Student’s mathematics literacy skills in solving of PISA type problems financial context

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Abstract. From outstanding issues, about UN questions in Indonesia adopted from the standard PISA/TIMSS. Skills in PISA questions can be used as a reference to knowing students’ mathematics literacy skills. The challenge as a researcher now is to present questions that can be used for students practicing questions similar to PISA questions. The purpose of this article is to know students' mathematical literacy skills in solving PISA type math problems that researchers have developed. The research method in this article is a design research type of development study which consists of two stages, namely preliminary and formative evaluation. The preliminary stage consists of analysis and design. And the formative evaluation stage consists of self-evaluation, expert reviews, one-to-one, small groups, and field test. Students’ mathematical literacy skills can be seen from the results of the field test. The mathematical literacy skills seen is communication skill, mathematizing skill, representation, reasoning and arguments skill, and skill to use mathematical tools.

1. Introduction

Based on information obtained from Puspendik Kemdikbud, measuring student achievement based on National Examination along with PISA or TIMSS achievements [1]. These achievements show that students are still weak on high-level cognitive skills, such as reasoning/analyzing/evaluating. Daily assessment must be familiarized with HOTS questions, so students are encouraged by their critical thinking skills. The HOTS problem is a question that has a high level of thinking skill, starting from the questions of level 4, 5, and 6. Improving the quality of education can be driven by good assessment, one of which is the Program for International Student Assessment (PISA).

PISA is an international program that is conducted every three years to assess the skill of 15-year-old students held by the Organization for Economic Cooperation and Development (OECD) since 2000 [2]. From the issues circulating in the world of education, UN questions are equivalent to PISA questions, which means that the problem is the level of difficulty that is PISA type math problems but uses a different context. In this case, the educator must encourage students to get used to solving math problems equivalent to PISA. PISA type math problems can be adapted from original PISA questions that can be changed in context, especially the context used is in the student environment, or phenomena that occur in everyday life that are near students.

Practicing PISA type math problems is not merely just giving questions, but educators need the ability to use the context around students to be processed in such a way into learning. One of the lessons is using realistic Indonesian mathematics education (PMRI) approach. PMRI is a learning approach from real things or phenomena for students, emphasizes mathematical process skills, discussions and collaborations, and argues with friends so that they can use mathematics to solve problems well [3].
In line with this, the researcher developed the PISA type math problems using the economic context. The PISA type math problems that researchers develop is related to change and relationship, social arithmetic is one part of the content [4-9]. What distinguishes the questions developed by researchers with other researchers is that the researcher focuses on the context of the problem, namely the financial context.

We can use the results in developing PISA type math problems in the form of student answers to analyze their mathematical literacy skills, which are the main objectives of this article. Mathematical literacy skills itself can be seen from the results of the test field based on the PISA framework [10-13].

2. Method
The method being used is a design research type of development study [14]. The research subjects in this study were 35 students in class X of Srijaya High School Palembang. The procedure of this research begins with the preliminary consisting of preparation, namely analyzing the basic competencies of the questions developed, analyzing students and observing the conditions of the class and school as a place of research, making other preparations such as arranging research schedules and collaborative procedures with teaching teachers.

Then proceed to the design, the design of the assessment instrument, which includes making question grids, writing indicators, writing instruments based on the criteria of the PISA type questions. The results of this product design focus on content, constructs, and language. Then proceed to formative evaluation, namely, self-evaluation, at this stage, a self-assessment of the design results of the PISA type math problems. In this expert review, the design of the questions made by the researchers was consulted with experts to be validated, which included content, construct, and language. Along with expert reviews stage, researchers also conduct a one-to-one stage.

Then the results of expert reviews and one-to-one are tested in small groups of 6 students; this stage is called the small group stage.

The final stage of the research, testing the research subject (field test), which is to class X Sriyaya, a high school in Palembang. Then see what potential effects appear in students in solving the problem. Analysis of the results of student answers is done by looking at the guidelines for scoring students' mathematical literacy skills based on the 2015 PISA framework.

3. Result and Discussion
Based on the results of the analysis in the field test, it can be seen that students' mathematical literacy skills are found in every question students do. Mathematical Literacy has become a rather common term through the influence of OECD/PISA [15]. Mathematical literacy skills in PISA are communication skills, mathematizing, representation, reasoning and argument skills, skill to design strategies to solve problems, and the skill to use language and symbolic, formal and technical operations.

Based on the results of the analysis of student answers in the field test, it can be seen that in unit 1 the problem number 1, the skill of mathematical literacy in PISA that emerges is a representation. For question number 2 in unit 1, the mathematical literacy skills in PISA that emerge are communication skill and mathematizing. Then the number 3 problem in unit 1 of the mathematical literacy skills in PISA that emerges is representation and reasoning and argument skill. In unit 2, question number 4, the mathematical literacy skills in PISA that emerge are communication skill and mathematizing. For question number 5, unit 2, the mathematical literacy skills in PISA that emerge are communication skill and mathematizing.

Furthermore, question number 6 in unit 2 of the mathematical literacy skills in PISA that appears is communication skills, mathematical abilities, and the ability to use tools. In unit 3, question number 7 mathematical literacy skills in PISA that appears are communication skill, mathematizing, reasoning, and arguments skill. Finally, in unit 4, problem number 8, mathematical literacy skills in PISA that emerge are communication skill, mathematizing, and representation skill.

The results of the analysis showed that 96% of students answered correctly questions 1, 2, and 3 in unit 1. Then 74% of students were able to solve questions number 4 and 6. In question number 5, there were 95% of students answering the question correctly. There were 46% of students who answered question number 7 correctly. And 65% of students answered correctly question number 8.
It is seen that the lowest percentage is in questions number 7 and 8. Where question number 7 has potential effects, namely communication skill, mathematising, and reasoning and argument skills. From several studies suggesting that mathematical questions that have reasoning and argumentation skills are high-level questions that are difficult for students to solve [16]. The low value of the percentage of students in solving this problem shows that students have not been able to involve reasoning and argument skills. Mathematical literacy skills that can encourage students' reasoning and argumentation skills are the need for communication skill, mathematising, and designing strategies in solving problems [17].

In addition to question number 7, the percentage is low, as well as in question number 8. Question number 8 has potential effects, namely, communication, mathematical, and representational abilities. The skill of representation that appears on high-level questions will be challenging to do because of the linkages that exist in both [18, 19, 20].

Figure 1. Question number 8

Figure 1 is an example of a question given to students. Where question number of number 8, which has a potential effect, namely mathematical literacy skills, including communication skill, mathematizing, and representation skill. This question number 8 is a level 4 question that is already a matter of HOTS [20, 21].
The more significant advantage is the Chiki Taro type BBQ.

**TP Answer**

8. Chiki Taro Jenis BBQ yang lebih

Menggunakan konsera dibuat as bunga putih.

Isi: $60 \times 2$ = $120,000$

Untung $= 60,000 - 50,000$ = $10,000$

Untung / pcs = $10,000 / 100 = 100$ / pcs

**MJM Answer**

8. Seaweed = $40 \times 1,000$

= $40,000$

Untung $= 40,000 - 36,000$

= $4,000$

Untung / pcs = $4,000 / 100 = 40$ / pcs

If calculated with the same amount, it is equally 240 pcs. Much cheaper types of Chiki with contents of 60 pcs, meaning that we can get bigger profits.

**NIG Answer**

Figure 2. Student answers in completing question number 8

Then in Figure 2 shows some student answers in solving question number 8. In the answers of the TP student in Figure 2, we can see the mathematical literacy skills that emerge are communication skill, matematizing, and representation skill. TP solve question number 8 is well. It seems that TP students answer systematically and in detail, one by one, the completion calculates the value of the packaging benefits in each type of Chiki. So that the packaging benefits can be obtained and TP can choose the type of Chiki which has a greater advantage.

In the MJM answer, it seems that it cannot solve the question, as seen in the answer sheet, MJM only works on the calculation of the value of the Seaweed type Chiki Taro. For the BBQ type Chiki Taro, the calculation has not yet been completed in determining the profit value, so you can't choose which type of Chiki Taro is fortunately bigger.

After the researcher made an observation, it turned out that the student did not solve problem number 8 because the time was up. Because of limited time, the student does not continue the answer again. Though these student understands the intent of the problem and can solve it, the researcher argues that JMIM students cannot manage time so that the time is less to answer all question. So, the answers of MJM cannot be categorized as being able to solve problems that bring out these skills well.

Similarly, other students who did not solve question number 8 also assumed that they were very short on time, even though they were able to answer the question. In this case, the researcher emphasizes to students who reason that there is a lack of time that in solving the problem needed is a strategy in solving...
the problem, one of the strategies in question is one that is managing time so that the problem can be completed on time.

NIG answer looks different from the answers of other students, the student answer by calculating the price if the number of pcs is equal to 240 pcs. From the results of the calculation, the student stated that the Chiki Kinds of BBQ were larger because the lower purchase price compared to the purchase price of Chiki Taro Seaweed. This can be said by the researcher that the NIG argument is rational. Rational in the sense of answers to NIG can show evidence that the bigger advantage is the BBQ type Chiki Taro.

4. Conclusion
The conclusion of this article is the potential effects that emerge from the results of the field tests tested by researchers using a mathematical type of financial context PISA type. The students' mathematical literacy skills that emerged were communication skill, mathematizing, representation skill, reasoning and argumentation skill, and the skill to use mathematical tools. With the lowest percentage in terms of students completing the question on a question that involves the skills of reasoning and argumentation, and the ability of representation on the question level 4.

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