

## Research Article

# Contextual Problem Presentation in Students' Mathematics Book and Students' Perceptions

Syukma Netti, Khairul Khairul, Listy Vermana\*, and Anisa Arnaz

Universitas Bung Hatta, Jl. Bagindo Aziz Chan By Pass Aia Pacah Padang Sumatera Barat, Indonesia

**ORCID**

Syukma Netti: 0000-0003-3443-5363

Khairul Khairul: 0000-0002-6503-5437

Listy Vermana: 0000-0002-0036-2322

Anisa Arnaz: 0000-0003-1757-0440

**Abstract.** The Government provides books to students for various subjects, including a mathematics book which is a compulsory source of learning material. However, there are still many complaints coming from students and teachers about this book. This research aimed to describe the pattern of material presented in this mathematics book and students' responses about this. Data on the material presented were gained by observing the book and using a checklist, while data on students' responses about the material were obtained by using a questionnaire. Based on the results, it was found that: (1) the material presented was dominated by deductive initiated with intuition thinking; and (2) students' responses toward the material were not good.

**Keywords:** students' mathematics book, word problem, students' perception, definition concept, image concept

Corresponding Author: Listy Vermana; email: listyvermana@yahoo.com

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## 1. INTRODUCTION

Many researchs on the analysis of student's mathematics book have been conducted [1, 2, 3]. [1]described the quality of students' mathematics book used at the tenth grade of senior high school covering learning materials, language use, material presentations and graphics. [2] analyzed students' mathematics book used at Islamic Junior High School based on the components of sstudents book Still other research conducted by [3]described the synchronization between the edition revision 2014 of students' mathematics book used for the seventh grade with curriculum 2013referred to content standard, process standard and evaluation standard. Based on the result of investigations that have been conducted, there is not yet any research on students' mathematics book related to their ability in completing word problems. This research analyzed students' mathematics book used at tenth and eleventh grade of senior high school in their relationship with the material presented.

The students' ability in completing word problems has become the main concern for researchers and teachers in mathematics [4, 5, 6, 7, 8, 9, 10, 11]. [4, 12] found

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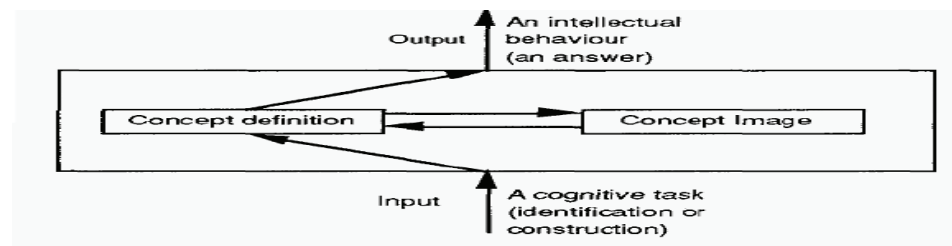
that the causes of the students' difficulty in completing word problems deal with the mistakes in linguistics, reading and comprehending the concepts of unequalisation and arithmetics process. [5]studied the relationship between reading comprehension ability and arithmetic ability, and found four groups of students in completing word problems.

Other researches focused more on the causes of difficulty in completing word problems from the inside of the students themselves. Still, other researches that have been conducted deals with the efforts that can be done to help students in completing word problems[13, 14, 15]. So far, there was not yet any research that study the causes of students' difficulty in completing word problems from the aspects outside of the students like students' book as their learning source. Has the students' mathematics book provided by the government been designed as it is in order that the students can learn optimally so that they can increase their skill or ability in completing word problems?

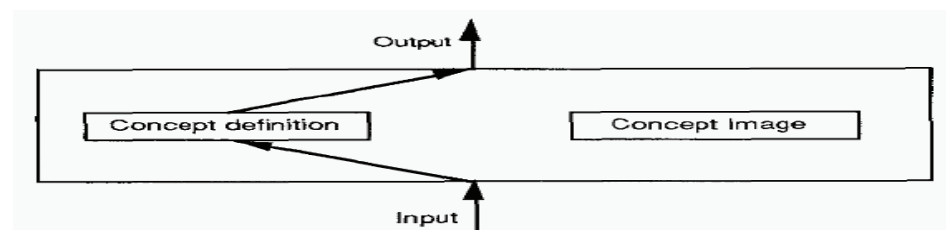
Students' book plays an important role in learning process. It is regarded as compulsory learning source in comprehending the concept of learning material. Students' book for mathematics subject that students have to possess is composed based on curriculum 2013 issued by Ministry of Education and Culture, revision edition 2018. In line with the government regulation, students' books ought to adopt the scientific learning approach that aims at increasing students' ability so that they can think critically and can link with problem in their daily life. According to[16],students' book is a book containing learning material in the form of concept and understanding that will be constructed by the students through the problems that they had have. It is a supporting facility for the smoothness of their learning activity in class or out of class.

Relating to the abstract characteristics of mathematics with the symbols of its objects causing the presentation of learning material in students' book, it is necessary to have contextual problem to link the concept of mathematics with things the students have known before learning the theoretical and abstract concept. This is in line with meaningful learning on purpose of helping students to construct new knowledge that they learn. Mathematics terms and definitions can be understood better if they are taught or presented with meaningful ways or methods. In the process of constructing the definition of mathematics, the logic sequence of material presentation is important to be considered [17].

Similarly, when students learn about the definition or new mathematics terms, there are four potential processes in their minds [18]. Those processes also yield different knowledge construction. Process, which is very recommended, is the one that always has interplay. Concept definition is standard definition agreed by experts, while image



**Figure 1:** The Interplay of the definition concept and image concept.



**Figure 2:** Pure Formal Deductive.

definition is the whole cognitive structure that associates concept definition including mental image, characteristics and process which is naturally formed by someone's experience [18, 19]. Based on the ideas about the four processes that happen in the students' mind in constructing definition, [19] modifies them become four processes that are possible to be done by teachers in teaching definition to the students. In this current research, they are used to see the patterns of how mathematics concept and definition is described in students' books as follows.

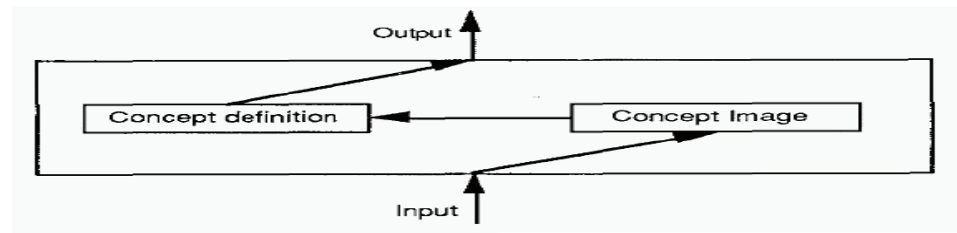
#### 1. Interplay the definition concept and image concept

This phase is very recommended in explaining new definitions. There is interaction between image concept and definition concept, namely by giving several examples and illustrations to explain formal definition. Interaction process that happens repeatedly between image concept and definition concept will make students able to internalize such process optimally, and this is in line with constructivism theory by Dubensky (Netti dkk, 2016).

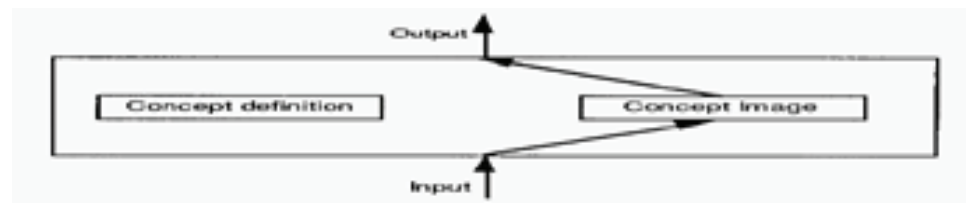
#### 1. Pure Formal deductive

The phase of pure formal deductive happens when understanding or explaining definition does not relate to image concept. As a result, the students only memorize the definition without being able to interpret it with things that they have known. This causes the students only able to memorize or remember without meaning.

#### 1. Deductive initiated with intuition thinking



**Figure 3:** Deductive initiated with intuition thinking.



**Figure 4:** Intuitive Response.

This process is initiated with illustrations and examples. Then, with examples and illustrations, formal definition and definition concept can be constructed. This will make students easier to construct the definition that has been explained and it is more meaningful even though not as good as phase one. Its difference with phase one is that there is no confirmation.

#### 1. Pure intuition thinking

This phase is a very unrecommended one because it is pure intuition without confirmation with definition concept. This can cause someone make mistakes in presentation or constructing definition.

### 1.1. Word Problems

Word problems are mathematical questions using words presented in a short paragraph.[20] states that word problems are mathematical questions presented orally or written and [21] declares that written word problems by using sentences depict the activities in daily life. Then [22] defines word problems as verbal descriptions of situation in which a question is exposed with its answer that can be obtained by applying mathematics operation to numeric data that are available in problem statement.

Good word problems do not only fulfill linguistics rules but also have benefit. According to [23],the criteria of good word problems are as follows; (1) it facilitates the students to learn and/or practice to apply appropriate strategy in solving mathematics problems as well as problems in other fields of study, (2) it facilitates the students to become better in modeling mathematics, (3) it makes the students enjoyable and provides good

opportunities to motivate them intrinsically, (4) it challenges cognitively and provokes students' creative ideas, and (5) it functions as contributive suggestions for the student progress in increasing the degree of their mathematics mastery.

## 2. METHODOLOGY

The research method used in this study was analytic descriptive research method, namely a kind of research that aims at giving description about the reality of object being studied objectively. This research had two variables; that is the way of presenting the concept in students' mathematics book used at tenth grade and eleventh grade of Senior High School, issued by the Ministry of Education and Culture, revision edition 2018, and students' response toward the presentation of concept and definition. The population of this research was the tenth and eleventh grade students at SMAN 1 Padang, SMAN 3 Padang, and SMAN 1 BatangAnai, Padang Pariaman. The research sample was a part of the population members, namely the students who filled out the questionnaire delivered through google form. The research object was the students' mathematics book used at tenth grade and eleventh grade of Senior High School, issued by the Ministry of Education and Culture, revision edition 2018. There were two research instruments used to collect data; (1) sheet of evaluation for students' mathematics book filled out by giving checklist and questionnaire on students' response toward their mathematics book.

Technique of analyzing data for rubric assessment of students' book was conducted by determining the number of every pattern exposed [19] in presenting concept and definition that exist in students' book. Then, it is continued by determining its percentage by using the following formula:

$$P_i = \frac{JP_i}{JP} \times 100\%; \quad i = 1, 2, 3, 4$$

Notes:

$P_i$  : Percentage of pattern  $i$

$JP_i$  : The number of pattern  $i$

$JP$  : The number of the whole pattern

Technique of analyzing data for the students' responses toward their mathematics book was done by analyzing the data obtained by using a questionnaire distributed through google form, with the following steps:

1. Grouping the students based on their grade; tenth grade and eleventh grade.
2. Grouping the students who had students' mathematics book and who did not have it.
3. Determining the number of students who highly agreed, agreed, not agreed and highly not agreed for every statement in questionnaire, and determining its total number.
4. Calculating the percentage of students who highly agreed, agreed, not agreed and highly not agreed by using the following formula:

$$PK_i = \frac{JK_i}{JSK} \times 100\%; \quad i = 1, 2, 3, 4$$

Notes: By:

$PK_i$ : Percentage of criterion  $i$  1 : highly agreed

$JK_i$  : The number of criterion  $i$  2 : agreed

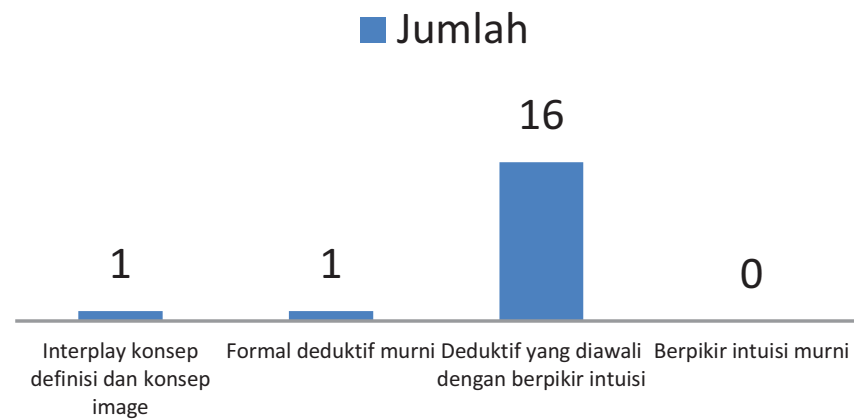
$JSK$  : The number of the whole criterion 3 : not agreed

4 : highly not agreed

1. Grouping the students who filled out the open statement and who did not fill it out, and determining its total number.
2. Grouping the students who did not fill out the open statement, and determining its total number.
3. Grouping the students who stated that book presentation is good and who stated that it is necessary to improve the book presentation, and determine its total number.
4. Concluding the students' response about things that should be improved in book presentation.

### 3. DISCUSSIONS

In line with research goal, namely how is the quality of material presentation, especially mathematics concept and definition, in students' book for tenth and eleventh grade of senior high school and students' response toward the presentation of mathematics concept and definition, the research findings and discussions were described in two separate parts. The first presentation deals with the quality of material presentation, especially mathematics concept and definition, in students' book for tenth and eleventh



**Figure 5:** The number of each Pattern Used in Describing Mathematics Concept and Definition in Students' Book for Tenth Grade.

grade of senior high school and the second presentation deals with the students' response toward the presentation of mathematics concept and definition in that book. To make clear, the data presentation is presented as the followings.

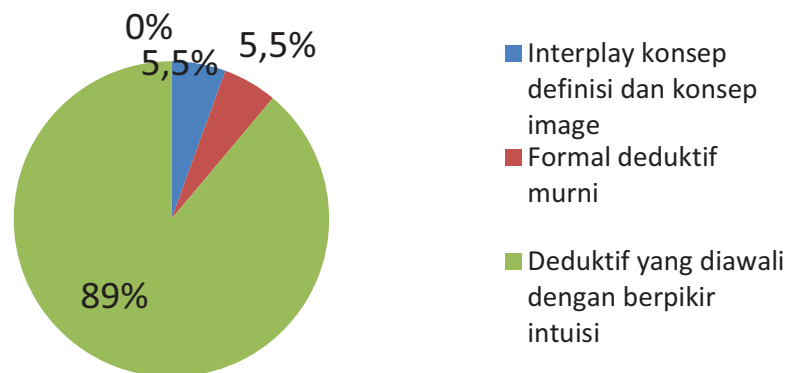
### 1. Presentation of Concept and Definition in Students' Book, Tenth Grade

Observation to the students book was focused on how the material is presented.

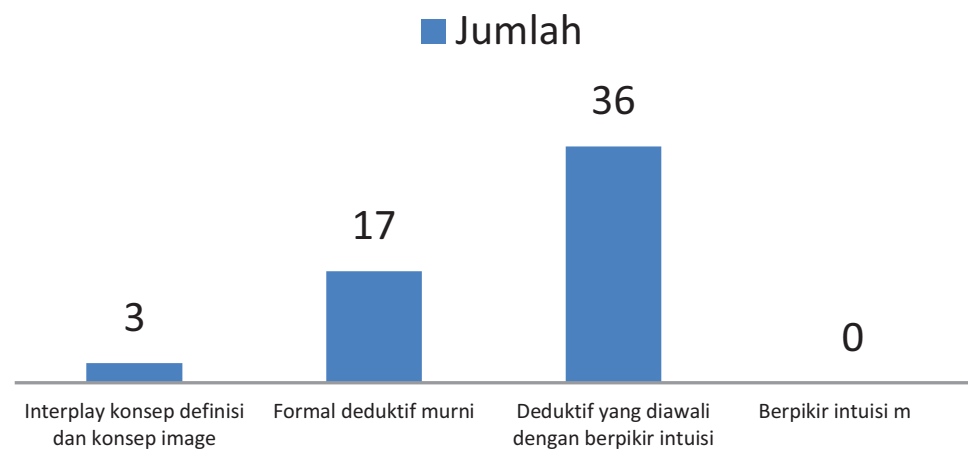
The framework used in this study is the interaction framework of concept and definition suggested by [19]. Analysis was done by giving code with numbering as follows; (1) Interplay the definition concept and image concept, (2) Pure Formal deductive, (3) Deductive initiated with intuition thinking, and (4) pure intuition thinking.

Based on the result of observation conducted to students' mathematics book used at tenth grade of senior high school about how mathematics concept and definition is described, the result is shown in Figure 5 and Figure 6.

Based on Figure 5 and Figure 6, it can be observed the pattern which is mostly used in presenting mathematics concept and definitions in students' mathematics book for tenth grade was deductive pattern initiated with intuition thinking, namely 16 times or 89%. This deductive pattern is frequently used if it is compared with the pattern of pure formal deductive which was only used once or 5.5%. The pattern which was never used was pure intuition thinking, and as a matter of fact this pattern should not be used. The pattern of interplay the definition concept and image concept was only used once or 5.5% in explaining mathematics concept and definition in students' book for tenth grade. It is only presented in chapter 1. The pattern of interplay is the most suggested one because in this pattern there is reinteraction between contextual problem and



**Figure 6:** The Percentage of each Pattern Used in Describing Mathematics Concept and Definition in Students' Book for Tenth Grade.



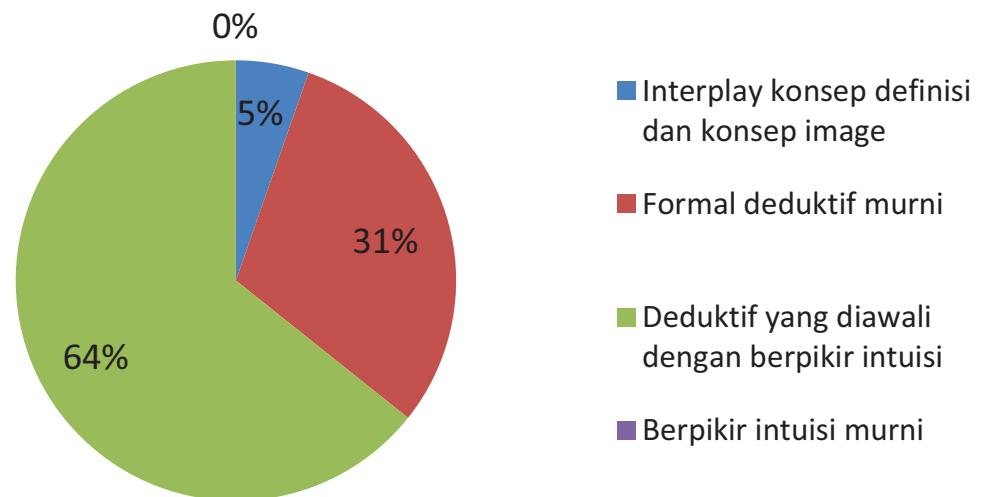
**Figure 7:** The number of each Pattern Used in Describing Mathematics Concept and Definition in Students' Book for Eleventh Grade.

formal definition so that the students gain confirmation about definition concept from contextual problem given to them.

In the meantime, the result of observation on students' mathematics book used at eleventh grade of senior high school about how mathematics concept and definition is presented, and its findings are shown in Figure 7 and Figure 8.

Figure 7 and Figure 8 show the pattern which was mostly used in presenting mathematics concept and definition in students' mathematics book used at eleventh grade of senior high school was also deductive pattern initiated with intuition thinking, namely 36 times or 64%. Although the pattern of pure intuition thinking was not used at all and the pattern of interplay definition concept and image concept was only used 3 times or 5%, in students mathematics book for eleventh grade, the pattern of pure formal deductive was used 17 times of 31% so that as a whole. Based ,on Figure 5, Figure 6, Figure 7





**Figure 8:** The Percentage of each Pattern Used in Describing Mathematics Concept and Definition in Students' Book for Eleventh Grade.

and Figure 8, it can be seen that presentation of students' mathematics book for tenth grade was better compared with students' mathematics book for eleventh grade.

### 1. Students' Response toward the Presentation of Concept and Definition in Students' Book

Data on student's responses were obtained by giving questionnaire to the tenth and eleventh-grade students. The questionnaire was designed as initial sounding, and it was distributed through link of google form so that it could be filled out by students from several schools. Total number of students who filled it out was 166 students, consisting of 47 tenth grade students and 119 eleventh grade students. The distribution of research sample was shown in Table 1. Base on the data gained through questionnaire, it was found that there were 166 students who filled out the questionnaire. The number of students who used students' book which was the same as the one being studied was only 139 students, comprising 38 tenth grade students and 101 eleventh grade students. The data distribution is shown in Table 2.

The number of statements in the questionnaire was 9. There were 4 statements concerning with material presentation in students' mathematics book, and the rest deal with word problems that are available in students' book. Response toward word problem is discussed furtherly after conducting interview to students. The form of statements in questionnaire consists of open and close statements. Students' response toward the statements in close questionnaire is presented in Table 3.

Data on students' response were presented by grade. The percentage of students response toward the presentation of concept and definition in students' mathematics

TABLE 1: Data on the Number of Sample by Grade and School

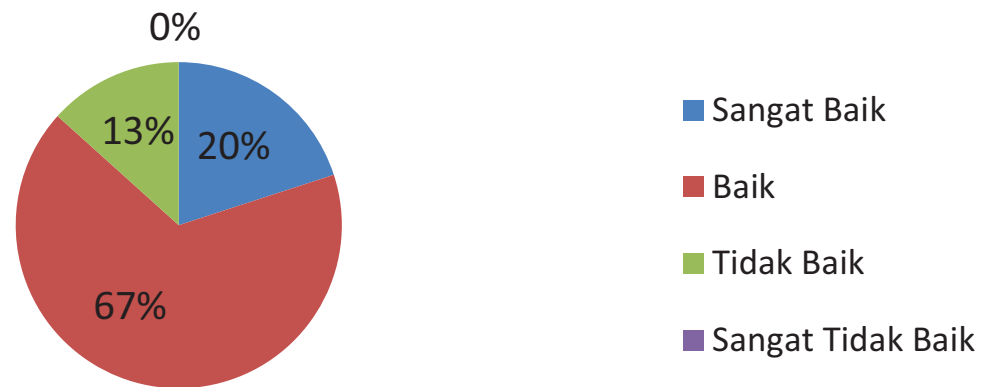
No	Name of School	Tenth Grade	Eleventh Gade	Total
1.	SMAN 1 BATANG ANAI	11	4	15
2.	SMAN 1 PADANG	31	21	52
3.	SMAN 3 PADANG	0	73	73
4.	SMAN 13 PADANG	1	0	1
5.	SMA PERTIWI PADANG	1 0	6	6
6.	SMAN 1 LEMBANG JAYA	4	11	15
7.	SMKN 1 KINALI	0	4	4
Total		47	119	166

TABLE 2: Data on Sample Who used Students' Book Being Studied by Grade and School

No	Name of School	Tenth Grade	Eleventh Gade	Total
1.	SMAN 1 BATANG ANAI	9	3	12
2.	SMAN 1 PADANG	23	12	35
3.	SMAN 3 PADANG	1	68	69
4.	SMAN 13 PADANG	1	0	1
5.	SMA PERTIWI PADANG	1 0	6	6
6.	SMAN 1 LEMBANG JAYA	4	9	13
7.	SMKN 1 KINALI	0	3	3
Total		38	101	139

TABLE 3: Recapitulation of Students' Response toward Book

No	Statements	Highly Agree		Agree		Not Agree		Highly not Agree	
		TG	EG	TG	EG	TG	EG	TG	EG
1.	I always use students' book when studying at school or at home.	4	16	31	75	3	9	0	1
2.	If there is material that I do not understand,I find to know by reading students' books.	10	22	24	63	4	15	0	1
3.	In students' book, material and mathematics definitions are explained well and clearly.	6	13	27	75	5	12	0	1
4.	Material and mathematics definition described in students' book can help in answering word problems	6	13	24	74	7	13	1	1
Jumlah		26	64	106	287	19	49	1	4



**Figure 9:** Students' Respon toward the presentation of Mathematics Concept and Definition in Students' Mathematics Book for Tenth Grade.

book for tenth grade can be seen in Figure 9. Data were obtained by adding all students who answered by the criteria of their response.

Based on Figure 5, it can be observed that in general students' response toward the presentation of mathematics concept and definition in students' mathematics book is categorized as good. However, there is an opposite category of students' responses when observing their responses to open statements. Students were required to write what they think as well as their expectations about their mathematics book. Only 29 out of 38 students gave their response and ideas to open statements. Furtherly, 2 out of 29 students who filled out the questionnaire gave responses or ideas which are not relevant with students' mathematics books so that they were excluded from reseach subjects.

Among 27 students who gave relevant responses or ideas, it was found that 8 students (29,6%) gave responses that students' mathematics book was good while 19 students (70,4%) state that students' mathematics book was not good yet, and the way of explaining the material should be upgraded or improved. Based on this data, it was found the response of tenth grade students toward open statements was significantly different with that of closed statements. If it is linked with the result of observation toward the way of material presented in students' mathematics book for tenth grade in which the pattern used was dominated by deductive one, it can be concluded that students' mathematics book does not fit yet the students' need. This can be concluded from the students' opinions in open questionnaire as follows;

1. The explanation on problem solving should be more detailed in order that it can be easily understood.
2. Adding the explanation or deepening the material
3. Providing more examples with their solutions



**Figure 10:** The Eleventh Grade Students' Respon toward the presentation of Mathematics Concept and Definition in Students' Mathematics Book.

4. The explanation about material is made in more detail to make it easy to be understood
5. Word problems use the more understandable words
6. Making the questions clearer in order that they can be easily understood
7. Word problems used in students' book should word problems that the students are interested in.

Furthermore, the eleventh grade students' response toward the presentation of concept and definition in students' mathematics book is not different from the tenth grade students' one. In general, the eleventh grade students' response is shown in Figure 10.

#### 4. CONCLUSIONS AND RECOMMENDATIONS

Based on the result of data analysis, some conclusions can be drawn. The pattern used in explaining concept and definition in students' mathematics book used at tenth and eleventh grade of Senior High School is deductively initiated with intuition thinking. Generally, students' response toward the presentation of concept and definition in students' mathematics book used at tenth and eleventh grade of senior high school according to open questionnaire was not good yet. The presentation of concept and definition in students' mathematics book used at tenth and eleventh grade of senior high school does not yet present a mutual relationship between definition concept and image concept. It means that theory is still dominant, and it is not yet linked to the students' daily life so that they think they are not facilitated in learning.

In line with the conclusion, more complete data are still needed, especially for clarifying the students' response toward their mathematics book. This would be advanced

research relating to this current one. However, it can be suggested that improving the students' mathematics book should be put into consideration.

## ACKNOWLEDGEMENTS

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More information in the website <https://elehic.bunghatta.ac.id>

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