5th ICRIEMS Proceedings
Published by Faculty Of Mathematics And Natural Sciences
Yogyakarta State University, ISBN 978-602-74529-3-0

Algebra Problems of PISA-LIKE in Indonesian Mathematics Textbook

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Abstract. This study aims to describe of context, process, fundamental mathematical capabilities and items capabilities level on PISA framework items in mathematics curriculum 2016 textbook of student revised edition. This type of research is descriptive. The Object was all the algebra materials exercise and competency test on a textbook. Meanwhile, data collection technique used is document and interview. In this research gradually analyzed the aspect of context, process, and fundamental mathematical capabilities based on PISA framework. The result of the study showed that the number of items using PISA framework on 2016 textbook of seventh class student revised edition still low rated, that is 10 items (8,95%) which classified PISA framework. In context aspect, dominated by 80% personal context and 20% occupational context. but, there's no found social and scientific context in algebra items. The context used also includes camouflage context. Furthermore, on the process aspect also dominated by 60% formulated a process and 40% employed, there's no interpretation process in this algebra items. Fundamental mathematical capabilities which used in algebra items only accommodate 60% mathematizing capabilities and 40% devising strategies for solving problems. While for five other capabilities were not found on algebra items. Seen from the level, algebra items on textbook consist of 67% item which first level and 33% second level.

INTRODUCTION

In the current era of globalization, it is required of students who have the ability to compete with other countries. Various types of international-level activities can be seen the extent to which learners Indonesia unable to compete. So far Indonesia is one of the countries participating in the Program for International Student Assessment (PISA). PISA is a study on international level student assessment program which is organized every three years by the Organization for Economic Cooperation and Development (OECD) or the organization for economic cooperation and development. Things were assessed in the study include the PISA mathematical literacy, reading literacy and scientific literacy.

Related to aspects of mathematical literacy, Indonesia has followed the PISA study in 2000. The results of the PISA score of Indonesia can be seen in the picture below.

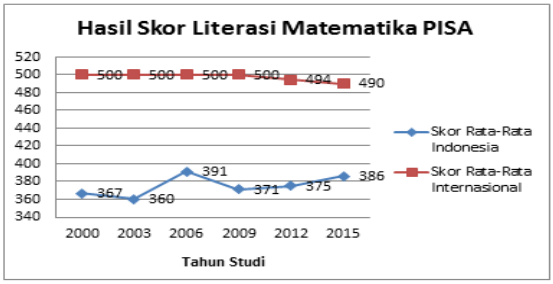

Figure 1. Results of PISA Scores Indonesia Year 2000 until 2015

The picture above shows the results of the PISA score Indonesia is always below the average International. There is instability results of PISA score of Indonesia where the decline and increase seen. The last three years the results of the PISA score Indonesia increased. From the results of the PISA scores can be concluded that the achievement of learners Indonesia lags behind countries also participated.

Education and Culture Ministry already anticipated this by making several changes to the curriculum in Indonesia[1]. With the change in curriculum, the textbooks used must be in accordance with the applicable curriculum is the curriculum in 2013, one of which motivated the low score PISA Indonesia. This becomes important the presence of Curriculum 2013. The implementation of the curriculum in 2013 believed to be able to improve the results of the PISA study, is no exception in this aspect of mathematics, given therein will be strengthened by learning approaches in accordance with the curriculum standards in 2013. One of the principles of curriculum development in 2013 that the curriculum must be relevant the needs of life. This is in line with the concept of the PISA mathematical literacy that makes mathematics education is useful for society in the face of future challenges and will also affect the development of curriculum and improvement of teaching and learning in the participating countries PISA[2].

The government provides compulsory textbook revision in 2016 as a source of student learning in schools according to the curriculum since 2013. The aim of the revision is not in accordance with the demands of basic competence in the curriculum in 2013.

According to Government Regulation No. 32 of 2013 article 1, paragraph 23, explains that the existence of textbooks is very important because the textbooks are the main learning resources to achieve basic competencies and core competencies. Textbooks also contain questions that are used as a measure of students' abilities. Buku student mathematics texts also show the government's desire to make improvements to the quality of education and improve the achievements of Indonesia in the international arena. The results of the PISA study can be seen the extent to which student mathematics achievement Indonesia[3]. The involvement of Indonesia in PISA is one attempt to see how far the development of educational programs in our country compared to other countries in the world[4]. Other efforts have been done already a lot, especially at Sriwijaya University. As a matter of developing research models PISA to measure students' mathematical ability[5,6,7,8]. In addition to the development of a model about PISA, research that has been done is a study about mathematics textbooks of class X[9].

In fact, the difficulty level of the questions in the textbook is very low, it is evident that the highest average level of difficulty can only reach level 3[2,10,11]. In line with previous research conformity percentage of questions in book learning mathematics curriculum PISA 2013 at a still lower component[9]. So it is important to do a study of the content of textbooks has been provided by the government, especially in terms of the quality of the questions presented therein[12].

Based on a previous exposure, so the researchers conducted an analysis of the problems in one textbook material seventh-grade Math 2016 Revised edition published by Kemendikbud, which was reviewed by the framework. PISA Aspects of assessment in framework PISAused in this study consisted of aspects of the context, process, basic math skills, and levels of ability[13]. Content used in this study contained an entire chapter about algebra. This is because algebra is the gateway of all branches of higher mathematics, algebra is also very important to be mastered by students because either implicitly or explicitly algebra is used in everyday life activities, either directly or as a prerequisite[14,15,16]. Besides the material on algebra is very important because in PISA 2003, algebra and measurement is significantly more difficult for Indonesian students of numbers, geometry, and data[2]. The results of study the PISA in 2009 showed that of the algebra results overall, only 41.4% of students were able to answer correctly. It is very small compared to the other questions on the material[17].

In the year 2018 will be held PISA, but still there are many problems seen in the description above as components of PISA is still low in the textbooks of mathematics curriculum in 2013 that became the main source of learning, low ratings PISA Indonesia as well as the results of the acquisition of scores of matter lowest in PISA ie algebra material. These problems make the analysis of problems of mathematics textbooks is very important.

Based on these descriptions, it is the purpose of this study is to determine and describe the context, process, basic math skills, and the level of ability of Problems of Algebra on Textbook Math Students Revised Edition 2016 is based on the framework of PISA

EXPERIMENTAL

This research aims to a description of context, process, fundamental mathematical capabilities and items capabilities level on PISA framework items in mathematics curriculum 2016 textbook of student revised edition. In this research, analyzing the data used PISA Mathematics Framework[15].

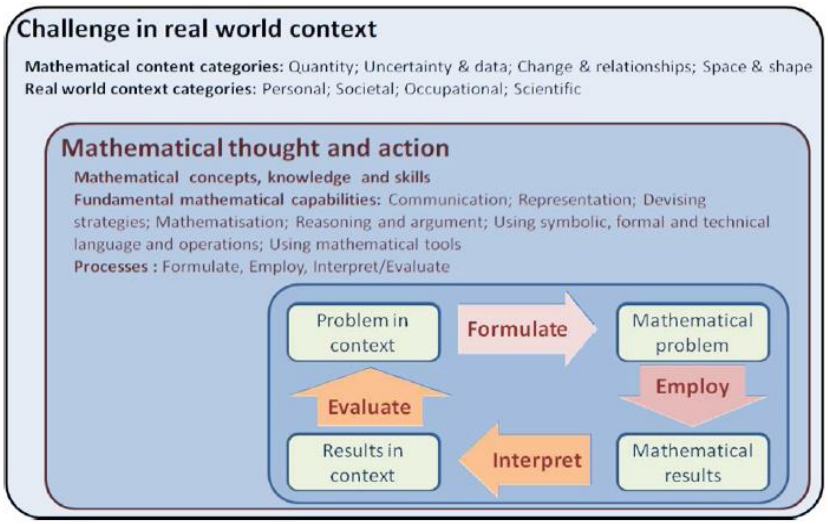

Figure 2. PISA Mathematics Framework

Algebra Problems in textbook analyzed in accordance with the existing aspects of the PISA Framework that is Context, Processes, Fundamental mathematical Capabilities, and Level.

RESULT AND DISCUSSION

The results after the determination of the unit of analysis on one of the subjects in mathematics textbooks seventh-grade students in 2016 revised edition that is the subject of algebra by focusing on issues that are presented, the researchers conducted about classified categorization framework and PISA non-framework PISA. The following table percentage of matter pertained framework PISA and non-framework.

Table 1. Percentage of Problem Classified Framework PISA and Non-framework in Mathematics Textbook Grade VII Revised Edition 2016

No	Problem	Number of items	Problem *framework* PISA	Problem *non-framework* PISA	Persentage of item *framework* PISA (%)
1.	Kegiatan 3.1	18	4	11	22,22
	Kegiatan 3.2	15	1	14	6,67
	Kegiatan 3.3	14	1	13	7,14
	Kegiatan 3.4	13	1	12	7,69
	Kegiatan 3.5	13	0	13	0
2.	Soal Uji Kompetensi	30	3	27	10
	Total	103	10	93	8,95

Based on the above table, the researchers found the percentage of the amount of matter framework PISAamounted to 10 problems or 8.95%. From the analysis of matter framework the PISAis not distributed evenly on each sub-sample questions, and exercises, which in each instance in the chapter about algebra nothing framework, PISA even in practice 3.5 none of the questions that pertained framework. PISA Here are the results of the analysis of the problems of the operations of mathematics textbooks revised edition of seventh-grade students who belong2016 framework PISAandnon- PISA framework.

The following is the analysis of some questions framework in the chapterPISA mathematics textbooks algebra class VII revised edition 2017.

Number 1 (Kegiatan 3.1)

Suatu ketika Pak Veri membeli dua karung beras untuk kebutuhan hajatan di rumahnya. Setelah dibawa pulang, istri Pak Veri merasa beras yang dibeli kurang. Kemudian Pak Veri membeli lagi sebanyak 5 kg. Nyatakan bentuk aljabar dari beras yang dibeli Pak Veri.

Context

Context Personal

context used in this matter is a personal context because it deals directly with daily personal activities that once "Pak Veri membeli dua karung beras untuk kebutuhan hajatan di rumahnya"

Process
Formulating Situations Mathematically
Identifying the mathematical aspects of a problem situated in a real-world context
Translating a problem into mathematical language

The Fundamental Mathematical Capabilities
Mathematising
Formulating a model in the sentences "Nyatakan dalam bentuk aljabar"

Level
Level 1
Questions involving familiar contexts as "Suatu ketika Pak Veri membeli dua karung beras"

Masalah 3.4
Pak Idris mempunyai kebun apel berbentuk persegi dan Pak Tohir mempunyai kebun jeruk berbentuk persegi panjang, diketahui adalah luas= $x^2 + 5x - 300$ satuan luas, dan panjangnya = $x + 20$ satuan panjang, kalian diminta untuk menentukan bentuk aljabar dari lebarnya. Bagaimana langkah kalian untuk menentukan lebarnya?

Context
Context Personal
These problems focus on activities of one's self in the sentence "Pak Idris mempunyai kebun apel dan Pak Tohir mempunyai kebun jeruk".

Process
Employing mathematical concepts, facts, procedures and reasoning
- Devising and implementing strategies for finding mathematical solutions "Berapa lebar kebun apel Pak Idris"
- Applying mathematical facts, rules, structures to finding solutions

The Fundamental Mathematical Capabilities
Devising strategies for solving problems
- Devising a plan or strategy to use mathematics to solve problems

Level
Level 2
- Employ basic formulate, procedures, or conventions.
- Capable of direct reasoning and making literal interpretations of the result.

Analysis interviews

one of the collections of data analyzed in this study were interviews. The interview aims to look at the opinions of teachers and students about the usefulness of mathematics textbooks students revised edition 2016. Here are some excerpts of interviews with teachers-researchers.

Researcher: How do I teach matters in this book bu?
Teacher: The questions in this book there is a form of contextual, so the right students are sometimes lazy to write long sentences, so it is aimed at the formulated his mathematical models of the word problems.
Researcher: Usually there is no difficulties bu?
Teacher: If trouble was not so, because the average student is lazy to read the problem. When we help direct them to make it known, was asked to collect information on the matter they understand, they can answer.
Researcher: Example question is usually taken from this book or any of the other sources?
Teacher: Oh, not all examples of questions I take away from this book, so just focus on one book, because in this book's been many examples of problems. So it is directed to the students to focus on this book alone.
Researcher: How about the exercise bu?
Teacher: To exercises, its own right in this book is a lot, so yes I take from this book as well. Competency test also in this book, so they can practice through this book alone. In addition they are also looking for other sources from the internet.

According to teachers, example problems and exercises students using the textbook revision in 2016. Problem shaped contextual text book makes students lazy sometimes difficult for students to read about a long story. But when they are assisted by teachers to collect information from the problems, students can finish it. It can be concluded that the literacy skills of students are still very low and the students are still used to doing routine matter.

Furthermore, the researchers also conducted interviews with students. The results of the interview are as follows:

Researcher: *Kalo eg the sample questions or problems that are given teachers are drawn from it or from any other book?*

Students: *if the sample questions are usually taken from the book, but if the practice questions usually sometimes uses this book, and some are from other books or from teachers. Most questions are drawn from it.*

Researcher: *Oh meaning of the book using that same two people yes. If teachers continue to use this book does not teach?*

Student: *Yeah often bu. Each study use this book.*
Problem straight there, but about the story is more difficult to digest.

Researcher: *when teachers who teach mathematics often gave the matter of this book?*

Students: *there are from other books, but most of the book.*

From the results of these interviews, it can be seen that the students found the sample questions and exercises mostly taken from textbooks, other than that students still have difficulty in understanding about the story[19].

The results of the study after analyzing the problems of algebra in mathematics textbooks seventh-grade students in 2016 revised edition contains questions that pertained questions framework about the and PISA non-framework PISA. The following discussion of the results of such research.

The Problem PISA Framework

Based on the analysis that has been discussed in the research results on the table, got that matter framework PISAis very low because only amounted to 10 questions (8.95%) of the 103 problems that exist in the chapter on algebra. So it can be understood why the various tests performed mathematical average PISA scores of students Indonesia is always located at the lower level[10]. This is supported also that the student's cognitive ability is still low[20].

Algebra framework PISA in mathematics textbooks students of class VII of the revised edition of 2016 is still very small, it is not in line with the government's desire to make improvements to the quality of education and improve the achievements of Indonesia in the international arena, where international event attended by students Indonesia one of them is PISA. The literacy skills of mathematics students, textbook chapter algebra should be provided questions framework PISA even more, because of the problems that exist in the chapter on algebra is dominated by matter that there is no context, a matter that directly uses an abstract mathematical, Therefore, it should also percentage questions framework PISAon textbooks multiplied in number and developed according to framework. PISA On the results of the study were discussed each question framework PISAof the operations of the problems that exist in textbooks. The following discussion will be presented every aspect of the research.

The Problem of Non-framework PISA

Results of the analysis conducted, researchers found problems on the activities of 3.5, there were 13 questions that all the questions pertained non-framework. PISA These issues are not considered framework due to the PISAabout the activities of 3.5 does not have a context in which the question directly refers to the mathematical structure. It also matters 3.2 activities, activities of 3.3 and 3.4 activities contains only a matter of framework PISAeach one thing only. It can be concluded that the question of non-framework is very dominant in the chapter PISA mathematics textbooks algebra class VII revised edition, 2016. In one of the objectives of the curriculum in 2013 by Permendikbud No. 68 the Year 2013 on Indonesian human prepare to have the ability to live as a person and a citizen who believed, productive, creative, innovative, and effective and able to contribute to society, nation, state, and world civilization. Therefore should the problems in chapter algebra more presents a real problem in the problems, and other aspects such as process, KDM, and level as it reflects the framework.

CONCLUSION

The results of the analysis and discussion can be concluded that the problems of algebra Textbook Mathematics Seventh-grade Students 2016 Revised edition contain 10 questions (8.95%) were classified as a framework. PISA All aspects of the matter framework PISAdoes not allcontained in questions algebra textbook. In the aspect of context dominated by private context as much as 80% and 20% work context. But the social and scientific context not found in the algebra problems. The context in which it was included a group context

camouflage. Further aspects of which the process is also dominated by the process of formulating and implementing as much as 60% to 40%, there is no process on matters Interpret this algebra. Foundational Skills Mathematics (KDM) used in algebra problems just load capability 60% and designing mathematical problem-solving strategies 40%. As for the five other capabilities not found on algebra problems. Judging from the level,the problems of algebra textbook consists of 67% about level 1 and 33% about of level.

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