Cek plagiat

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Development of PISA- Like Math Taks for Uncertainty and Data Using the Context of COVID-19

Abstract

This study aims to produce valid and practical questions and find out the potential effects of questions on mathematical literacy skills of PISA-Like Math Tasks type content of uncertainty and data using the context of COVID-19. The subjects of this study were grade IX students of Junior High School number 19 Palembang. The research was conducted using the Design research method of development study type. The stages in question development research are through the preliminary and formative evaluation stages. The preliminary stage includes analysis of student needs, curriculum analysis, and analysis of PISA evaluation instruments. The formative evaluation stage includes self-evaluation, expert reviews, one-to-one, small group, and field tests. This study resulted in a set of PISA-Like Math Tasks on uncertainty and data content using the COVID-19 context which consisted of 7 units with 12 valid and practical questions and potential effects on mathematical literacy skills which included communication skills, reasoning skills, mathematical abilities, representation ability and strategy selection ability. The resulting PISA- Like Math Tasks can help students think mathematically by using ideas from different subjects to solve a given problem.

Keywords: Development Research, PISA-Like Math Tasks, Mathematical Literacy, COVID-19

Abstrak

Penelitian ini bertujuan untuk menghasilkan soal yang valid dan praktis serta mengetahui efek potensial soal terhadap kemampuan literasi matematika tipe PISA konten *uncertainty and data* menggunakan konteks COVID-19. Subjek penelitian ini adalah peserta didik kelas IX SMP Negeri 19 Palembang. Penelitian yang dilakukan menggunakan metode *Design research* tipe *development study*. Tahapan dalam penelitian pengembangan soal melalui tahap *preliminary* dan *formative evaluation*. Tahap *preliminary* meliputi analisis kebutuhan peserta didik, analisis kurikulum, dan analisis instrumen evaluasi PISA. Pada tahap *formative evaluation* meliputi *self-evaluation*,*expert reviews*, *one-to-one*, *small group* dan *field tests*. Penelitian ini menghasilkan seperangkat soal matematika tipe PISA pada konten *uncertainty and data* menggunakan konteks COVID-19 yang terdiri dari 7unit dengan 12 butir soal yang valid dan praktis serta terdapat efek potensial terhadap kemampuan literasi matematika yang meliputi kemampuan komunikasi, kemampuan penalaran, kemampuan matematisasi, kemampuan representasi dan kemampuan pemilihan strategi. Soal tipe PISA yang dihasilkan dapat membantu siswa dalam berpikir secara matematis dengan menggunakan ide-ide dari mata pelajaran yang berbeda untuk memecahkan masalah yang diberikan

Kata kunci: Penelitian Pengembangan, Soal Matematika Tipe PISA, Uncertainty and Data, Literasi Matematika, COVID-19

INTRODUCTION

PISA is one of the programs to improve students' mathematical literacy (Murdaningsih & Murtiyasa, 2016; OECD, 2019). Mathematical literacy is very important for students to have in order to master mathematics well so that students can make the right decisions and can deal with problems or jobs that are found in everyday life (Rifai & Wutsqa, 2017; Astuti, Kartono, & Wardono, 2018; Amelia, Sutrisno & Adirakasiwi, 2019; Syamsuri & Novaliyosi, 2020). Therefore, it is important that students should have literacy skills.

One of the most important contents of PISA questions in mathematical literacy is uncertainty and data, this is due to the fact that they are at the center of mathematical analysis of a wide range of problems, as well as probability theory and statistics as a method of representing and explaining data (OECD, 2019). However, Mutia & Effendi's research, (2019) indicated that junior high school students' mathematical literacy competence on questions similar to PISA with uncertainty and data

content is still not literal, and many students are still unable to complete the mathematical literacy process.

The low accomplishment of Indonesian students in PISA mathematical literacy can be attributed to a variety of issues, including Indonesian students' difficulty solving mathematical problems such as PISA using context and turning them into mathematical problems, as well as being less acclimated to tackling PISA problems and simply being used to tackle routine tasks (Wijaya, 2014; Nizar, Putri, & Zulkardi, 2018; Zulkardi, & Kohar, 2019). In order to strengthen their mathematical literacy skills, students must be conversant with PISA-based questions in order to solve contextual situations in real life mathematically (Dasaprawira, Zulkardi, & Susanti, 2019; Efriani, Putri, & Hapizah, 2019; Bahar, Syamsuadi, Gaffar & Syahri, 2020; Noviana & Murtiyasa. 2020). In order to improve students' literacy skills, it is recommended to develop PISA math problems with the context of problems in the surrounding environment and familiarize students with PISA-Like Math Tasks (Pratiwi, Effendi & Ummah, 2020; Veronica, Zainil, & Helsa, 2020).

Putri & Zulkardi (2020) stated that it is important to integrate the context in the surrounding environment that is used in assessment activities. Previous research has used the 2018 Asian Games as context for generating PISA-Like Math Tasks with uncertainty and data with football context (Yansen, Putri, Zulkardi, & Fatimah, 2019), long jump (Pratiwi, Putri, & Zulkardi, 2019), bowling on the jumping task (Putri & Zulkardi, 2020). The context used by these researchers is the context of major events that were happening at that time in Indonesia. The big event that is happening both in the world and in Indonesia is the COVID-19 pandemic, which spreads the virus very quickly and cannot be stopped (WHO, 2020). The researchers decided to take the issue of the COVID-19 pandemic as the context that will be used in developing the problem. Saputri, et al. (2020) in his research using COVID-19 as a context for PISA-Like Math Tasks containing valid and practical without looking at the potential effects of the questions. In addition, several other studies have used the same context, including the context of physical social distancing, change and relationship content (Nusantara, Zulkardi, & Putri, 2020b), using COVID-19 as a context for questions developed focusing on level 5 only (Nusantara, Zulkardi, & Putri, 2020a) and using the COVID-19 context with quantity and change & relationship content (Nusantara, Zulkardi, & Putri, 2021).

According to the preceding description, this cannot be separated from the mathematical literacy score of Indonesian students, which remains poor according to PISA 2019 especially in uncertainty and data content. Furthermore, previous research using COVID-19 as a context has not yet reached the stage of seeing the potential effects of questions, especially for mathematical literacy skills on uncertainty and data content. The purpose of this study is to generate valid and practical questions and to discover the potential effects of questions on mathematical literacy skills of PISA with uncertainty and data content by using the COVID-19 context.

METHODS

The design research method of development study type was used to perform the research. The stages of question development research are preliminary and formative evaluation. The preliminary step comprises an examination of student needs, a review of the curriculum, and an examination of the PISA assessment tool. Self-assessment, expert evaluations, one-on-one, small group, and field tests are all part of the formative evaluation stage (Bakker, 2018; Zulkardi, 2002).

During the preliminary stage, the researchers did a student analysis, an examination of the curriculum for junior high school students in the COVID-19 era given by the Ministry of Education and Culture, and an examination of PISA questions on Uncertainty Content and data. The researchers then created PISA-like math tasks using the COVID-19 context. The device created at this step is referred to as prototype 1. At this step, the researcher designs a set of questions which includes the design of grids, question cards, scoring rubrics and math problems using the PISA model of uncertainty and data content based on indicators of mathematical literacy ability. The problem design process is carried out by prototyping using three characteristics, namely content, construct and language.

The set of questions that have been made is evaluated by the researchers themselves. The result of this self-evaluation is called prototype 1. The next step for prototype 1 is prototyping. Beginning with an expert review and one-on-one sessions held simultaneously. This is accomplished by monitoring and evaluating each item based on its content, structure, and language. The content assessed is in accordance with the curriculum used and the material studied by junior high school students. The construct that was observed was conformity with the characteristics of the PISA questions. The language validation in question is the suitability of the use of language in the questions with the applicable language rules. Along with validation by two experts, a one-to-one stage is carried out. This stage involves two teachers, six students who are asked to collaborate in reading and observing the questions and then giving responses about the readability and clarity of the meaning of the questions. The findings from the expert review and one-on-one sessions were used to revise the prototype 1. The redesigned prototype 1 resulted in prototype 2. Prototype 2 was put to the test on students in small groups.

In the small group stage, prototype 2 was tested on two groups of four students from Junior high school number 19 Palembang with heterogeneous abilities, including high, medium, and low. In this situation, the teacher supported the researcher in determining which students were assigned to one group. The teacher uses report cards to see each student's ability selected so that in one group of students have heterogeneous abilities. This small group stage was carried out for 3 meetings, namely two lessons using blended learning, the LSLC system and the PMRI approach consisting of asynchronous and synchronous and one final test, in this case the researcher became the teacher. Synchronous learning is carried out through virtual face-to-face using Zoom meetings. Students

collaborate with various abilities to solve prototype 2 questions. Then, the students are also asked for opinions and comments about the questions that have been working on. This stage focuses on the practicality of the questions that have been developed.

At the field test stage, particularly testing prototype 3 produced by one class of students at Junior High School number 19 Palembang. The field test results are in the form of student answer sheets, which are then descriptively evaluated to determine the potential effects of the PISA model questions using the created COVID-19 context and through a validation process. Validation sheets and tests were employed in this study as instruments. During the validation process, experts employ validation sheets, while test instruments are used to acquire information about the feasibility of the questions created and to identify their potential effects.

Observation, exams, and document review were used to obtain data. The PISA-Like Math tasks are valid, as determined by referring to expert comments and suggestions and one-on-one validation. Validation results are based on predetermined criteria, including content, construct, and language. The practicality of the questions is determined by observation and document analysis in small groups. Furthermore, student test results and field test observations revealed that the generated questions had the potential to affect mathematical literacy. The acquired data was then descriptively evaluated.

RESULTS AND DISCUSSION

Twelve items have been developed as a result of research into the development of PISA-Like Math Tasks using the COVID-19 context. These items use the context of COVID-19 such as the spread of cases, the availability of isolation places for COVID-19 patients, COVID-19 cases by age group, nutritional needs, the increase and decrease in the highest COVID-19 cases, daily needs, and COVID-19 death cases based on comorbidities. The focus of this discussion is the bed & patient unit (2 items) and the comorbidity unit (3 items). The two units consisting of 5 items covered mathematics literacy abilities of students that emerged from the whole unit, therefore the researcher decided to focus on discussing these 5 questions.

The researcher did a literature study, reviewed the curriculum employed in the school where the research was conducted, and examined the PISA framework in the preliminary stage. The next stage is to design the COVID-19 context to create PISA-like mathematics tasks on uncertainty and data content and other necessary research instruments. The material used in the developed questions is statistics contained in the curriculum for junior high school. The level in the question consists of levels 2, 3, 4, 5, and 6. In addition, researchers analyzed at the students who would be the subject of the study. The students involved in this study were students with heterogeneous abilities who were selected based on the teacher's recommendation by looking at the existing student score

documentation, six students were selected to be involved in one-to-one and eight students were divided into two groups for small groups, then the class was determined. material for field test.

The results of the development of PISA-Like Math Tasks on uncertainty and data content using the COVID-19 context that have been designed, examined, and re-evaluated by researchers in terms of content, constructs, and language are examined and re-evaluated by researchers in the self-evaluation stage. The following is a figure of the results of the prototype 1 revision decision on the bed & patient unit and comorbidities.

UNIT 4: Bed & Patient

The need for additional hospital beds is needed considering the higher occupancy at the corona hospital which is a referral for COVID-19 patients. So that apart from the Hospital, athlete's houses also prepared for an independent isolation room. The chart below shows a breakdown of the number of "Beds" and "Patients" for COVID-19 on September 18, 2020

	Tower 4, flat isolasi mandiri, wisma atlet kemayoran	Tower 5, flat isolasi mandiri, wisma atlet kemayoran	Tower 6, RSDC Wisma Atlet Kemayoran	Tower 7, RSDC, Wisma Atlet Kemayoran	Tower 8, Karantina Mandiri, PMI, Wisma Atlet Pademangan	Tower 9, Karantina Mandiri, PMI, Wisma Atlet Pademangan	RS LAP INDRAPURA (Surabaya)	RSKI P. GALANG (BATAM)
Number of Beds	1546	1570	1036	1578	1548	2619	238	360
Number of Patients	Haven't been used	1002	935	994	597	1471	173	276
Remaining Bed	1546	568	101	584	951	1148	65	84

Sources: instagram//satgascovid19.id

Question 5

On September 19, 2020, 50 patients at the LAP Indrapura Hospital had recovered from COVID-19, but the number of positive patients increased by 34 people. Make a pie chart that describes the status of the number of patients and the availability of beds in the hospital.

Question 6

Below are three statements regarding the number of beds and patients at athlete's house Kemayoran. Are all statements correct?

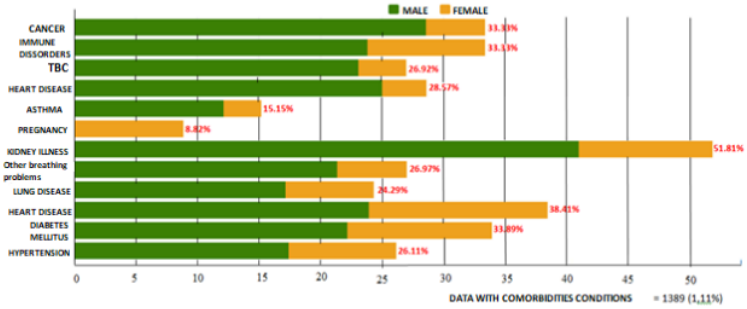
Circle "Yes" or "No", for each statement.

Statement	Is the statements correct?
Tower 7 is the place to stay for the fewest patients	Yes/No
The average number of patients per tower is 833 patients	Yes/No
Tower 5 and tower 7 have the same remaining bed supplies	Yes/No

(a)

UNIT 6: Comorbidities

COVID-19 disease is risky for people who previously had a disease in medical terms called comorbid. Patients who have these comorbidities require more attention because their conditions are more vulnerable so that when they contract COVID-19 it can have a fatal impact. The Ministry of Health's list contains the 12 co-morbidities of COVID-19 with the most positive COVID-19 patients. People who already have this disease must strictly implement health protocols to avoid the transmission of COVID-19. The diagram below shows the percentage of deaths of Covid-19 patients due to comorbidities by gender.



Source : https://covid19.do.id/peta-sebaran

Quetion 1
How many data on patients exposed to Covid-19 who died with TB co-morbidities?

Quetion 2
Based on the data above, kidney disease has the highest risk of death, especially in male patients. Does this also apply to female patients? Give your reasons.

Quetion 3
Is the number of female Covid-19 patients who died with comorbidities with other respiratory disorders the same as those with cancer?

(b)

Figure 1. Prototype 1 PISA Type Development Problems

Figure 1(a) prototype 1 of the PISA type development problem uses the context of the bed and the patient. In question 1, students have to create a diagram that solves the problems described in the question. In question 2, students need to clarify the truth regarding the assertion posed in the question. Figure 1(b) prototype 1 of the PISA type development question uses the context of comorbidities. In question 1, students were asked to calculate the amount of data contained in patients who died from TB co-morbidities. For question 2, students were asked to determine the risk of death in female patients for kidney disease. Furthermore, in question 3, students were asked to compare the number of female patients who died from COVID-19 with other respiratory disorders and cancer.

In the expert reviews stage, two experts examine, assess, and evaluate prototype 1, which was designed by the researcher, in terms of content, construct, and language. In addition, during the one-to-one stage, the researchers conducted a prototype 1 experiment with six students from Junior High School 19 Palembang who had heterogeneous abilities, including high, medium, and low. The following table summarizes the suggestions and comments as well as the researcher's revision decision for the problem of developing PISA types in bed & patient units and co-morbidities.

Tabel 1. Comments of experts and students on bed & patient units and comorbidities

Validation	Comments / Suggestions	Revision Decision
Experts	• It is better if question 2 in unit 4 bed & patient does not only have yes / no but is accompanied by reasons for choosing the option • Unit 4 image is better made at higher resolution • It is better if question 3 is accompanied by the students' reasons for their answers for unit 6 • Image fixed for 6 units • Consistently use the term COVID-19 virus	• Add the sentence, "give reasons that support your answer" on questions 2 unit 4 and question 3 unit 6 • Change the image resolution to higher on unit 2 and unit 4 • Consistent in using the term COVID-19
One-to-one	• In unit 6, students have a little difficulty in writing down the information or	• Changing the image resolution to a higher one so that students do not write

	numbers correctly contained in the diagrams • Students only choose yes or no without giving reasons for making decisions, so that researchers cannot know how students think in answering questions.	down the wrong information in solving problems • Add the sentence "give reasons that support your answer", so that researchers can find out how students think in working on questions.

Table 1 presents expert comments in terms of content, construct, and language. In addition, students' comments in understanding and what if students have to solve the questions given by the researcher. Then the question was revised by the researcher, prototype 2 was declared valid qualitatively (Zulkardi, 2002). Then, prototype 2 was put to the test in a small group to evaluate how practical the questions were.

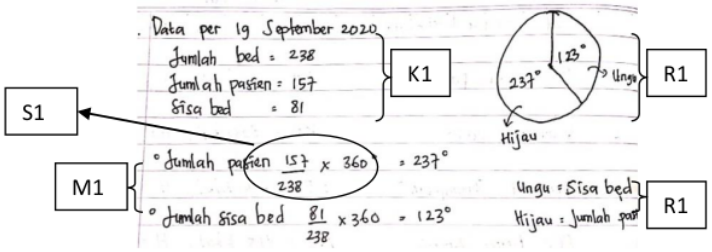
Students discuss two units PISA-Like Math Tasks that are accomplished collaboratively in small groups, especially unit 1 on nutritional needs and unit 4 on beds and patients. Synchronous learning is a type of independent learning in which each group discusses two unit of PISA-Like Math Tasks that were discussed collaboratively in WhatsApp groups. The two items are unit 2 cases of COVID-19 and unit 6 co-morbidities. The next step is to do a virtual face-to-face individual written test using a Zoom meeting and then the student's work is collected via Google Form. The written test consists of 7 units consisting of 8 questions.

The researchers revised prototype 2 based on the findings of the small group stage. In unit 6, there are students who ask the relationship between the amount of data and 1.11% contained in the data description with the accompanying conditions in the diagram image so that students focus on that percentage, hereby the researcher decides to eliminate the percentage because it is not needed by the question.

In asynchronous and synchronous learning as well as written tests that have been carried out, it is revealed that the PISA-Like Math Tasks that have been developed can be applied because participants can understand comprehensively, integrate questions with various strategies. As a result, the PISA-Like Math Tasks produced are made up of seven units and twelve problems that are considered practical (Zulkardi, 2002). The revisions yielded prototype 3, which was both valid and practical.

The field test is the last stage in the development process where at this stage prototype 3 trials are carried out at SMP Negeri 19 Palembang, the research subjects at this stage are class IX students consisting of 24 students. At the beginning of the lesson the teacher explores students' knowledge about the COVID-19 pandemic, then students try to solve PISA type math problems collaboratively. After that, students present the results of their group discussions. At the field test, who acted as the model teacher in learning was the class IX teacher at Junior High School number 19 Palembang, namely Isri Mawarni, S.Pd.

In working on the questions, students are required to use mathematical literacy skills. Like the problem in Unit 4 with bed & patient contexts consist of two questions as seen in figure 1. To solve the first problem, students need to involve some literacy skills in PISA. In this problem, students are asked to reconstruct existing data regarding the number of patients and the remaining beds. After that, students are asked to make pie charts that can represent the new data that students have obtained. The following is a figure of the answers of students who can solve the questions correctly (a) and students who can fulfill their literacy skills but the results are still inaccurate (b).



Translation

Data as of 19 september 2020

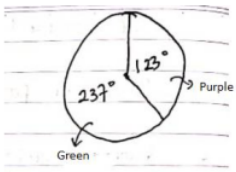
Number of beds : 238

Number of patients : 157

Leftover bed : 81

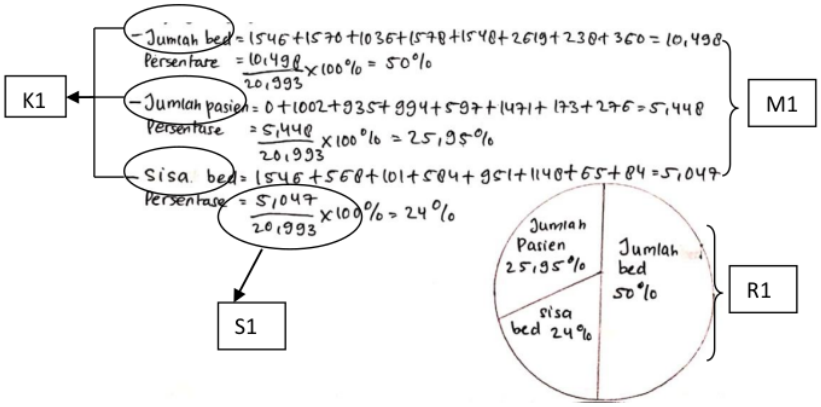
Number of patients : 157/238 × 360° : 237 °

Number of remaining beds : 81/238 × 360°: 123°



Purple: leftover bed
Green: Number of patients

(a)



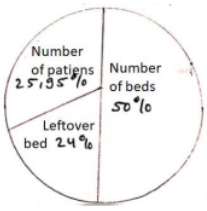
Translation

- Number of beds = 1546 + 1570 + 1035 +1578+1548+2619+238+360 = 10,498
  Percentage = 10,498/20,993 × 100% = 50%
- Number of patients = 0+1002+935+994+597+1471+173+276 = 5,448

Percentage = 5,448/20,993 × 100% = 25,95%

- Leftover beds = 1546+568+101+584+951+1148+65+84 = 5,047

Percentage = 5,047/20,993 × 100% = 24 %



(b)

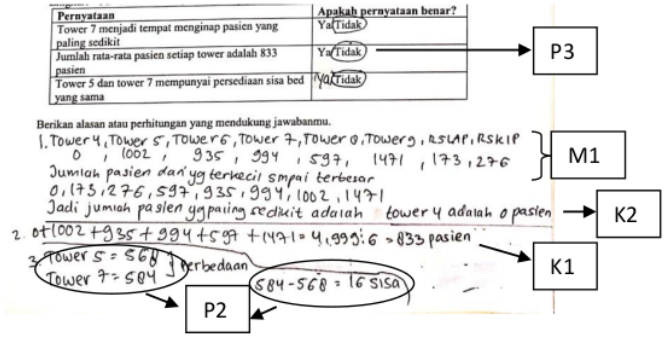
Figure 2. The results of the answers of students (a) and students (b) Unit 4 Question Number 1 in the Field Test Stage (Prototype III)

Figure 2(a) shows that students can understand and work correctly. Students can construct problems (K1) by carefully writing down data that has changed on the 19th, so that in making diagrams students do not make mistakes. Students can determine the right formula in making diagrams and determine the data to be used in making diagrams, this shows that students can design and apply strategies in solving mathematics (S1). Furthermore, students count the number of remaining beds and the number of patients in making a diagram, this shows that students understand the range in solving problems (M1). Then students can interpret the mathematical results in various formats related to the situation, namely making diagrams based on the results that have been obtained previously (R1).

Figure 2(b) shows that students are able to involve all of the same literacy skills as figure a, although it is still not appropriate in constructing the existing problems (K1). Students also do not understand the range in making diagrams (M1), this can be seen from students who are looking for the degree results from the number of remaining beds, the number of patients, and the total number of beds. The total number of beds is universal in determining the making of the diagram, so the number of beds is not included in the diagram section. Students are also still not correct in choosing a strategy (S1) to find degrees in making diagrams. However, students are able to make a diagram (R1) based on the calculations made previously.

In the process, students must find information that is not in the problem. Students must first calculate the information provided by the question. Some students did not find the information but immediately made a diagram. So that the diagrams made by students are wrong even though students are right in their calculations. The strategy used is not right, it will result in the conclusion or the final answer of the student is still wrong (Noviana & Murtiyasa. 2020). In addition, there are students who can choose the right strategy in making the diagrams described in the questions but in the calculation process students are still not thorough so that the final answers of students are wrong. This happened in research conducted by Noviana, & Murtiyasa, (2020), where students were correct in choosing a problem-solving strategy using a number pattern, but during the calculation process the student's answers were still wrong.

In question number 2 unit 4, students are asked to circle yes or no according to the statement given. The majority of students were able to accurately answer the questions, however there were a few who were not careful in interpreting the results. Here are responses of the students.



Translation

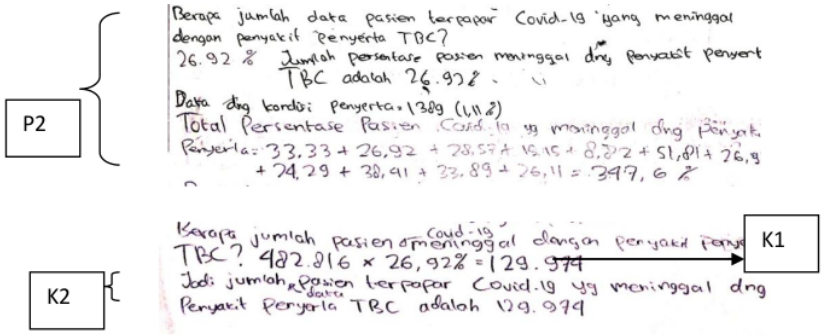
Give reasons or calculations that support your answer.

1. The number of patients from smallest to largest
   0,173,276,597,935,994,1002,1472
   So, the least number of patients is tower 4 = 0 patient
2. 0+1002+953+994+597+147 1= 4,999:6 > 833 patients
3. Tower 5 = 568
   Tower 7 = 584 } Difference 584-568 = 16left

Figure 3. Results of Student Answers for Unit 4 Question Number 2 at the Field Test Stage (Prototype III)

Figure 3 shows that students can conclude by circling yes or no with various mathematical arguments (P3) written below the table. For the number one statement, students are able to understand the statement given by writing the right reasons (M1), and students write the conclusion of the results (K2) based on the information written by the previous students. In the second statement, students are able to provide solutions (K1) by calculating the average value on the tower in the diagram, although students have not been careful in concluding the arguments (P3) that have been given, this can be seen from students circling 'no' in the table, even though the statement is true. Furthermore, students are able to connect pieces of information to reach a mathematical solution (P2) for the third statement by writing down information from the diagram and finding that there is a bed difference with a difference of 16 beds, so the third statement is false.

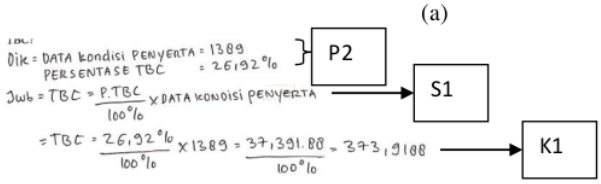
Unit 6 questions with the context of comorbidities consist of three questions. There are some students who are still not right in using the information that must be used to solve the problems. However, the majority of students are capable of answering the questions correctly and precisely. Here are two answers from students who have full and incomplete marks.



Translation

How many data on patients exposed to COVID-19 who died with TBC comorbidities?
Total percentage of patients who died with TBC is 26.92%.
Data with comorbid conditions :1389
Total percentage of COVID-19 patients who died with comorbidities =
33,33+26,92+28,57+15,15+8,82+51,81+26,9+24,29+38,41+33,89+26,11 = 347,6%
How many COVID-19 patients have died with TBC comorbidities?
482.816 ×26,92% = 129.974
So, the number of patients exposed to COVID-19 who died with TBC comorbidities was 129,974

(a)



Translation

Known:
Data on comorbid conditions: 1389
TBC percentage: 26.92%
Answer:
TBC = P.TBC/100% × data condition of comorbidities
TBC = 26.92%/100% × 1389 = 37,391,88/100% = 373,9188

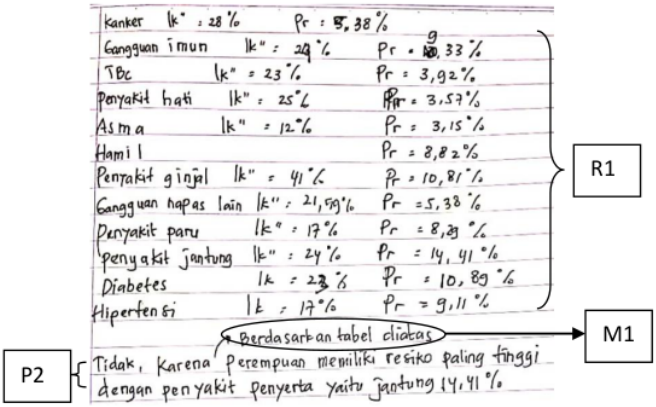
(b)

Figure 4. Results of Student Answers for Unit 6 Question Number 1 at the Field Test Stage (Prototype III)

Figure 4(a) shows that students can write down what information is needed (P2) to solve the problem. After that, students perform calculations that show the work in solving the problem (K1) even though it is still not correct and make conclusions from the results of the calculations. (K2) regarding the number of patients who died from comorbidities. This is in accordance with the findings of Bahar, et al. (2020), who found that while students can express the produced problems, the techniques for solving them aren't exactly right. As a result, students will receive less exact solutions.

In contrast to the students' responses in figure 4(b), it indicates that students can write down what information is required (P2) to solve the problem, students also write down the strategy (S1) used and show the work in solving the problem (K1), but students do not give conclusions (K2) on the results of their calculations.

In solving problem number 2 unit 6, students need to have a strategy in making appropriate conclusions regarding the statements given in the questions. The following is one of the answers of students who are able to provide strategies and represent the information provided well.



Translation

Cancer	male: 28%	female: 5,38%
Immune disorders	male: 24%	female: 9,33%
TBC	male: 23 %	female: 3,92%
Heart Disease	male: 25%	female: 3,57%
Asthma	male: 12%	female: 3,15%
Pregnancy	male: -	female: 8,82%
Kidney illness	male: 41%	female: 10,81%
Other breathing problems	male: 21,59%	female: 5,38%
Lung disease	male: 17%	female: 8,38%
Heart disease	male: 24%	female: 14,41%
Diabetes	male: 23%	female: 10,89%
Hypertension	male: 17%	female: 9,11%

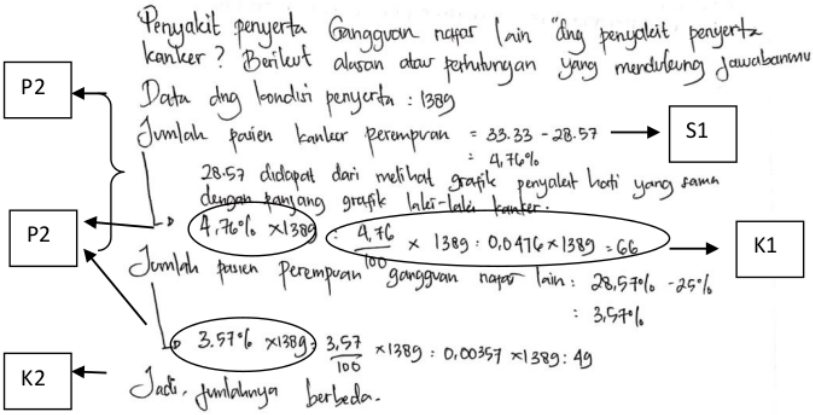
No, because based on the table above, female have the highest risk of comorbidities, namely heart disease, 14.41%.

Figure 5. Results of Student Answers from Unit 6 Number 2 at the Field Test Stage (Prototype III)

Figure 5 shows how students can adapt information presented in the form of diagrams into words and tables created by students. This is in contrast with Nusantara et al(2021), which found that students solve problems and interpret mathematical solutions, students use mathematical symbols made by students to simplify the explanations on the graphs given to the problems. This shows that students are able to interpret (R1) back information in the context into tabular form. The table remade by students shows that students understand the range in solving problems (M1) so that students can draw conclusions and give reasons for these conclusions. Students can make an explanation or

argument that meets the requirements (P2) regarding disagreements with the statements contained in the questions so that the student's statements can be accepted and support students' answers.

In solving problem number 3 unit 6, in this question, students have different arguments or strategies in answering the questions. The following is one of the student's answers.



Translation

Co-morbidities of other respiratory disorders with co-morbidities of cancer? The following reasons or calculations that support the answer

Data with comorbid conditions: 1389

Number of female cancer patients: 33.33-28.57 = 4.76%

- 28,57 obtained from looking at the graph of liver disease which is the same as the length of the graph of cancer male
- 4,75% × 1389 = 4,75/100 × 1389 = 0,0476 × 1389 = 66

The number of female patients with other respiratory disorders: 28,57%-25% = 3,57%

- 3,57% × 1389 = 3,57/100 × 1389 = 0,00357 × 1389 = 49

So, the numbers of those patients are different

Figure 6. Results of Student Answers for Unit 6 Question Number 3 in the Field Test Stage (Prototype III)

Figure 6 shows that students can write down the strategy (S1) that students need in drawing conclusions, namely to find the number of female patients who died with cancer and other respiratory disorders. Students can connect pieces of information (P2), namely the percentage of each comorbid disease with the total amount of data to find the number of patients needed according to the strategy (S1) that students use. Furthermore, students are able to write down the work or calculations correctly involved in solving questions (K1), so that students can conclude (K2) that the number of co-morbidities with cancer and other respiratory disorders in women has differences.

In this study, there are still several students who make mistakes in calculating and constructing the problems given to the questions developed by the researchers, this occurs when students are unfamiliar with complex problems or questions that need attentive reading and comprehension. In line with research Astuti, et al. (2018), what the researchers found showed that the

accuracy of students in counting, using tools and operating to answer questions was still lower than in other aspects.

Other factors that make it difficult for students to work on PISA-Like Math tasks include a lack of student preparation in answering these questions. According to Efriani et al. (2019), students made errors in turning the questions into a counting process because students did not read the questions correctly. Students are focused on developing the given problem, according to Nizar, et al. (2018) and Zulkardi, et al. (2020), who also claim that students simply pay attention to the question's description, do not understand the main problem, so that the time given is too much to understand the supporting information provided. This makes students not careful in doing calculations or giving final conclusions.

According to the results of the analysis of students' solutions during the field test stage, the majority of students are able to use mathematical ability. according to the students that able to understanding the context of the problems presented to help the process of solving mathematics, but there are still some students who have not been able to understand the range or limits of mathematics in solving problems. The limited mastery of the material and not being able to relate the concepts that have been studied for a long time with the problems being worked on makes students unable to understand the range of problem solving.

Students can understand, identify, and employ various representations when solving problems, according on the results of the analysis of their responses to representational abilities. Students have various answers in representing the results of the answers, there are students who represent information in tabular form to support students' arguments in answering questions. However, there are students who are able to represent the questions, but are still wrong in their calculations. This is in accordance with Bahar, et al. (2020), who found that the subject can represent the developed questions, but the procedures used in solving the questions are not quite right. So that the subject gets a solution or answer that is less precise.

The results of the analysis of students' answers to reasoning abilities are that students are able to make explanations to defend arguments well, although there are some students who are still wrong in making arguments because the problems in the questions are not understood by the students. This is in line with Asdarina & Ridha. (2020), stating Students were able to write down the information in the questions well, but students did not make any additional guesses when it came to problem solving. So that students are not yet correct in making arguments to answer questions.

Students were able to construct ways sequentially to solve difficulties, according to the researcher's study of their responses regarding their capacity to choose strategies. The majority of students are capable of selecting the appropriate strategy, although there are some students who are not right in designing strategies because students are not correct in constructing the initial information contained in the problem.

The use of COVID-19 context in PISA-like math activities had the potential to affect mathematical literacy skills such as communication, mathematization, representation, reasoning, and strategy selection ability, according to the analysis of student answers. This finding supports Nusantara, et al. (2021), who claim that using the COVID-19 context as a learning resource helps students enhance mathematical literacy by allowing students to relate COVID-19 questions to a variety of other math topics.

Students require special questions that allow them to improve their mathematical literacy abilities while solving problems. PISA questions are designed to improve students' mathematical literacy skills in applying math to real-life situations. So that students are used to solving issues that are similar to PISA questions and have an impact on PISA scores in the future. The use of context guides students to think mathematically because their capacity for mathematical thinking processes emerges from the particular circumstance (Kohar, et al., 2019; Zulkardi et al., 2020), and it will engage students in collaborative learning, resulting in more meaningful learning (Putri & Zulkardi, 2020).

CONCLUSION

This research produces PISA development questions that are valid and practical and have the potential to affect mathematical literacy. The valid criteria for this question are in terms of content where the questions match the PISA mathematical literacy domain for content, context, and process ability, constructs that are seen from the suitability of the characteristics of PISA questions, and use language that is in accordance with PEUBI and can be understood by students. While the practicality criteria of the questions are seen from the results of small groups where questions with contexts recognized by students can be understood by students and applied in the learning process. Students can utilize mathematical literacy skills such as communication, strategy selection, mathematization, representation, and reasoning while working on PISA-Like Math tasks using COVID-19 context. Communication skills are assessed in item 1 and 2 of unit 4 and item 1 and 3 of unit 6. Unit 4 items 1 and 2 and Unit 6 item 2 both require mathematization skills. Unit 4 item1 and Unit 6 items 1 and 3 both bring up the ability to choose strategies. The ability of representation is mentioned in item 1 of unit 4 and item 2 of unit 6. The ability of reasoning is assessed in unit 4 item 2 and unit 6 on all items. Students can further improve their mathematical literacy by using the COVID-19 context as a learning resource. As a result, students will be able to work mathematically on COVID-19 cases and connect ideas from many subjects to come up with a solution.

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