PISA-LIKE: Uncertainty and data content in Statistics subject with futsal context

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Abstract. This research is a development research that will produce a valid PISA-LIKE of uncertainty and data content with futsal context. The development model used in this study is the 4-D model (Define, Design, Develop, and Disseminate). The development phase discussed are a result of expert review and simulation. The review stage expert of this study were involved material experts, and language expert, as well as IX grade students in one of junior high school in Karawang at the simulation stage as the subjects. Data collection is done by documentation and interviews. Based on the result of data analysis, it can be concluded that this research has produced valid PISA-LIKE of uncertainty and data content with futsal context, it can be seen from the comments given by the validator and also the students at the simulation stage.

1. Introduction

Indonesia as a developing country continuously working to improve the mathematical literacy of students through various program, one of which is through the PISA [1]. The Program for International Student Assessment (PISA) is a study of an international level assessment program organized by The Organization for Economic Cooperation and Development (OECD) every 3 years. PISA assesses the extent to students which are 15 years 3 months and 16 years 2 months at the time of research nearing the end of compulsory education who have gained knowledge and skills in using mathematics in daily life [2]. Mathematical skills are revealed in the results of the PISA study. The low results of Indonesian students' PISA studies are caused by several factors one of them is the use of memorization methods, students are accustomed to routine problems provided by the teacher, and students are not accustomed to solving non-routine problems, one of them is problems such as PISA.

Based on the data published by the Organization for Economic Cooperation and Development (OECD) in two cycles of PISA is in the PISA 2015. Indonesia ranks 62 of 70 countries [3], while in PISA 2018, Indonesia was ranked 73rd on the 79 countries [4]. The low PISA Indonesia’s results is one of the bases in the development of the 2013 curriculum which requires the teacher's creativity in shaping students to be creative in thinking, solving problems, making decisions, reasoning, and conveying ideas in activities [5]. The PISA problem was developed based on four contents namely Change and Relationship, Space and Sharpie, Quantity, and Uncertainty and Data.

One of the PISA content related to statistical material is uncertainty and data content (uncertainty and data). Uncertainty and data are part of PISA content which is very important and useful for solving problems that are closely related to life [6]. Uncertainty is a phenomenon that lies at the heart of mathematical analysis of various situations. Uncertainty and data categories include the recognition of the place of variation in a process, the meaning of quantification of the variation, knowledge of uncertainty and error in measurement, and knowledge of chance/opportunity. Presentation and
interpretation are the key concepts of this content. In addition to the PISA content also developed based on four contexts namely Personal, Occupational, Society, and Scientific.

Sport is a physical activity carried out with the aim to maintain physical health and strengthen the total muscles of the body and in the development of sports carried out as an entertaining and enjoyable activity, or also carried out with the aim to improve achievement [7]. Sport is an activity that is often carried out by students in accordance with the demands of the school curriculum which requires students to do sports at least once a week. Various branches of sports are studied by students such as swimming, basketball, volleyball, badminton, futsal, and others. The context of football can help students understand the opportunities material [8]. With students being used to playing sports, sports can be used as context in mathematics learning. The context of sports can help students express mathematical ideas that students have because they can be more comfortable and confident. Students are interested in solving problems in PISA questions using the context of football in uncertainty and data content. Problems developed in these problems help students improve literacy [9].

One of the mathematical concepts in the theory is statistics which shows the relationship between mathematics and futsal. As for one component in futsal that is directly related to mathematics learning is the basic technique of futsal play: points, lines, triangles, rectangles, statistics, speed, angles and opportunities [10]. This is in line with the basic competency of statistics, namely presenting and solving problems related to data distribution, average values, median, mode, and data distribution to draw conclusions, make decisions, and make predictions [11].

Based on the description above that shows the relationship between futsal and mathematics learning, the researcher wants to design the valid problem of development PISA uncertainty and data content with a futsal context.

2. Method
This research is classified as development research because in this study aims to find, develop, and validate a product. Development means deepening and broadening existing knowledge, actions and products [12]. Development model used in this study is a model Thiagarajan known as 4-D model of which is done through 4 stages, namely the define, design, develop, and disseminate [13]. The defining stage includes the front-end analysis and task analysis, then the researcher compiles the test questions to be developed by selecting the format and initial design, the development stage discussed is expert validation and simulations for the readability test, while at the deployment stage for conducting validation tests on the questions development that has been tested at the simulation stage and revised and then disseminated to the field [14]. The validity of this research includes content validity, construction, and language validity.

The expert review involved material experts, linguists and subjects at the simulation stage were two IX grade students at a junior high school in Karawang. Data collection used is (1) Documentation; the documents used are the 2013 Curriculum for Junior High School, the PISA framework, and issues related to PISA. (2) Interview, conducted at the simulation stage. The results of interviews with students will be used as revision material.

The collected data is then analyzed using descriptive analysis method. First, analyze the steps derived from expert comments at the expert validity stage to get the validity of the questions. Second, the results of the interview at the simulation stage are used to get the validity of the readability.

3. Results and Discussion
This research produces about PISA mathematical models consisting of 5 levels PISA, and 3 PISA process capability. From 4 experts at this stage of the validity of the expert and 2 learners in simulations stage provide comments and suggestions are different to fix the first draft of the development.

The development stages produced questions with valid criteria revised based on experts input and data obtained from the simulation. This stage is an advanced stage to refine the initial problem before
finally becoming a problem with valid criteria [14]. The results of experts review and simulation is the validity of the experts associated with the initial assessment of draft questions that have been created. In the experts review the researchers asked the opinions of experts who have experience in the field of mathematics education, PISA questions, and language. Comments and suggestions from experts on the development of the questions that has been written in the validation sheet as material for revise and declared that the questions are valid. The development of the PISA model the content uncertainty and data developed by the researchers were validated through expert validity and simulation.

This is in line with triangulation, which is the process of using the conflict of data from various sources, confirming the observations of various sources of observers, and confirm the information with different data collection methods [15]. Triangulation can be interpreted as checking data from various sources in various ways, and at various times. Triangulation means researchers use different data collection techniques to get data from the same source [12].

In general, the experts stated that the matter of development the PISA model was valid related to content, context and language although there were still some revisions. The validity of the problem in terms of content is in accordance with the literacy domain in PISA, one of which is the uncertainty and data content developed in the direction of statistical material. The context that suits the personal context is sports, more specifically the sport of futsal; construction in accordance with the characteristics of the level on PISA and the ability of grade IX students; The revised language is in the form of the use of Indonesian Spelling General Guidelines, easy to understand, and does not contain multiple meanings [16].

The validity of the expert suggests attaching the original PISA questions in accordance with the questions developed, so the researchers accepts the suggestions from the validity of the expert and then changes the draft question by attaching the original PISA questions before the questions are developed as shown in Figure 1.

The revision in the context that given by the expert, the question number 1 in question table number 1 is less related to the concept of futsal, the table is too small, and the table should not include age, because every year the age will always increase will make the problem less effective, so that the revised turn the tables about number 1 along with the question, which is at the first is looking for a range of revamped form to finding the middle value or median of Myanmar state of time goal achieve against Cambodia state in the event AFF 2019 as shown in Figure 2.
Figure 2. Revised Table and Problem Changes

In the sentence structure that shows the ranking criteria in the futsal classement, changes in sentence structure are in number 4 where sentences in criterion number 4 can contain ambiguous meaning, it is feared that student misinterpret the fourth criterion which will affect the results of the answers of students. Researchers accept the suggestion and then changes the structure of the sentence to a sentence which does not contain a double meaning and remains in accordance with the ranking criteria in the futsal classement.

Translate: The following are the result of the match from Cambodia vs Myanmar at the 2019 AFF which was held in Vietnam with a final score of 3-13. The following are the names of the players who scored during the match and the time when the goals were scored.

| Cambodia   | Myanmar  |
|------------|----------|
| Chean     | Neng Nam Bex   |
| Sereyeng  | Aung Zin Do    |
|           | Pyae Pyae Maung   |
|           | Kk Kj Lwin    |
|           | Hlaing Win Tin   |
|           | Nang Ju Kyaw   |
|           | Wai Zin Oh   |
|           | Pyae Pyae Maung   |

Number: [https://en.wikipedia.org/wiki/2019_AFF_Futsal_Championship](https://en.wikipedia.org/wiki/2019_AFF_Futsal_Championship)
Figure 3. Revised Sentence Structure

In the language section the experts revised the section on the use of the Indonesian Spelling General Guidelines, is easy to understand, and does not contain multiple meanings. Researcher accepts the advice of the experts and then revises the draft I about the development that was made, as shown in Figure 3. shows changes based on the validator’s comments on question number 5, where the question asks which group is superior, the word ‘unggul’ in the question has a double meaning can be superior for each team or for the whole team in the group, so the researchers follows the validator's suggestion and then changes the overall question from the team in each group.

Figure 4. Revised Question Sentences

At the simulation stage, two class IX C students were tested: ETC and SS. The purpose of simulation is to see the responses and constraints that students will face when answering questions about the development of the PISA model [8]. The responses and difficulties observed focus on the readability and the level of difficulty of the questions in the matter of development of the PISA model. The
development of the questions given aims to familiarize students with non-routine problems such as PISA questions.

After implementing the test, the researcher provides the opportunity for students to provide comments and suggestions about the PISA model of the uncertainty and data content and futsal context developed. Students show that they like the questions that are done, the advice given by students is a table that is presented difficult to understand. In addition to providing opportunities for students to provide comments, researchers also interviewed students about the matter of the development of the PISA model.

The results of the interview stated that students were quite satisfied with the questions given, from the contents, construction, and language. Even students say that the PISA model questions with futsal context can increase the interest of other students to read the math problems first from the given question. Because most students in Indonesia nervous and does not like learn math, so the assessment of mathematics students in Indonesia is still low [17]. Some students even think that mathematics has no implementation in daily life. Therefore, adding context in mathematics learning is very important [18]. Then the researchers asked students to provide comments or suggestions on the matter of the development of the PISA model of uncertainty and data content in the context of futsal.

Table 1. Student Comments

| No | Name | Comment |
|----|------|---------|
| 1. | ETC  | I can know more about futsal, especially on the results of scores and standings. |
| 2. | SS   | I don't understand and I'm not used to problems like that. To solve the problem takes a long time. |

From the results of the comments given by the students after conducting the interview, it was seen that the students still did not answer the questions perfectly, at least the students had tried and were able to answer the questions. From the simulation stage it can be seen that the ability of students to read and interpret problems in mathematical expressions is quite good [19]. Seen from Figure 5, the answers of students at the simulation stage they are able to read and interpret questions even though it is not perfect, because students are still not familiar with the questions of type PISA and also questions in translating tables. These students still make a little mistake when reading the table like reading scores from Bintang Timur team that used to be win for 11, draw 0, and lose 3, so that it affects the final answer that should be right to be wrong because inaccurate at reading the table.
After obtaining the results from expert review and simulation, so researchers revised the draft I to draft II in accordance with the General Guidelines for Indonesian Spelling, replaced irrelevant images, and refined questions. Validity test is done so that the instruments make produce information that is appropriate, meaningful, precise, and useful in drawing conclusions made by researchers [20].

4. Conclusion
The results from this research are about the valid PISA model of uncertainty and data content with futsal context. The first draft was tested at the develop stage, namely the expert validity and simulation stages. The expert validity and simulation stages are in accordance with the contents, construction, and language. After getting comments and suggestions from the results of the interview then it was revised and produced a PISA model question draft II with valid criteria. So the valid question of the PISA model of uncertainty and data content with futsal context are 6 questions.

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