

DEVELOPMENT OF MATHEMATICAL PROBLEMS MODELS OF PISA CONTEXT OCCUPATION FOR STUDENT JUNIOR HIGH SCHOOL

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Abstract

Resolving math problems PISA can assist students in training students' mathematical skills. This aims research to (1) Generate math problems of PISA type work context for valid and practical junior high school students, (2) Knowing the potential effects of mathematics on PISA type of work context on the mathematics ability of junior high school students. The method in this research is research method design research with type development studies consists of two stages namely preliminary or preparation and stage prototyping (formative evaluation) which cover self evaluation, expert reviews and one-to-one, small group, and field test. This research involves 2 mathematicians and students of the class VII SMP Negeri 5 Pangkalpinang. Data collection techniques used are walkthrough, documentation, questionnaires, test results, and interviews. This research produces 10 device type problem PISA context occupation on the material SMP that is valid and practical, as well as having a potential effect on students' mathematical abilities. Kevalidan problem based on expert comments (expert review) and test of empirical validity and reliability test, as well as subject comments one-to-one. On test small group obtained data about practicality problem, and phase field test obtained data on potential effects on students' mathematical abilities that students appear when working on questions. The results of the problem analysis reveal some of the students' difficulties in doing the questions seen from mathematical skills include communication skills, mathematization, representation, reasoning and argumentation, problem-solving strategies, and the ability to use symbolic or language formal.

Keywords: About Mathematics PISA, Student Mathematical Ability, Development Studies, Prototyping.

INTRODUCTION

PISA or Programme for International Student Assessment is an international study held to see skills and academic ability students 15 year old in terms of reading literacy, mathematic literacy, and scientific literacy (OECD, 2013). This study is conducted every 3 years. where for the first time held in 2000 followed by 41 participating countries including Indonesia (OECD, 2003).

However, for 5 times participated in this study, Indonesia always occupy ratings the bottom of many countries who participated. Year 2003, Indonesia occupy order 38th from 41 countries (OECD, 2004) with skors average 411, then year 2006, Indonesia occupy ratings 50th from 57 countries who participated (OECD, 2007), with skors average only 391, then year 2009 is at ratings 61th from 65 countries (OECD, 2010), with average skors 371, and year 2012, Indonesia occupy ratings 64th from 65 countries, with achievement level which is still very low, ie only capable until at level 3 (OECD, 2013).

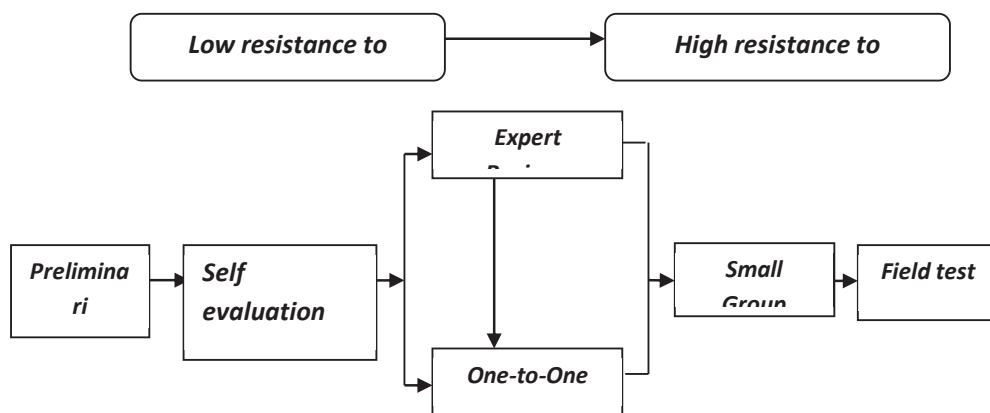
Look result study PISA, Indonesia which is still very low, various efforts have been made by the government and they who is involved in education. Among other, evaluate result PISA low. One of the causes the cause of the low this study PISA among other due to less familiar to the students solve the problems solving or problems high level. Proven from result study PISA, where Indonesia only able to finish problems level 3. Education of Indonesia in general still used problem low level and students accustomed to acquire and use matematic knowledge formal in the class kelas (Stacey, 2010; Wu, 2011; Novita, Zulkardi, & Hartono, 2012).

Result study PISA Indonesia this is also in line with result research Azmi (2012: 3) which states more than 50% students still experience difficulty complete problems sovling. So are from result research Kamaliyah (2012) who develops matematics problems solving type PISA levels 4, 5, and 6 also shows less than 50% students able to finish problems that developed. Correspondingly, on result research Kohar (2014) developed problems PISA to see profile mathematical literacy student Senior High School state that in general student achievement complete problem type PISA low pertained, that is 31% from 120 grain analysis answers which is identified as the correct answer.

Some researchers who developed problems about PISA can take topics based on content, context and competence. On content research ever done by Annisah (2011), and Ahyan (2013) each taking focus on the content Quantity, and konten Change and Relationship. On the competencies never researched by Mangelep (2013) which focuses on connection and reflection process competencies. While in context, once researched by Julaiha use context Sumatera Selatan, Lutfianto (2013) use personal context. even though context in PISA there is 4 context ie personal, occupational, social, and scientific (OECD, 2010). Until now no one has taken focus on the occupation context. Therefore, the researcher wanted to develop mathematical problems of PISA type PISA context occupational for students Senior High School.

RESEARCH METHODS

This research method is design research with type development studies or research development. This development research is types of research intended for generate math problems type PISA to measure ability problem solving student class VII Junior High School who apply KTSP 2006 is valid and practical. This research consists of two stage ie preliminary and stage prototyping (formative evaluation) which cover self evaluation, expert reviews and one-to-one and small group and field test (Tessmer 1993, Zulkardi 2002).



Picture 2. Design Flow Formative Evaluation (Adoption from Tessmer,1993; Zulkardi,2002)

Technique collection data used in research is documentation, walthrough, test, interview, and questionnaire. The data obtained are analyzed by descriptive qualitative.

RESULTS AND DISCUSSION

The following problem is a mathematical of the model PISA context occupational that researchers have successfully developed.



Ahead of Independence Day a tailor take opportunities for create a flag “Merah Putih”. Rules Flag rule is rectangular with size width $\frac{2}{3}$ size length. Materials owned Mr Tono is 5 meters for every colours.

Questions

Mr Tono, the tailor want make size flag ie 20 cm x 30 cm. He is think about how to cut the cloth so that flag gained more and few remaining materials. Mr Tono cut the cloth with with by the way below. You think it's really done Mr Tono? Explain!

The comment expert suggestion and subject one-to-one are presented in table 1 below.

Table 1. Comments and Decisions Revision Question

Test	Expert/One-To-One	Comment / Response	Revision Decision
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P-1	1. The word "meters" changed into "square" on the question information 2. The word "materials owned" on information clarified eg being" has ingredients 5 meters for each colour"	1.The changed word"meters" be "square" 2. The changed word" be" has ingredients 5 meters for each colour" The changed image flag red white
P-2	Images the flag should be flat not turn because made a matter with no value The word "a tailor" omitted only	Eliminate word"a tailor" Revise questions
A-1	1. Confused what to ask	
A-2	1. The question is quite clear 2. Image does not help	
A-3	Difficult to understand the confused question	

Information:

P: Experts

A: Subject

Further revision results are in the one-to-one and revision research revision stage, and the revised results are tested at the small group stage

Small Group

The comment / suggestion result of small group process is presented in table 2 below. The next, the revision results at small group stage followed by testing at field test stage.

Table 2. Comments and Decisions Revision by Subject of Small Group.

No	Comment / Suggestion Subject of Small Group	Small Revision
1.	Comment: 1. Understand with the purpose of the question	Maintained without revision

Field Test

Unit 4: Flag “Merah Putih”

Information Question



Source: Private Documents

Towards the day of independence a tailor takes the opportunity to create a flag. Flag rule rules is rectangular with size width $\frac{2}{3}$ size length. Mr Tono a tailor has ingredients 5 meters for each colour.

Mr Tono want make size flag “Merah Putih” for Pak Tono ingin membuat ukuran bendera merah putih untuk installed in public transport with size 20cm x 30cm. How many pieces there are flag “Merah Putih” that can be created Mr Tono with materials available?

DISCUSSION

On question above included in the category context occupational because related with material wake flat in relation to determining many pieces of flag (rectangle) of the materials available. Construct from question is on flag size length $\frac{2}{3}$ from width. Will be created 2 type of size flag ie 20 cm x 30 cm and 100 cm x 150 cm. Materials available 5 meters for every colour. This question pertained on category process employ, and including category content uncertainty and data, while for predictions level included into level 4.

question image by definition, rule, and formal. As using calculations in determining many pieces flag “Merah Putih”.

As S-1, S-2, S-3,S-4,S-5,S-6 less precise in communicating problems and lacking in involving ability reasoning and argumentation no students raised in answer question even though this question can be done on the basis of reasoning to draw conclusions. So in involving the ability of mathematization and formulate strategies in answering the question less precise.

CONCLUSION

This research has produced the product form question type PISA context occupational for student Junior High School that is valid and practical. This question it says valid and practical. This question said to be valid and practical after a revision based on suggestions from experts and student reviewed from terms content (question in accordance with Basic Competence (KD)) and Indicators of Competence Achievement, degree of difficulty and material abilities according to the level of thinking student Junior High School class VII so it can be translated easily). From term construct (each item already reflects the characteristics or level on PISA) and from term language (sentences used in good and correct language according to EYD, the question does not contain multiple interpretations, clear boundaries of questions and answers, using a common language and not containing words that can offend a person).

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