises that provide in the textbook. It also can be seen from the data on table 2 of reading stages on mathematics textbook, most of the students, 67% of students decide to do the exercise as the last stages that they did. This statement is in line with the research that conducted by Österholm, most of the students read the definition or trying the worked example problems first because from that steps students will understand the expert procedural descriptions when mathematical forms are used in problem solving [3].

Students' conceptual knowledge affects the improvement of their procedural knowledge, and vice versa [21]. Meanwhile, to support the understanding of example problems, it should be given examples of questions with problems of type solving problems. The aim is to train students to use understanding of definitions and rules well, and develop new mathematical understanding and provide students with opportunities to expand their knowledge. Problem solving is an activity that is very difficult for students to master, therefore skills and problem solving skills can only be obtained by students through a learning process that brings experience for them to solve various problems. So by giving examples of problems solving will make students able to think as problem solvers [22].

3.3. Linkages Between Reading Stages and Student's View on Mathematics

From this study show to the reader there are three difference types of stages reading mathematics textbook, such as **Type 1**; defined by (1) Read the definition and/ or rules; (2) Get into worked example; (3) Do the exercise.; **Type 2**; defined by (2) Get into worked example; (1) Read the definition and/ or rules; (3) Do the exercise.; **Type (3)**; defined by (3) Do the exercise (1) Read the definition and/ or rules; (2) Get into worked example. The types of the reading stages on mathematics textbook influence the student's view about mathematics. This statement is in line with Wong statements that said students' experiences in learning mathematics influence their view about mathematics [9, 10]. The linkages between type of reading stages and student view on mathematics can be seen in Table 4.

From the data in Table 4, show us the linkages between type of reading stages and student view on mathematics. Students who choose type 1 states that they will understand the mathematics when they are able to do exercise, able to understand the worked example and also able to read and understand the definition and rules. In other words, students who choose type 1 state that they will understand mathematics if they are able to read and able to understand in all reading stages. In type 1, students will get the procedural mathematics understanding. Mathematical procedures comprehension is an awareness of expressing mathematical ideas procedurally without explicit reference [23]. While, students who choose type 2 said that they will understand the mathematics only when they are able to do exercise. This is relevant with the stages when they read the textbook, such as get into worked example, read the definition and/ or rules, do the exercise. Do the exercise is the last stage that they do when read the textbook. It means their objective on reading the textbook is to be able to do the exercise. For the last type, students who choose type 3 said that they will understand the mathematics

only when they are able to get into worked example. So by giving conceptual and procedural questions, it can measure and train students' ability to understand the definitions and rules that apply in a mathematical content. These types are relevant with the statement by Österholm that state reading activities and reading comprehension in mathematics textbooks is the main point in mathematics lesson because will help students to be able to solve every mathematical problems [3]. In addition, mathematical understanding can also be assessed from the students' ability to define mathematical concepts, both written and verbal; determine and construct example, counter example, and nonexample; represent a particular concept in models, diagrams or symbols; create alternative representation; recognize and interpret certain concepts; identify the properties of a concept; and compare and distinguish mathematical concepts [8].

Table 4. Linkages between type of reading stages and student view on mathematics

Type of Reading Stages on Mathematics Textbook	Students View on Mathematics
<p>Type 1</p> <p>(1) Read the definition and/ or rules; (2) Get into worked example; (3) Do the exercise</p>	<ul style="list-style-type: none"> • Understand and get the main point of every definition and rules; • Investigate and comprehend the worked example by following every step in the textbook. • Do the exercise; reader are able to answer, to solved and to connecting to their prior knowledge.
<p>Type 2</p> <p>(2) Get into worked example; (1) Read the definition and/ or rules; (3) Do the exercise</p>	<p>Do the exercise; reader are able to answer, to solved and to connecting to their prior knowledge.</p>
<p>Type 3</p> <p>(3) Do the exercise (1) Read the definition and/ or rules; (2) Get into worked example</p>	<ul style="list-style-type: none"> • Investigate and comprehend the worked example by following every step in the textbook.

4. Conclusion

Every student has difference stages of reading mathematics textbook. From the study that conducted in secondary 3 students at SIS Palembang, There are three difference types of stages reading mathematics textbook, such as Type 1; defined by (1) Read the definition and/ or rules; (2) Get into worked example; (3) Do the exercise.; Type 2; defined by (2) Get into worked example;(1) Read the definition and/ or rules; (3) Do the exercise.; Type (3); defined by (3) Do the exercise (1) Read the definition and/ or rules; (2) Get into worked example. As we can see in finding result shows to reader that there are correlation between types of reading stages and the student's view on mathematics. The correlation is influenced by reading objectives, student's prior knowledge and student's perspective.

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