Development of PISA-Type Questions and Activities in a Smartphone Context

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Abstract

Sometimes our smartphone's internal storage is complete, and we must download an application that is very necessary at that time; this is where numeracy plays a role in solving this problem, namely the way we download the desired application with a complete smartphone's internal storage. This study aims to produce valid and practical PISA-type questions and activities using a smartphone context and potentially effective on students' numeracy skills. This design research-type development study comprised a preliminary and formative evaluation phase consisting of the design stage, self-evaluation stage, expert review stage, one-to-one stage, and small group stage. This research used question grids, question cards, assessment rubrics, lesson plans, PISA-type questions, and student activity sheets as its tools. This study was initiated owing to the insufficient numeracy skills of Indonesian students. This study focuses on seventh-grade students at secondary school number 59 Palembang, Indonesia. The qualitative findings of this research are based on field data collected through walkthroughs, observations, tests, interviews, and document reviews. This research yielded PISA-type questions and activities, namely four activity questions and six evaluation questions with smartphone context that seventh graders may utilize to develop their numeracy abilities. In conclusion, PISA-type questions and activities in the context of smartphones can be used in classroom learning to strengthen students' numeracy skills.

Keywords: Numeracy Skills, Questions and Activities, PISA, Smartphone, Design Research

Abstrak

Terkadang penyimpanan internal *smartphone* kita penuh, dan kita harus mengunduh aplikasi yang sangat diperlukan saat itu; disinilah berhitung berperan dalam menyelesaikan masalah tersebut yaitu cara kita mendownload aplikasi yang diinginkan dengan penyimpanan internal *smartphone* yang lengkap. Penelitian ini bertujuan untuk menghasilkan soal dan aktivitas berjenis PISA yang valid dan praktis dengan menggunakan konteks *smartphone* dan memiliki efek potensial terhadap kemampuan numerasi siswa. Studi pengembangan tipe penelitian desain ini terdiri dari tahap *preliminary* dan *formative evaluation* yang terdiri dari tahap desain, *self-evaluation*, tahap *expert review*, tahap *one-to-one*, dan tahap *small group*. Penelitian ini menggunakan kisi-kisi soal, kartu soal, rubrik penilaian, RPP, soal-soal tipe PISA, dan lembar kegiatan siswa sebagai alatnya. Penelitian ini dimulai karena kurangnya kemampuan numerasi siswa Indonesia. Penelitian ini berfokus pada siswa SMP kelas tujuh di Palembang, Indonesia. Temuan kualitatif penelitian ini didasarkan pada data lapangan yang dikumpulkan dalam bentuk *walkthrough*, observasi, tes, wawancara, dan telaah dokumen. Penelitian ini menghasilkan soal tipe PISA dan aktivitas yaitu empat soal aktivitas dan enam soal evaluasi dengan konteks *smartphone* yang dapat dimanfaatkan oleh siswa kelas VII untuk mengembangkan kemampuan berhitungnya. Kesimpulannya, soal tipe PISA dan aktivitas dalam konteks *smartphone* dapat digunakan dalam pembelajaran di kelas untuk menguatkan kemampuan numerasi siswa.

Kata kunci: Kemampuan Numerasi, Soal dan Aktivitas, PISA, *Smartphone*, *Design Research*

INTRODUCTION

Mathematical literacy is urgently needed in the 21st century. The school literacy movement was launched in 2015 by the Ministry of Education and Culture to foster lifelong learners among students. Mathematical literacy is the capacity to think mathematically and construct, apply, and interpret mathematics to solve issues in real-world situations, encompassing ideas, facts, tools, and methods to explain, describe, and forecast events (OECD, 2018; OECD, 2019a). Mathematical literacy is essential in everyday life, understanding how to use mathematics is a crucial skill in dealing with an ever-changing society (Jannah et al., 2019; Nusantara et al., 2021). Mathematical literacy is also called numeracy and numeracy literacy (Kemendikbud, 2021).

The Program for International Student Assessment (PISA) is one of the systems used to evaluate mathematics or numeracy literacy in different nations. Every three years, PISA, an international initiative focusing on a country's education, assesses the performance of 15-year-olds in mathematics, reading, and science. In 2015, Indonesia ranked 69th out of 72 nations, with an average math literacy score of 386 (OECD, 2016), while in 2018, it ranked 74th out of 79 countries with a score of 379 (OECD, 2019b). According to Sari's study (2021), only a few students received high marks in solving numeracy issues. Only a few students met the indications of numeracy competence to comprehend the analysis results. This is in line with a study conducted by Fitriyani et al. (2017), which shows that Indonesia still has low mathematical literacy or basic numeracy skills.

Several factors contribute to Indonesian students' poor PISA performance, particularly in mathematics. One is that students have low numeracy skills when solving PISA questions because they are not accustomed to working on questions like PISA during the learning process (Maharani et al., 2019). In addition, textbooks do not emphasize students' real-world problem-solving skills as tested by PISA questions (Munayati et al., 2015). PISA-type questions should be utilized in classroom learning activities to acquaint students with the required methods for solving PISA questions (Maharani et al., 2019). Therefore, designing PISA-type questions and using them in classroom learning activities is vital (Nusantara et al., 2021).

In learning mathematics, the development and design of PISA-type questions are critical (Zulkardi, 2010). PISA-type questions used in the learning process should use context because one of the characteristics of PISA is context-based PISA questions (OECD, 2018). Therefore, teachers must design problems using the context of the students' environment in a way that is close to the students' lives (Nusantara et al., 2021; Zulkardi & Putri, 2006). Learning in a context close to students, namely learning with the Indonesian Realistic Mathematics Education approach (Wati et al., 2015). Questions consisting of activities help students interact through collaboration and group discussions. Activities support students' thinking processes and help them think more deeply. Students gain more knowledge because they can discuss together rather than just read or listen (Achera et al., 2015). According to Risnawati et al. (2016), activities on questions can provide students with learning experiences and

develop metacognitive skills in unique ways, such as understanding problems, planning solutions, implementing solutions, and interpreting results.

Prior research created the PISA-type questions about the propagation of COVID-19 (Nusantara et al., 2021), the context of social distancing during a pandemic (Sistyawati et al., 2022), and the context of the Asian Games (Putri & Zulkardi, 2020). However, PISA types and activities have yet to be developed in the context of smartphones. Nowadays, not only adults but also children are familiar with smartphones as sophisticated technologies and sources of information. The COVID-19 pandemic has increased the use of digital technology, such as smartphones, laptops, and tablets. Smartphones, among other things, are required for online learning. Children often use smartphones in their daily lives. In using some smartphone features, it is necessary to understand numeracy, such as the smartphone's internal storage, battery, alarm, and other applications. Some data on smartphones is presented in the form of diagrams such as line charts, bar charts, and pie charts. Therefore, smartphones are very closely related to numeracy. That way, developing PISA-type questions and activities using the smartphone context can provide meaning for students in the learning process. Consequently, this research aims to develop PISA-type questions and activities with a smartphone context that may effect on students' numeracy abilities.

METHODS

This design study consists of two stages of development research: preliminary and formative evaluation (Bakker, 2018; Zulkardi, 2006). In the first step of the preliminary evaluation, the researcher analyzed the PISA framework using PISA items from 2000 to 2018 and developed the 2022 PISA criteria consisting of content, context, and cognitive capacity at the reasoning level. The researcher then produced activity questions, PISA evaluation questions, grids, question cards, and assessment guidelines. The second step is the curriculum analysis of the created PISA questions. The analysis findings are then used to create the first draft of activity questions and evaluation questions, along with ancillary instruments such as question grids, question cards, assessment rubrics, a list of interview questions, and validation sheets.

This research was validated by Sriwijaya University mathematics education lecturers, Ph.D. students, postgraduate students, and secondary school mathematics teachers during the expert review or focus group discussion (FGD) phase. In addition, the researcher did one-to-one validation with three students with low, medium, and high abilities who were not included in the study subject. Before moving on to the small group stage, the comments and ideas from the expert review and one-to-one stages are implemented as changes. In addition, the study proceeded to the small group stage with nine students of the low, medium, and high abilities to evaluate the practicality of the questions. Each student provides their replies in small groups. Each student group was assigned a research team that served as observers. Ultimately, groups responded to the questions, allowing students to show

their work. Concurrently, the model teacher interviewed the students to see how well they understood the activity and evaluation questions. Before approaching the level of field testing, enhancements were made during the stage of small-group testing.

The following stage was a field test in which 34 students in the same class from secondary school number 59 Palembang participated. In carrying out the field test followed by students with high, medium, and fewer abilities. In teaching advanced field tests, researchers collaborated with class teacher Ade Silvia Utari, M.Pd., an extraordinary educator. The PBL concept is applied to classroom activities for learning in this study. PISA-type questions and activities were presented as learning material in the first meeting's field test. Evaluation questions were given to one class at the second meeting of the field test. At this stage, trials were carried out on the subject of this study using valid and practical PISA-type questions and activities. The field test aims to determine the possible impact of the questions designed by assessing the results of students' answers using indicators of their numeracy skills.

Then, while using the PBL model, the teacher gives students the required content prior to the start of the activity. The PBL paradigm includes learning steps such as student orientation to issues, student organization for learning, directing individual/group investigations, generating, and presenting work, and assessing and evaluating problem-solving processes. In the student orientation part of the topic, the model teacher transforms the problem into an activity students must do to pique their attention. In addition, students are broken into groups of four to five and given a chance to ask questions concerning poorly understood problems. Students solve issues in groups, and the model teacher monitors each group to see whether anybody has questions or is still unclear about problem-solving. After each group has solved the issue and recorded their findings on the student activity sheet, the model teacher invites each group member to present the discussion results to the class. In the last stage, students examine and evaluate the problem-solving process by responding to other groups' presentations. If mistakes exist, the model teacher will correct the findings of their talks.

The researcher used walkthroughs, observations, tests, interviews, and document reviews to obtain data. The validity of the PISA-type questions and activities in the smartphone context was reviewed using comments and ideas from expert reviews, FGDs, one-to-one, and document reviews. During the small group stage, practicality is gained through observation, interviews, and document reviews. Following up on this, the results of student answers (tests), observations, and interviews during the field test phase revealed that PISA-type questions and activities could effect on students' numeracy skills. The data obtained were described qualitatively.

RESULTS AND DISCUSSION

This research consisted of four activities and six evaluation questions based on PISA-type questions and activities in the context of smartphones. In this piece, however, we will address one

activity related to smartphone internal storage and two evaluation questions related to phone storage and alarms. This study focuses on content quantity.

Preliminary

During the preliminary stage, the researchers conducted classroom observations in a secondary school in the city of Palembang to determine the selection of research subjects, timing, and flow of teaching and learning activities, as well as to obtain the necessary permits as an administrative requirement for conducting research in the schools in question. After that, analyze various PISA questions and activities and develop PISA-type questions and activities using the smartphone context.

Researcher visited the school, secondary school number 59 Palembang, directly. They then identified students who played a role in data collection, such as implementing one-to-one and small group instruction under the guidance of the teacher who taught the class. Three students with low, medium, and high abilities were chosen for the one-to-one stage. Meanwhile, nine students with low, moderate, and high abilities were chosen for the small group stage. This is intended to measure the success of PISA-type questions and activities developed by researchers for each student with different abilities based on the difficulty level of each student given the variety of student abilities.

The researcher then identified teaching materials based on the curriculum used at secondary school number 59 Palembang as the subject of this research. The curriculum used is the Independent Curriculum. In the Independent Curriculum, the material for arithmetic operations on integers is taught on the topic of numbers in the first chapter. At this stage, evaluate the questions and activities that have been made. Figure 1 depicts one of the PISA questions utilized as an example in the preparation of this study: the 2012 PISA question.
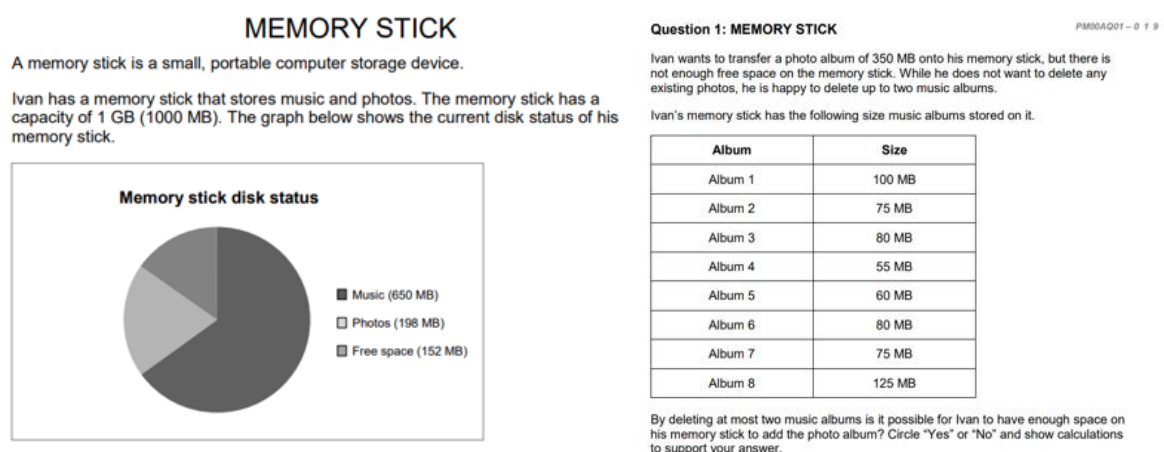

Figure 1. Original 2012 PISA questions with memory stick context

Figure 1 is a PISA problem with quantity content that describes a memory stick, a compact portable computer storage device. The picture album will be copied to the memory stick. However, there needs to be more free space, and only two music albums may be erased from the memory stick.

In this case, the problem is whether there is enough free space on the memory stick after deleting at most two music albums. Students are asked to answer Yes or No and show the calculation of the answers that have been obtained. Many possible music albums can be deleted, so students can decide which music album to delete. Students must reason in determining which music album should be deleted, namely choosing the music album with the most significant size to avoid trying the many possibilities available. In this problem, the concept of integer arithmetic operations is needed. According to Fosnot & Dolk (2001), students with good number sensitivity can determine the most practical and efficient strategy for solving problems with various alternative solutions. The researcher will develop PISA-type questions using a smartphone context based on these questions.

Self-Evaluation

During the self-evaluation stage, developed PISA-type questions and activities with a quantity content focus and smartphone context must be examined and evaluated by the researcher. According to Zulkardi et al. (2020), content, construct, and language must be considered and reviewed when developing questions and activities. Researchers will correct questions and activities if there are errors such as typos, choosing the right words, and several sentences that must be completed. Researchers tested two things, namely questions and activities, on students. Based on the self-evaluation results, the researcher modified PISA-type questions and activities to create Prototype 1, as shown in Figure 2.

(a)

(b)

(c)

Figure 2. Prototype 1 of PISA-type questions and activities based on quantity content

In Figure 2a, the researcher corrects the table on the problems in the activity because there are too many applications, so they only choose applications that students often use. Initially, the applications in the table contained the Ruangguru, iRecorder, Grab, Gojek, Shopee, YouTube, Instagram, Candy Crush, CamScanner, Canva, and Al-Quran applications. The remaining applications were Ruangguru, Gojek, Zoom, WhatsApp, YouTube, and Instagram. This is consistent with Zulkardi and Putri (2006) assertion that teachers must create questions using contexts relevant to students' lives. Furthermore, in Figure 2b, the researcher replaces the word "error" in the table with "statement" because the word "error" can be confusing when choosing right or wrong. Then in Figure 2c, the researcher previously added an image of the alarm options to be set. Still, the researcher deleted it because the picture did not solve the problem. Prototype 1, which incorporates self-evaluation-stage enhancements, will proceed to the expert review and one-to-one stages.

Expert Review and One-to-One

After generating PISA-type questions and activities in Prototype 1, expert and one-to-one validation was carried out to produce valid questions and activities regarding content, construct, and language (Zulkardi et al., 2020). Regarding content, it is to see the suitability of questions and activities within the PISA framework regarding the quantity of content, the material being tested, and indicators of numeracy ability. In the construct aspect criterion, namely to establish the appropriateness of PISA-type questions and activities with the ability level of seventh-grade students, the features of the level of questions in the PISA framework, as well as things such as questions and tables, are provided clearly, legally, and functionally. Moreover, in terms of language, to determine whether words in the PISA-type questions and activities apply to *The Enhanced Spelling of the Indonesian Language* (Indonesian: *Ejaan Bahasa Indonesia yang Disempurnakan*, EYD), the sentences used are basic, straightforward, do not lead to various interpretations, and are communicative. Following the expert review and FGD, the researcher also performed a one-to-one review to examine comments and recommendations on the created questions and get student feedback on the questions and activities for Prototype 1. Based on the expert review findings and one-to-one interviews, the researcher modified questions and activities from Prototype 1 to generate Prototype 2 with valid questions and activities.

Table 1. Commentary, suggestions, and alternative revisions

Validators	Commentary and Suggestions	Alternative Revisions
Experts	1. Add symbol descriptions and time changes to the question of Activity 1. 2. Correct the sentences on some questions according to the suggestions. 3. Add table information to question Activity 3. 4. Add sources of information and images as suggested. 5. Reconsider the level of the question. 6. All possible answers to the questions of Activity 3 should be written in the scoring rubric. 7. Question (a) on evaluating the alarm should be reconsidered. 8. In the Shopedia evaluation questions, the PO information on order three should be omitted because it will affect students' answers. 9. The fractional number $\frac{1}{10}$ in a question of Activity 3 should be changed to 0.1. 10. Add the reasons for choosing two types of YouTube in a question of Activity 2.	1. Adding symbol descriptions and changing the time in the question of Activity 1. 2. Correct the sentences on some questions according to the suggestions. 3. Adding table information to question activity 3. 4. Adding information sources and images as suggested. 5. Fix the question level. 6. Write down all possible answers to the questions of Activity 3 in the assessment rubric. 7. The question on the evaluation of the alarm is removed. 8. Deleting PO information on order three on the Shopedia evaluation questions. 9. Change the fractional number 1/10 to 0.1 in a question of Activity 3. 10. Adding reasons for choosing two types of YouTube in a question of Activity 2.
Students	1. Activity 2 adds the word "each" because students think to count them simultaneously. 2. Correct the sentence in the question of Activity 4 because of the difference in the question's meaning between students and researchers.	1. Adding the word "each" to activity question 2. 2. Improve the sentence in the question of Activity 4 because of the difference in the meaning of the question between students and researchers.

All comments and ideas from experts and students about developing PISA-type questions and activities were positive, but further improvement is still needed, as shown in Table 1. Zulkardi et al. (2020), it can be seen that there are three aspects to assessing qualitative validity. The first aspect is the content, which contains the relationship between material for arithmetic operations on integers and the smartphone context. The second aspect is assessing the difficulty level of the questions related to the PISA 2022 framework. The third aspect is to load sentences with excellent and correct language characteristics.

Small Group

As depicted in Figure 3, prototype two was created due to the expert review and one-to-one repairs to prototype one. Prototype 2 will be used in small groups.

PISA-type questions and activities for prototype two (as shown in Figure 3) were tested in three small groups, each consisting of three students with different abilities. Students solve PISA-type questions and activities for 60 minutes collaboratively. Researchers have adopted a PBL model at the learning in small groups stage, including steps such as orienting students to issues, arranging students to learn, directing individual/group investigations, producing and presenting work, and assessing and evaluating problem-solving processes (As'ari et al., 2017). Some students answered and understood the meaning of the questions correctly, but others answered and misunderstood the meaning.

Figure 3. Prototype 2 of PISA-type questions and activities based on quantity content
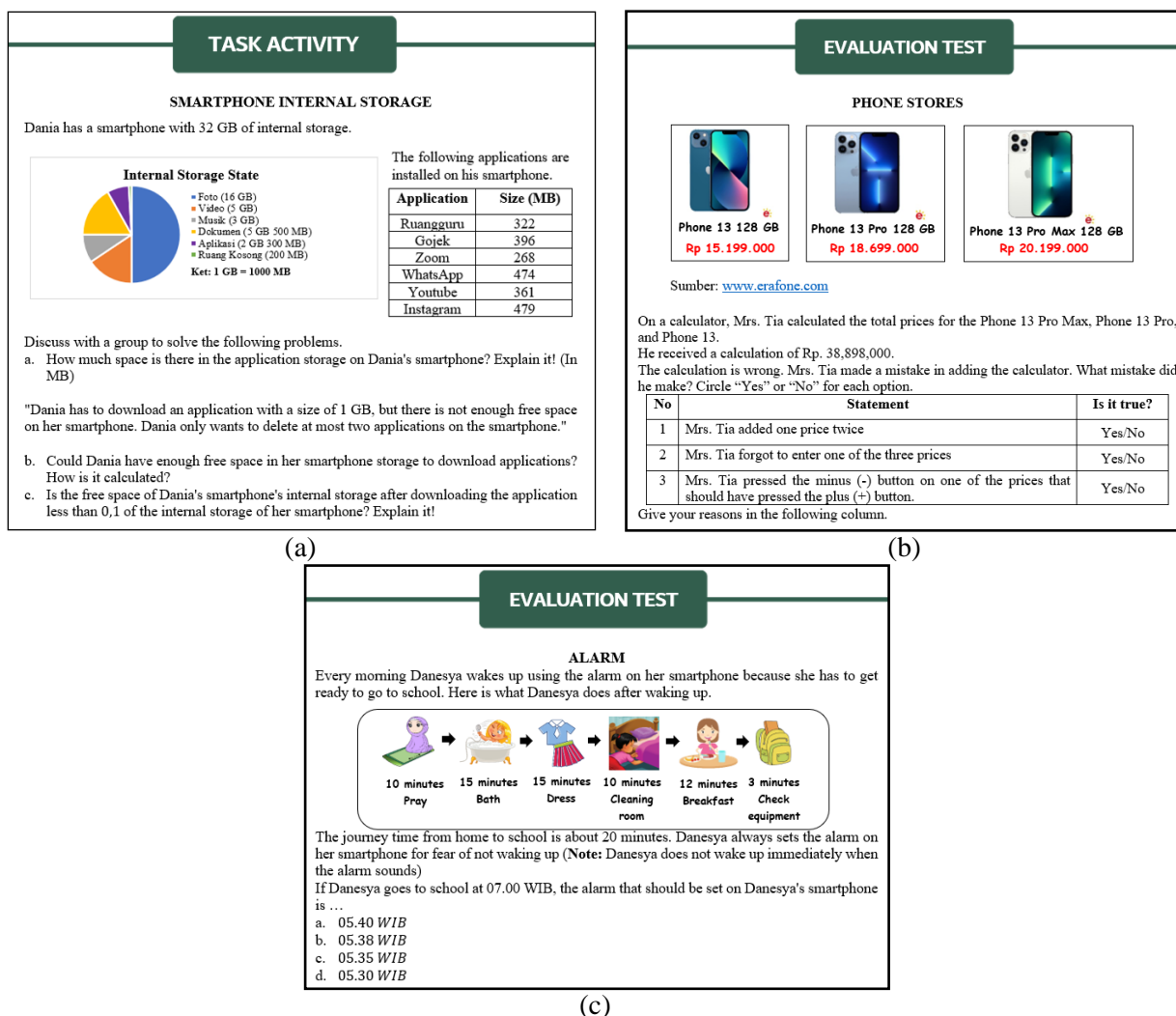
Figure 4. Prototype 3 of PISA-type questions and activities based on quantity content

Figures 4a, 4b, and 4c are the results of improvements after making observations at the small group stage and conducting interviews with several students. In Figure 4a, the researcher made improvements by moving the information sentence: "Dania has to download an application with a size of 1 GB, but there is not enough free space on her smartphone. Dania only wants to delete at most two applications on the smartphone." after question part a. This was done because, in the small group process, the researcher observed that some students misinterpreted the question partly because they had thought too far after reading the sentence first. In Figure 4b, the researcher adds numbers to the table because, based on the observation results, students are confused about giving reasons for which statements are written in the column, and students only give reasons for one statement, which should provide reasons for all statements. The researcher also corrected the sentence in Section 3 because it had a double meaning, and the researcher conducted interviews with students to confirm this. In Figure 4c, the researcher added information to the questions to facilitate student analysis. According to NCTM (2000), mathematics standards for schools must contain content and process standards, with process requirements covering problem-solving, understanding and proof, communication,

connecting, and representation. This knowledge in question is analyzing information from the text in mathematical form in solving problems (Sari et al., 2017). The researcher also confirmed this by conducting interviews with students. The following are the outcomes of student interviews conducted during the small group stage.

(*R: Researcher; S: Student*)

    R: From your answer, why did you answer no to the first part?

    S: If you add more, the result will be too much.

    R: That is right. If the third part, why did you answer yes when you previously answered no?

    S: At first, I thought that one plus one was reduced in price, ma'am.

    R: This reduction means that the operation is less, right?

    S: Yes, ma'am, less. Nevertheless, after I reread it turned out that my understanding was wrong, so I changed it, ma'am.

    R: Okay. Well, what I meant was your initial understanding which you thought was wrong. If we use a calculator, sometimes someone clicks the wrong button. What should have clicked on the plus button instead clicked the minus button? Maybe you think reducing there is not included in the price, right?

    S: Yes, ma'am, the price was not included.

    R: That means the sentence must be corrected. For example, the sentence is changed to Mrs. Tia pressing the less button on one of the prices that should have pressed the plus button. What if it was like that?

    S: Yes, ma'am, it is more explicit like that, so I do not misinterpret the meaning of the question.

Based on the results of the interviews, it is evident that students misunderstood the question due to the double meaning of the sentence in the question. Therefore, the researcher corrected the sentences in the questions according to the interviews with these students.

The results of the students at this stage provide a variety of answers. From student answers, observations, and interviews, researchers improved the questions and activities in the context of smartphones so that they were declared practical. This is in line with Nusantara et al. (2021) and Zulkardi (2002), which state that PISA-type questions can be practical if they meet the criteria, including expert statements regarding problem development and students' ability to solve problems using various strategies.

Field Test

Numeracy skills that appear at the field test stage in PISA-type questions and activities are using various symbols or numbers related to basic mathematics to solve daily life problems (N1),

analyzing information presented in multiple forms such as graphs, charts, and tables (N2), and interpreting the results of the analysis to predict and make a decision (N3). Students' numeracy ability is seen in the way they describe the steps in solving problems. This shows that students' numeracy skills appear when working on questions.

Translated into English:
Information: The internal storage of the Dania app section (2GB 300MB)
1GB = 1000MB
If $1GB = 1000MB$, then $1000MB \times 2 = 2000$ MB + 300 MB = 2300 MB.
So, the internal storage of the Dania application, if calculated in MB units, is 2300 MB.

Figure 5. Student's answer on the smartphone's internal storage task activity part (a)

Figure 5 depicts the result of student's field test answers. The answer demonstrates that students can use the knowledge in the questions and activities to solve issues. In part (a) of the smartphone's internal storage task activity, students understand the problem nicely by giving the correct answer. According to Han et al. (2017), there are three indicators of numeracy ability: the ability to use various symbols or numbers related to basic mathematics to solve problems in everyday life; the ability to analyze information presented in the form of such things as graphs, tables, and diagrams; and the ability to interpret the results of the analysis in predicting and making decisions. From the results of these answers, all indicators of numeracy skills appear, namely, that students can use numbers in solving problems, students can also analyze the information on the pie chart in the problem in determining the internal storage of the application section, and students can conclude and make decisions in solving the problem.

Translated into English:
Information: Free space on Dania's internal storage is 200 MB. Dania must download an application with a size of 1 GB; therefore, Dania wants to delete at most two applications on her smartphone so that it is enough to download the application with a size of 1 GB.
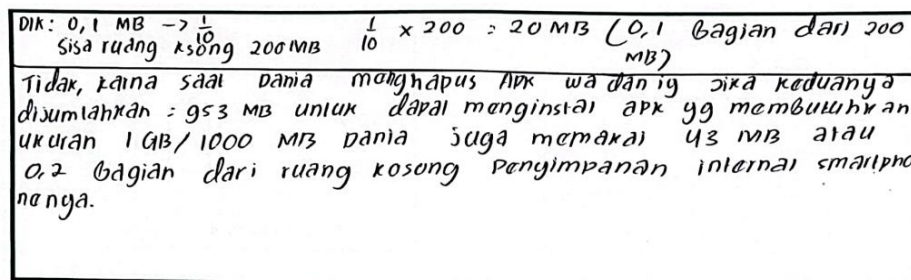Free space = 200 MB
Dania must delete the WhatsApp and Instagram applications because they have the largest MB size.
WhatsApp + Instagram + Free Space = 474 MB + 479 MB + 200 MB = 1153 = 1 GB 153 MB
So, Dania has enough internal storage after deleting two apps.

Figure 6. Student's answer on the smartphone's internal storage task activity part (b)

Figure 6 shows the results of student answers on the smartphone internal storage task activity part (b). It is also seen that students clearly understand the problem by giving the correct answer, and all indicators of numeracy ability appear. Students can draw conclusions and explain why they choose which applications to delete. The results of student answers varied in choosing which applications to delete, namely WhatsApp and Instagram, Teacher's Room and Instagram, and Instagram and Gojek. Students with good reasoning skills will immediately choose WhatsApp and Instagram applications because they are more significant than others, but some will use trial-and-error strategies. According to Meryansumayeka et al. (2021), students typically employ the trial-and-error method because they do not know the problem's pattern or formula; as a result, they seek answers through trial-and-error on the potential solutions.

Translated into English:
Information: $0.1\text{MB} = \frac{1}{10}$
Remaining free space 200 MB
$\frac{1}{10} \times 200 = 20$ MB (0.1 part of 200 MB)
No, because Dania deletes the WA and IG applications if they add up to 953 MB to be able to install applications that require a size of 1GB or 1000 MB. Dania also uses 43 MB, or 0.2 part of her smartphone's free internal storage space.

Figure 7. Student's answer on the smartphone's internal storage task activity part (c)

Figure 7 shows the results of student answers on the smartphone internal storage task activity part (c). Students have understood the problem, but the solutions are only partially correct. Students operate by multiplying numbers $\frac{1}{10}$ with free space, which should be 0.1 of the total internal storage of the smartphone.
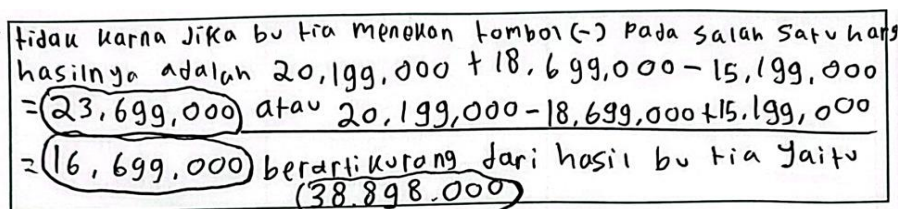
Translated into English:
No, because if Mrs. Tia presses the (-) button on one of the prices, the result is
$20,199,000 + 18,699,000 − 15,199,000 = 23,699,000$ or
$20.199000 − 18.699.000 + 15.199.000 = 16.699.000$
It means less than Mrs. Tia's result, which is 38,898,000.

Figure 8. Student' answer on the evaluation test in the context of "phones store"

The N1 ability indication emerges based on Figure 8; students may utilize numbers to answer the issue. Students understand the problem very well because it provides a complete solution, namely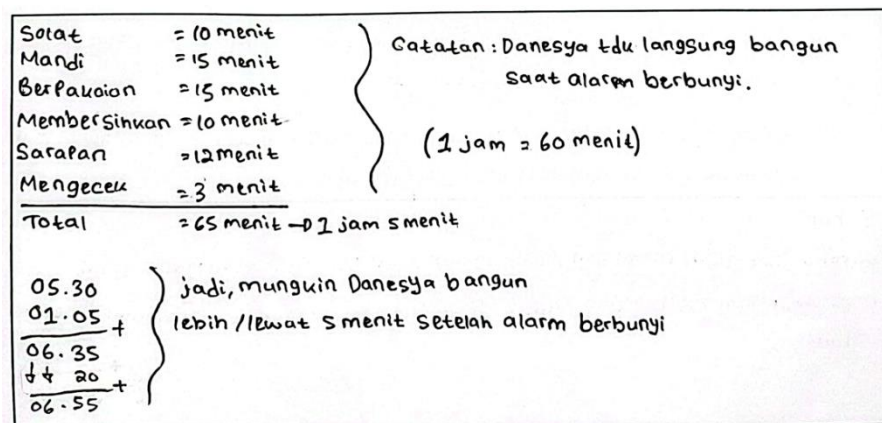 writing down the possibilities when Mrs. Tia presses the less button, which is included in the N2 indicator. In addition, on the N3 indicator, students can conclude their answers and give solid reasons for their answers.

Translated into English:
Prayer = 10 minutes, Shower = 15 minutes, Dressing = 15 minutes, Cleaning the room = 10 minutes, Breakfast = 12 minutes, Checking the equipment = 3 minutes, Total = 65 minutes = 1 hour, 5 minutes
Note: Danesya does not wake up immediately when the alarm sounds.
05.30 + 01.05 = 06.35 + 20 = 06.55
So, maybe Danesya woke up 5 minutes after the alarm went off.

Figure 9. Student' answer on the evaluation test in the context of "alarm"

In Figure 9, it can be observed that the students first provided solutions to the calculations that Danisya completed before departing for school. Students also attentively understand the questions, as seen from their answers, namely by using important note information on the questions. This shows that students have understood the problem well enough to draw conclusions about the solution to the problem. Based on the findings of Sholihah and Shanti (2017), a question is said to be successful. The student's success in responding to questions demonstrates this. According to Zulkardi et al. (2020), there are steps where students understand and solve problems: see pictures and read questions, refer to all information to solve problems, and read and compare all information.

Learning Process Stage using Student Activity Task

According to this research's findings, applying the PBL model in developing PISA-type questions and activities substantially impacts the development of students' numeracy abilities. The PBL model consists of five phases: student orientation to issues, student organization for learning, directing individual/group investigations, generating and presenting work, and assessing and

evaluating the problem-solving process. About the preceding explanation regarding the phase of student introduction to the issue, students may readily comprehend the information included in the activity, despite the lengthy duration. In addition, students can find out the problems that must be solved from these activities by organizing students. Students can then present issues based on the activities and questions given, where students can provide examples of possible answers and actions that must be taken to complete these activities and questions. In addition, students analyze and evaluate the results of the solutions given and the activities for the final concluding step.

The steps in the PBL model make it easy for each student to complete the questions and activities. Students' mathematical problem-solving skills can be honed, expanded, and enhanced through PBL-based activities (Zulfah et al., 2018). During the learning process in the classroom using PBL, students are more engaged in discussing problems and engaging in activities within the context of smartphones. In line with Hendriana et al. (2018), using the PBL model makes students more active in learning and creative, with good self-confidence, communicating more, and working together to solve the problems given.

According to the findings of interviews with students, completing questions and activities in the context of a smartphone is more engaging than addressing common questions since it requires more mental effort. Zulfah et al. (2018) states that presenting problems in the real world makes students enthusiastic about learning.

The smartphone context encourages students to study and think mathematically and may unintentionally involve them in active learning. According to Kohar et al. (2019) and Zulkardi et al. (2020), using contexts promotes students' ability to think mathematically since specific circumstances make mathematical thinking processes possible. Additionally, context enables students to engage in collaborative learning and gives learning significance (Putri & Zulkardi, 2020).

Students' Numeracy Skills

Numeracy can be interpreted as the ability to apply mathematical concepts and skills to solve practical problems in various contexts of everyday life, for example, at home, at work, and participating in community life and as citizens (Kemendikbud, 2017). Based on the results of students' answers at the field test stage, it found that the questions that had developed could bring up indicators of students' numeracy abilities, namely, students were able to use various symbols or numbers related to basic mathematics in solving daily life problems (N1), students were able to analyze information which is presented in multiple forms such as graphs, charts, tables, diagrams, etc. (N2), and students can interpret the results of the analysis to predict and make a decision (N3). Students' numeracy skills can be seen from the way students describe the steps in solving problems. This shows that students' numeracy skills emerge when working on questions.

From the analysis of the results of students' answers at the field test stage, it found that in the jumping task activity of the smartphone internal storage unit question 1 (see Figure 5) and question 2 (see Figure 6), the numeracy abilities that emerged were abilities (N1), (N2), and (N3), as well as abilities (N1) also appear in question 3 (see Figure 7). In questions 1 and 2, students can answer the questions properly and correctly because they can understand them well. However, in question 3, students needed help understanding the problem. Understanding the fundamentals of global issues is crucial for resolving PISA issues (Nusantara et al., 2020). However, some students focused solely on providing supporting evidence rather than answering questions. This is consistent with Nusantara et al. (2021) finding that students spend more time comprehending the problem statement than identifying its essential elements. This can affect students in the calculation process. Efriani et al. (2019) stated that students made mistakes when converting questions into a calculation process because they did not read them correctly.

Furthermore, in the question of evaluating the phone store unit (see Figure 8), the numerical abilities that emerged were abilities (N1), (N2), and (N3). Then, in the matter of evaluating the alarm unit (see Figure 9), the numerical capabilities that appear are (N1), (N2), and (N3). Students can solve problems and give correct answers because they use their reasoning and understand the questions well. This is in line with Ahyan et al. (2014), Jannah et al. (2019), and Nusantara et al. (2021), which state that students who have good reasoning abilities can understand, formulate and solve problems correctly and appropriately.

CONCLUSION

This research resulted in PISA-type questions and activities using PBL model consisting of four problems in activity and six evaluation questions with a valid and practical using smartphone context. The criteria include quantity content and smartphone context in the form of the smartphone's internal storage, phone store, and an alarm application. Developing PISA-type questions and activities within the context of a smartphone may assist students in integrating other subject areas with problem-solving. In addition, students calculate mathematically and apply their reasoning to articulate their perspectives and arguments the characteristics of smartphones related to life skills. In this way, students learn how to operate and take advantage of features on smartphones while strengthening students numeracy skills, i.e., students were able to use various symbols or numbers related to basic mathematics in solving daily life problems, students were able to analyse information which is presented in multiple forms such as graphs, charts, tables, diagrams, etc., and students were able to interpret the results of the analysis to predict and make a decision.

ACKNOWLEDGMENTS

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