



A COMPARISON OF MATHEMATICAL TASKS TYPES USED IN INDONESIAN AND AUSTRALIAN TEXTBOOKS BASED ON GEOMETRY CONTENTS

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Abstract

This study examined the type of mathematical tasks in two Australian and two Indonesian mathematics textbooks for 7th-grade students. The quantitative data were collected from the coding results of the tasks in the textbooks. The tasks were coded based on six categories: the presentation forms, the cognitive requirements, the contextual features, the information provided, the number of steps required, and the numbers of answers. Both the similarities and differences in the mathematical tasks provided in the selected textbooks were analysed. The coding results reveal that the majority of tasks in both the Australian and Indonesian textbooks were presented in verbal and combined forms. Routine and closed tasks were still dominant in the four textbooks. More than 93% of tasks in the four textbooks had sufficient information for students to solve the problem. One of the Australian textbooks had a higher proportion of tasks with real-world contexts than the other textbooks. One of the Indonesian textbooks showed a high proportion of tasks requiring multiple steps or procedures. These results were used to explore the learning opportunities offered by the textbooks, and the possible influence on students' performances in international assessments. Some recommendation for the refinement of the textbooks and future research are also outlined at the end of the study.

Keywords: Textbook analysis, Mathematical task, Australia, Indonesia

Abstrak

Penelitian ini meneliti jenis soal matematika pada dua buku teks Australia dan dua buku teks Indonesia untuk siswa kelas 7 (tujuh). Data kuantitatif diperoleh dari hasil pengkodean pada keempat buku teks tersebut. Soal-soal dikoding berdasarkan pada enam kategori: bentuk tampilan soal, syarat pengetahuan yang diperlukan, fitur kontekstual, informasi yang tersedia, banyak tahapan (langkah) penyelesaian, dan banyaknya jawaban yang mungkin dari soal tersebut. Persamaan dan perbedaan dari keempat buku teks tersebut dianalisis. Hasil pengkodean menunjukkan bahwa kebanyakan soal pada buku teks Australia dan Indonesia disajikan dalam bentuk verbal dan bentuk gabungan. Soal rutin dan soal tertutup masih mendominasi keempat buku teks. Lebih dari 93% soal pada keempat buku teks memberikan informasi yang cukup bagi siswa untuk menyelesaikan soal tersebut. Salah satu buku teks Australia memiliki lebih banyak soal dengan konteks dunia nyata dibandingkan dengan tiga buku teks lainnya. Salah satu buku teks Indonesia memiliki proporsi yang tinggi untuk tipe soal yang harus diselesaikan dengan banyak langkah (tahapan). Hasil ini digunakan untuk mengeksplorasi peluang belajar yang ditawarkan oleh buku teks, dan kemungkinan pengaruhnya pada kinerja siswa dalam penilaian internasional. Beberapa rekomendasi untuk penyempurnaan buku teks dan penelitian di masa depan juga diuraikan di akhir penelitian.

Kata kunci: Analisis buku teks, Soal matematika, Australia, Indonesia

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The performance of Indonesian students in international assessments has become one of the main concerns of the Indonesian Government and mathematics researchers in Indonesia. This can be seen from several studies that have been conducted related to this case (Ahyan, Zulkardi, & Darmawijoyo, 2014; Edo, Hartono, & Putri, 2013; Novita, Zulkardi, & Hartono, 2012). The result of TIMSS 2011 and

2015 show that Indonesian students were still below the ‘Low International Benchmark’ (Mullis et al., 2012; Mullis et al., 2016). The results of PISA 2009, PISA 2012, and PISA 2018 also revealed more than 75 % of Indonesian students were only able to work up to level 2 (OECD, 2010; 2014; 2019). According to research that has been conducted to study this issue, one of the main factors that might influence this performance is the lack of students’ skills for high level or non-routine problems since teachers only used low-level tasks in the mathematics classroom (Ahyan et al., 2014; Edo et al., 2013; Novita et al., 2012). This idea is also reflected by the statement of the Indonesian Ministry of Education and Culture (2013) that a lot of tasks or problems presented in the international assessments were not included in the Indonesian mathematics curriculum.

Some studies have shown that the different results among the countries which participated in the international assessment are related to the differences of quality and quantity of mathematics instructions or textbooks (Mayer, Tajika, & Stanley, 1991). The important role of textbooks in mathematics learning has been recognized and has received attention from the international mathematics education community especially since the inclusion of the analysis of hundreds of textbooks from almost 50 countries in the Third International Mathematics and Science Study in 1995 (Yan & Lianghuo, 2006). One of the ways to investigate and evaluate the textbooks used in one country is by comparing the textbooks with textbooks from other countries. The comparative analysis of textbooks has become a debatable issue among researchers. Some researchers have argued that the analysis of textbooks gives insignificant influence in determining what students learn, since textbooks are part of an intended curriculum, not an implemented curriculum (Freeman & Porter, 1989). However, other researchers believe that the study of textbooks used in different countries can give insight and reveal the similarities and differences of opportunities in mathematics learning provided to students around the world (Charalambous et al., 2010).

In this study, Indonesian textbooks were compared to Australian textbooks, which focused on the types of mathematical tasks provided in the textbooks. Based on the scores in TIMSS 2011, Australian students achieved higher score in all domains compared to Indonesian students (Mullis et al., 2012). Meanwhile, in terms of hours per year, Indonesian students spent more time than Australian students in learning mathematics. Indonesian students spent 173 hours per years, while Australian students only spent 143 hours (Mullis et al., 2012). This fact leads to a question “with fewer hours, what make Australian students achieved higher scores than Indonesian students in international assessment?”. One of the ways to answer this question is by looking at learning instructions provided in these two countries so that we can see the kind of learning opportunities offered for the students.

The aim of this study is to extend the previous research related to Indonesian students’ performance in international assessments, focusing on the comparative analysis of mathematical tasks types in mathematics textbooks from Indonesia and Australia. This study is expected to provide insights into the similarities and differences of the types of mathematical tasks in Indonesian and Australian textbooks. Thus, it will be useful for mathematics teachers, so that they can be more selective in

choosing tasks to provide better learning opportunities to students. Furthermore, it is hoped that this study could provide feedback and suggestions to the Indonesian Government and textbooks developers for the improvement and refinement of mathematics textbooks in Indonesia.

METHOD

Textbooks Selection

The data sources of this study are two Indonesian and two Australian (Victorian) mathematics textbooks for 7th grade presented in Table 1. We chose the first Indonesian textbook because this textbook was published by the Indonesian Ministry of Education and has been used as the main source for many schools that have implemented the new curriculum in Indonesia. This textbook is available online and can freely accessed and downloaded by the teachers and the students. Furthermore, this textbook has been revised several times to meet the international standards.

Table 1. Selected Textbooks

Country	Selected Textbooks
Indonesia	<p>Textbook 1 As'ari, A. R., Tohir, M., Valentino, E., Imron, Z., & Taufiq, I. (2016). <i>Matematika SMP/MTs Kelas VII semester 2</i> (Revised ed.). Jakarta: Pusat Kurikulum dan Perbukuan, Balitbang, Kemdikbud</p> <p>Textbook 2 Adinawan, M. C., & Sugijono. (2013). <i>Matematika untuk SMP/MTs kelas VII semester 2</i>. Jakarta: Erlangga</p>
Australia	<p>Textbook 1 Smith, C., Elms, L., Roland, L., & Rowland, R. (2014). <i>Maths Quest 7 for Victoria</i> (Australian Curriculum ed.). Queensland: John Wiley & Sons Australia, Ltd</p> <p>Textbook 2 Brown, P., Evans, M., Gaudry, G., Hunt, D., McIntosh, J., Pender, B., & Ramagge, J. (2011). <i>ICE-EM mathematics: Year 7 book 1</i> (Australian curriculum ed.). Melbourne, VIC: Cambridge University Press</p>

The second mathematics textbook-released by a private publisher- was selected based on discussions with several mathematics teachers in Indonesia. In Indonesia, the selection of mathematics textbooks often occurs at the school level hence each school has different mathematics textbooks. Therefore, one of the best ways to determine the most popular textbook is by asking the mathematics teachers.

Two Australian textbooks are the best-selling mathematics textbooks from “the largest supplier of education resources to primary and secondary schools in Australia”, *Campion*. The two textbooks were chosen based on the discussion with the supplier and one mathematics teacher in Victoria. In this research, the two Australian textbooks, Math Quest and ICE-EM, will be mentioned as Aus_1 and

Aus_2, and the two Indonesian textbooks, National textbook and mathematics textbook by Erlangga, will be mentioned as Indo_1 and Ind_2.

Procedures for Textbook Analyses

The chosen topics for this study were geometry since it is one of the content domains assessed in international assessment. Furthermore, Tatsuoka et al. (2004) also found that there is a high correlation between geometry and the attribute to measure higher order mathematical thinking skills.

Geometry topics covered in this study are measuring angles, perimeter and area of a square, rectangle, parallelogram, and triangles. After deciding the topics, the researcher marked all of the tasks in each textbook that would be coded in the next step. In Aus_1, the researcher marked all of the tasks under the section “exercise”, “challenge”, “rich task”, and “code puzzle”. In Aus_2, all of the tasks were under the section “exercise”, “review exercise”, and “challenge exercise”. In Ind_1, I marked all of the task under the section “Ayo kita pahami” (Let’s understand), “Ayo kita coba” (Let’s try), and “Ayo kita latihan” (Let’s practice), while in Ind_2, all of the tasks were under the section “Latihan” (Practice), “and Tes Kompetensi” (Competency Test).

Data Analysis

Research related to the type of mathematical tasks has been conducted by many researchers. Li (2000) categorized the tasks based on the number of procedures required for the solution, contextual features, response type, and cognitive requirement. Meanwhile, Guven et al. (2016) distinguished the tasks based on 1) presentation (verbal or visual, containing many data or not, long or short); 2) content (routine or non-routine, irrelevant data or not, incomplete data or not, close to or far from daily life, dependent or independent from the curriculum); and 3) solution (many operations or not, different strategies or not, hard or easy)

In the present research study, the types of mathematical tasks were adopted from a previous study conducted by Yan and Lianghuo (2006) since these types of tasks are more suitable for textbook analysis which cover three main components i.e. presentation, content and solution, explained in Table 2.

Table 2. Types of Mathematical Tasks

Presentation	Content	Solution
Purely Mathematical Forms (M)	<i>Cognitive Requirements</i>	<i>Steps Required</i>
Verbal Form (Vb)	Routine (R)	Single Step (SS)
Visual Form (Vs)	Non-Routine (NR)	Two Steps (TS)
Combined Form (Cb)		Multiple Steps (MS)
	<i>Contextual Features</i>	<i>Numbers of Answers</i>
	Real Context (RC)	Open-Ended (OE)
	Non-Real Context (NRC)	Closed (C)
	<i>Information Provided</i>	
	Sufficient Data (S)	
	Extraneous Data (E)	
	Insufficient Data (I)	

1. 'Tasks in a Purely Mathematical Form, Tasks in a Verbal Form, Tasks in a Visual Form, and Tasks in a Combined Form'

If the presentation of the tasks only included mathematical expression, then they were categorized as tasks in a purely mathematical form. If the presentation of the tasks was in written words only, then they were classified as tasks in a verbal form. If the presentation of the tasks consisted of pictures, graphs, figures, etc., then they were coded as tasks in a visual form. If the presentation of the tasks was a combination of two or three of the above, then they were categorized as tasks in a combined form.

2. 'Routine Tasks vs Non-Routine Tasks'

A routine task is a task that can be solved by merely following a certain known algorithm, formula or procedure, while a non-routine problem is the contrary of routine problem; it cannot be solved by simply using a certain known algorithm, formula, or procedure.

3. 'Real Context Tasks vs Non-Real Context Tasks'

A real context task is a task related to everyday life or real-world context. In contrast, the non-real context is defined as a task that is unrelated to any practical backgrounds in daily life or real-life situation. A task, such as games or puzzles, also belongs to real-context tasks since it can be found in students' everyday life.

4. 'Sufficient Data Tasks, Extraneous Data Tasks, and Insufficient Data Tasks'.

According to Yan and Linghuo (2006), sufficient data tasks mean that the information provided is sufficient for solving the tasks. Extraneous data tasks mean that the information provided is more than enough to solve the task. On the other hand, insufficient data tasks mean the information provided is not enough to obtain the solution of the task.

5. 'Single Steps Tasks, Two Steps Tasks, and Multiple Steps Tasks.'

A Single step task is defined as a task that can be solved by using one direct operation, while a two steps task is a task that needs two steps of procedure to find the solution. Furthermore, if the task needs more than two direct steps, then it belongs to multiple steps tasks.

6. 'Open-ended Tasks vs Closed Tasks'

There are two definitions of the open-ended task: 1) a task that has many possible solutions (Kwon, Park, & Park, 2006); and 2) a task that can be solved using a variety of procedures (Sanchez, 2013). This study focuses on open-ended tasks as tasks that have several or many correct answers (the first definition). Therefore, the closed task is a problem that only has one solution.

An example of the coding used is presented below

Jane is a landscape gardener who is laying a new lawn. The rectangular lawn is 13 m long and 8 wide. How many square meters of turf should Jane order? What is the total cost of the turf if it costs \$12.50 per square meter?

Coding: Verbal Form (V), Routine (R), Real-Context (RC), Sufficient Data (S), Two Steps (TS), Closed-ended (CO)

In order to make the counting process easier, Microsoft excel was used in the coding process. Related to the reliability of the coding process, the researcher used an intra-coder process in which the coding process was carried out twice. The interval time of the first coding and second coding process was approximately one month. The results of these two coding processes showed that there was a slight difference in the first and the second coding especially in the category of routine vs non-routine tasks and the steps required for solving the tasks. The figures that used for the final results were from the second coding because the accuracy in the second coding was better than in the first one. The differences in the results of these two coding processes are less than 5% which means that the coding result of this study is reliable.

RESULTS AND DISCUSSION

General Finding

In this study two Indonesian and two Australian mathematics textbooks for 7th-grade students were analyzed. In general, the four textbooks had different characteristics. The two Australian textbooks, Aus_1 and Aus_2, were bigger, thicker and had more pages than the Indonesian textbooks. The total numbers of tasks in the topics of angles, perimeter and area provided in the textbooks can be seen in [Figure 1](#). It shows that the Australian textbooks had more tasks than the Indonesian textbooks. However, this study focused more on the different types of tasks than the total number of tasks provided in the textbooks.

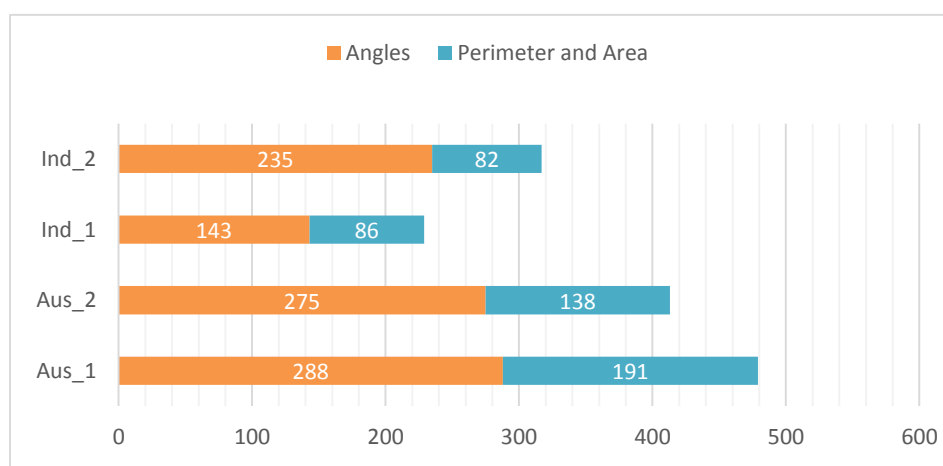


Figure 1. The total number of tasks in the textbooks

Presentation Forms of The Types of Tasks in the Textbooks

The presentation of tasks in the four textbooks was coded into four different presentation forms. The coding result can be seen in [Figure 2](#).

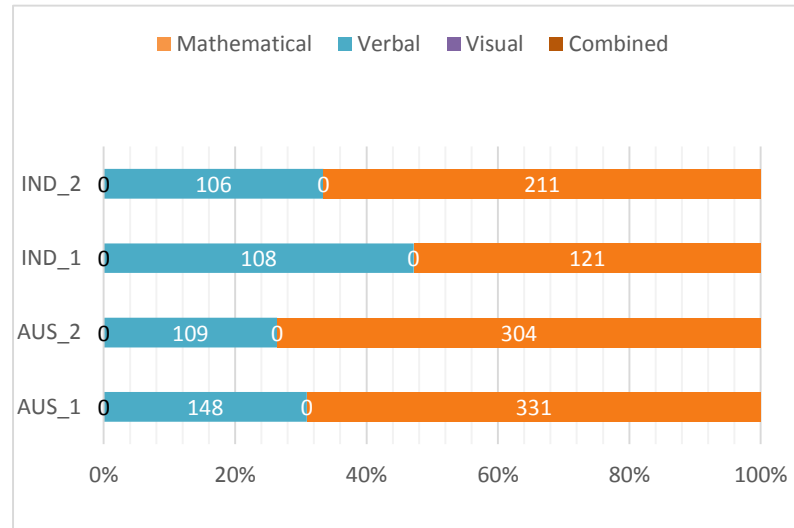


Figure 2. The presentation forms of tasks in the textbooks

The tasks presented in these four textbooks had common types of representation: verbal and combined forms. More than half of the tasks analyzed in this study were presented in the combination of two or three forms, such as the combination of visual and verbal, verbal and purely mathematical form, or verbal, visual and mathematical form. From Figure 2., it can be seen that the Australian textbooks had more combined tasks compared to the Indonesian textbooks. In total, there were 331 out of 479 or 69.1% in Aus_1 and 304 out of 413 or 73.6% in Aus_2 that contained combined forms. Indonesian textbooks were also dominated by the combination representation with 52.8% and 66.6% percentage in the textbook Ind_1 and Ind_2 respectively. The absence of tasks in purely mathematical and visual forms is due to the tasks in these topics always including a verbal form. The most common combined form in these four textbooks is a combination of verbal and visual (i.e., tables or figures), and Aus_1 had more colorful figures compared to other textbooks.

Routine vs Non-Routine

Related to the content, the tasks were coded into two types: routine or non-routine tasks. The distributions of routine and non-routine tasks in the four textbooks can be seen in Figure 3.

The coding results reveal that the majority of tasks in both the Australian and Indonesian textbooks comprised routine tasks. The two Australian textbooks had similar portions of routine tasks: 93.5% in Aus_1 and 95.6% in Aus_2. This result aligns with the study done by Vincent and Stacey (2008) which revealed that four Australian textbooks had a high proportion of problems with low procedural complexity, ranging from 73% to 96% for the topic of geometry. The two Indonesian textbooks, Ind_1 and Ind_2, showed a big difference in the total number of routine tasks.

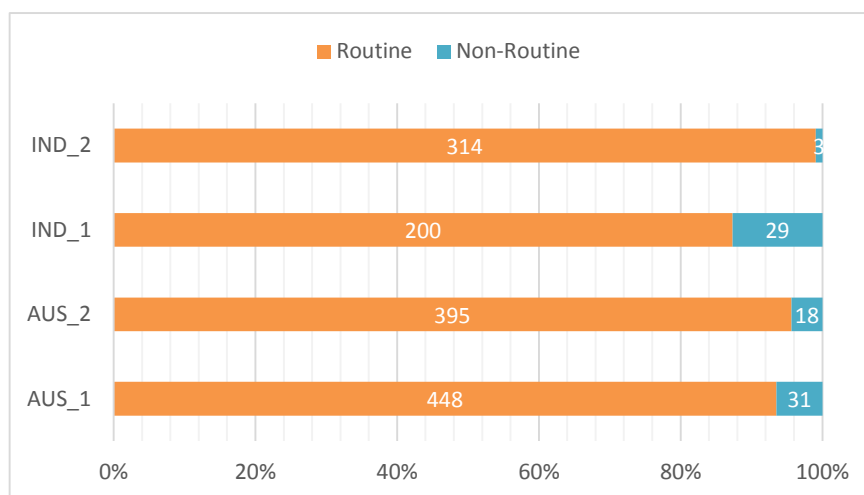


Figure 3. The presentation forms of tasks in the textbooks

Ind_1 contained 87.3% routine tasks, while Ind_2 consisted of 99.1% routine tasks, the highest percentage of the four textbooks, as shown in Figure 3. The difference in publication years of these two textbooks could be one of the reasons that explaining the big gap in routine tasks in the Indonesian textbooks. Ind_2 was published in 2013, while Ind_1 was revised and released in 2016 with the aim of providing instructional materials for teachers that meet international standards.

What length of party lights is needed to decorate the perimeter of a rectangular tent with dimensions 15.5 m by 8.75 m?

Figure 4. Routine task from Aus_1

Some of the routine and non-routine tasks below are taken from the Australian and Indonesian textbooks. The tasks in Figure 4 and Figure 5 were coded as routine tasks since students can solve them simply by using the formula of perimeter and area of rectangle and square.

The area of a rectangle is equal with the area of a square that has the side length 4 cm. Find the length of the rectangle!

Figure 5. Routine task from Ind_2

The tasks in Figure 6 and Figure 7 were coded as non-routine tasks because students cannot use the concept of angles directly. At first, the tasks seem to lack of information, but when the students manipulate the figure by dividing it into several triangles, they will find the solution.

The types of non-routine tasks in the Indonesian textbooks seemed more challenging compared to the Australian textbooks, even some of the non-routine tasks in Ind_1 was taken from the National Mathematics Olympiad questions. Furthermore, several questions in Ind_1 can't be solved by using only one mathematics concept.

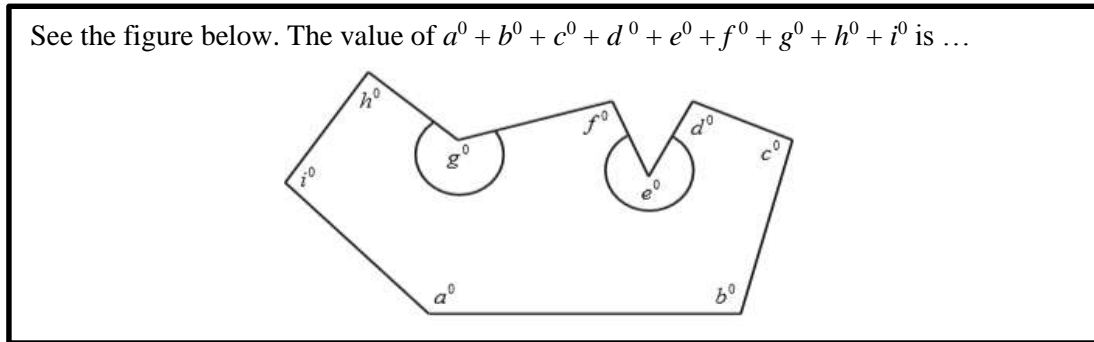


Figure 6. Non-routine task (Adopted from Ind_1)

The task in Figure 8, for example, besides using the concept of the area of the triangle, the students need to connect it with the concept of congruent triangles which will be taught in the 9th grade. Ind_1 was released by the Indonesian Ministry of Education, and the intention to provide tasks (such as that shown in Figure 8) in this textbook must be appreciated since they want Indonesian students to be more familiar with this kind of task.

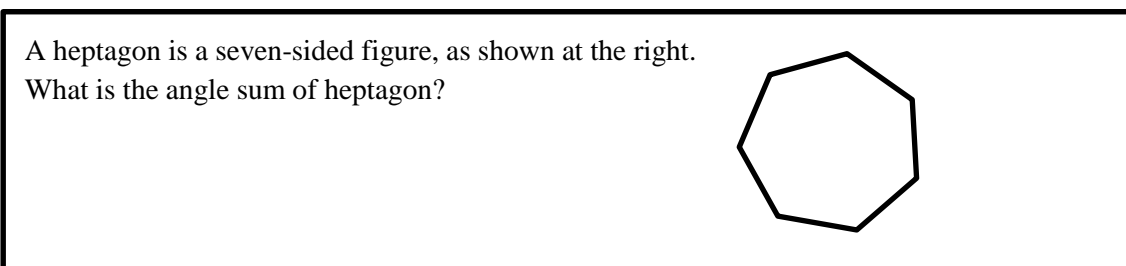


Figure 7. Non-routine task (Adopted from Aus_2)

However, McInerney (2014) proposed that there should be a level of challenge in the task that is suited to students' capacities which is known as the optimal challenge level. Such tasks are neither too easy that makes them look purposeless nor too difficult that makes them look impossible for the students.

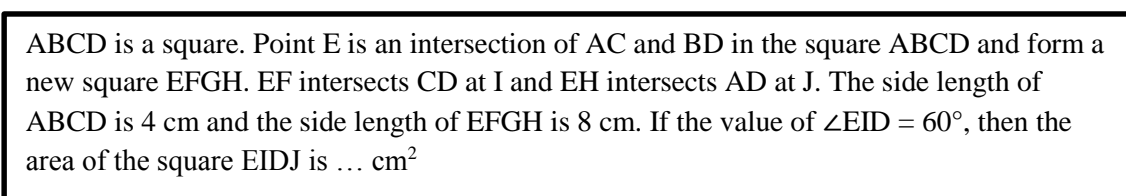


Figure 8. Non-routine task from Ind_1

Real Context vs Non-Real Context

The distribution of real-world context and non-real-world context tasks in the four textbooks are shown in Figure 9. It shows that two Australian textbooks, Aus_1 and Aus_2, had a big difference in terms of the proportion of tasks with real-world contexts. Aus_1 has 26.9% of real-world context tasks, while in Aus_2, more than 95% of tasks were set in non-real contexts and only 4.6% tasks presented

real world situations. The two Indonesian textbooks had less than 20% of tasks that were contextualized in real-world situations (17% and 11% for Ind_1 and Ind_2 respectively). This result is consistent with the findings of a study by Wijaya et al. (2015) which revealed that only 11% of tasks in Indonesian mathematics textbooks were context-based.

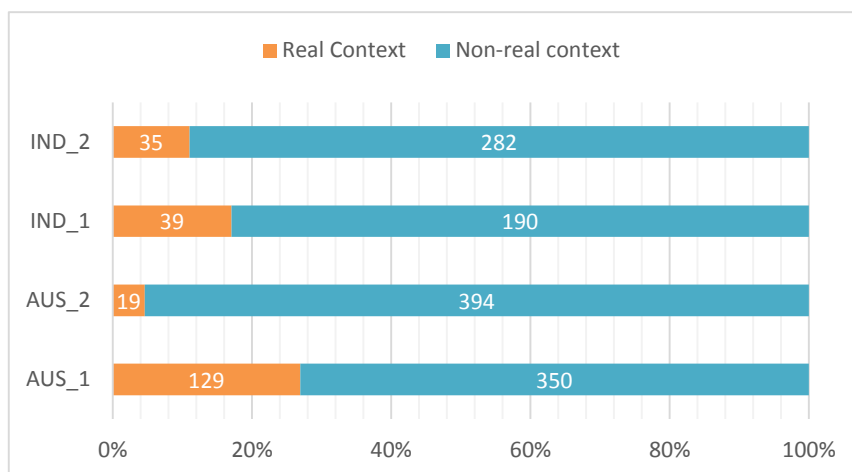



Figure 9. real-context and non-real-context tasks in the textbooks

The high proportion of tasks with real-world contexts in one of the Australian textbooks was predictable since this country has included mathematical literacy, known as ‘numeracy’ in its curriculum. The Australian Education Council (as cited in Goos, Stillman, & Vale, 2007) stated that there are four reasons why a mathematics curriculum is needed in schools: 1) mathematics is useful in daily life; 2) mathematics is necessity for being an intelligent member in civic life; 3) mathematics is useful in a wide range of careers, and 4) mathematics is part of cultural heritage. These reasons reveal that to support students to realise that mathematics is important for their lives, teachers should relate it to everyday situations such as shopping, cooking, and others daily activities (Brady & Bowd, 2006). Similarly, Sullivan (2011, p.3) stated that to set the goals of mathematics teaching; we have to consider “what mathematics is” and “what might be the purposes of teaching mathematics to student”. The results of this study reveal that although Australia has included mathematical literacy in the curriculum, there is still an Australian mathematics textbook, Aus_2, which only provides a small number of tasks with real-world contexts. The tasks below are the samples of tasks with the real-world context in Australian (Figure 10) and Indonesian (Figure 11) textbooks.

The design of tasks related to the real-world context in Aus_1, Aus_2, and in Indonesian textbooks was slightly different. Compared to the other textbooks, the tasks in Aus_1 were more colorful, and most of the tasks used the real figures of the context. On the contrary, most of the tasks with real-world contexts in Aus_2 and in the Indonesian textbooks were presented in verbal type without figures, or using an illustration to resemble the real figure. Even in Aus_2, there was only one task out of 19 tasks with a real-world context that used an illustration.

1. In each of the photographs, measure the indicated angles.



2. Find the missing angle in each of the triangles marked on the following photographs




Figure 10. Real context task from Aus_1

Source: Smith, Elms, Roland, & Rowland, 2014, p. 151, 171

Furthermore, the contexts of tasks in Aus_1 were more varied than the contexts in the Indonesian textbooks. In learning the topic of angles, for example, Aus_1 used many contexts such as a clock, playing golf, doing ballet, surfing, flying a kite, windmills, popular buildings in Australia, a Ferris wheel, bicycle and other contexts. Aus_1 also provided tasks that were presented in the games mode which could make students feel more engaged since they might feel that they are playing a game when solving the task. Furthermore, the contexts used in Ind_2 were limited. Some of them were presented repetitively (e.g., clock and stairs). In Ind_1, there were more varied contexts compared to Ind_2, such as archery, a laptop computer, a chair, playing billiards, rails, and the points of a compass. However, these contexts were still less varied compared to Aus_1.

The figure below is a staircase that has parallel poles. Find the values of a and b .




Figure 11. Real context task from Ind_2

Source: Adinawan & Sugijono, 2013, p. 21 – 22

Sufficient Data, Extraneous Data, and Insufficient Data

Related to the information provided in the tasks, the tasks in the four textbooks were differentiated into three types; those are tasks with sufficient data, tasks with extraneous data and tasks with insufficient data. Figure 12 presents the distribution of tasks in the Australian and Indonesian textbooks based on different types of information provided.

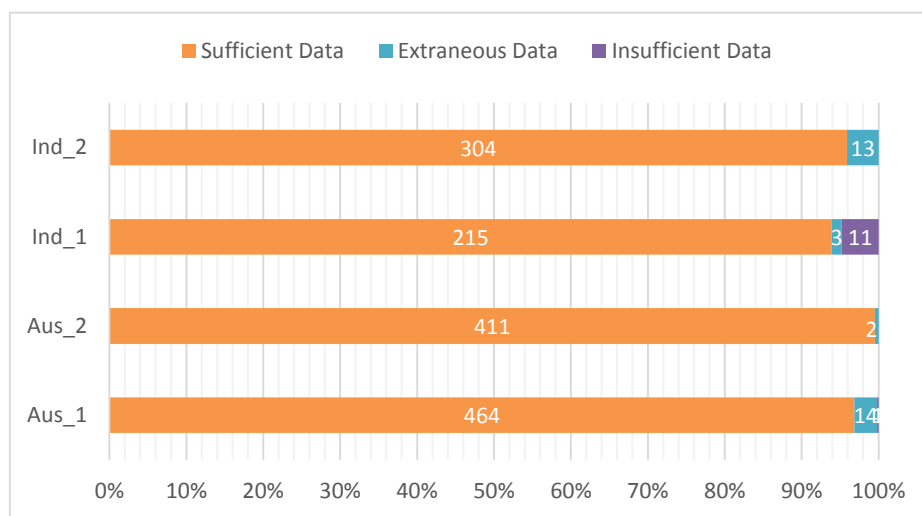


Figure 12. Types of information provided in the textbooks

As shown in Figure 12., more than 93% of tasks in the four textbooks had sufficient information for students to solve the problem. Aus_2 had the highest percentage, that is, 99.5%, followed by Aus_1, Ind_2, and Ind_1 with 96.9%, 95.9%, and 93.9% respectively. All of the textbooks also had a small number of tasks with superfluous data, and the kinds of the extra information in all of the textbooks was quite similar (see Figure 13). From the tasks in Figure 13, it can be seen that there is some unnecessary information for solving the tasks, for example, the length of the hypotenuse. However, these superfluous data are needed to see students' understanding of the concept of the height and base of triangles. The tasks with extraneous information are also effective to reveal students' misconception of certain mathematical concept. Yan and Lianghuo (2006) stated that many students tend to use all the numbers provided in the tasks without knowing whether the numbers are needed to find the solutions or not. Hence this type of task is necessary to help the students learn how to select appropriate information correctly.

In addition, even if the extraneous data in the task will not be used in the process of finding the solution, the information should be realistic and appropriate to the mathematics concept. The tasks numbered (1) and (3) in Figure 13 are examples. The length sides of the triangles are mathematically not realistic and they conflict with the concept of Pythagoras Theorem. Hence, the developers of the textbooks should be more careful when presenting such superfluous information, except there is another intention for providing this conflicted data, for instance, to provoke students' critical thinking.

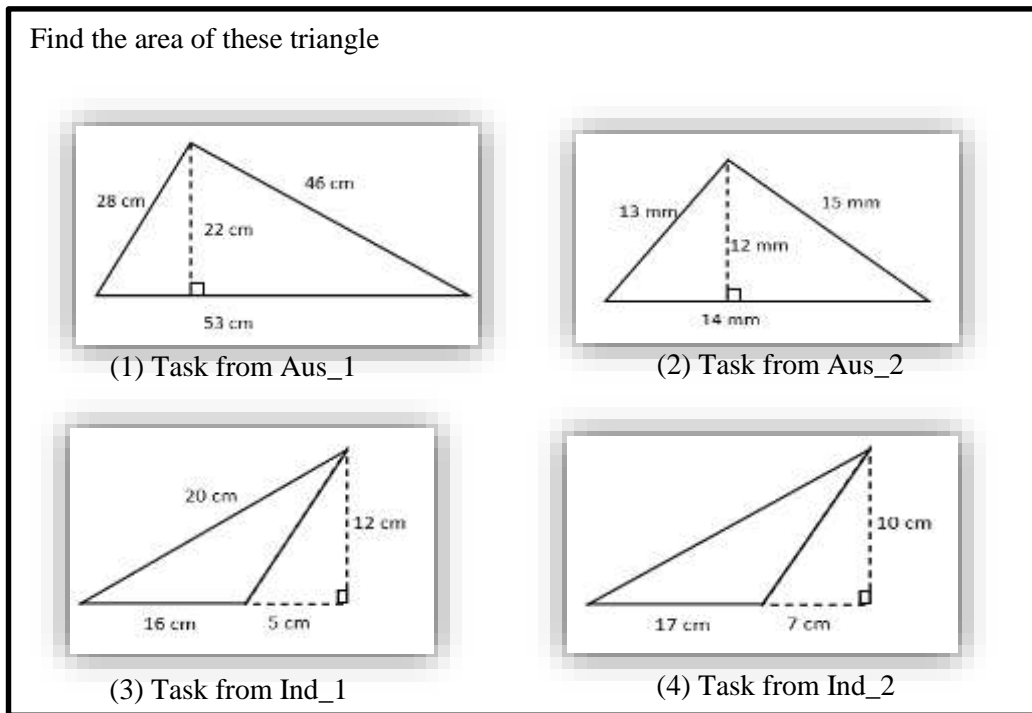


Figure 13. Tasks with superfluous data
Adopted from Aus_1, Aus_2, Ind_1, and Ind_2

Tasks with insufficient information were only found in Aus_1 and Ind_1. In Aus_1, there was one task that did not provide enough information, while in Ind_1, there were 11 out of 229 tasks that contained insufficient data. One task in Aus_1 and four tasks lacking information in Ind_1 cannot be solved (see Figure 14) and 7 tasks in Indo_1 that do not provide enough data can only be solved by making assumptions (see Figure 15).

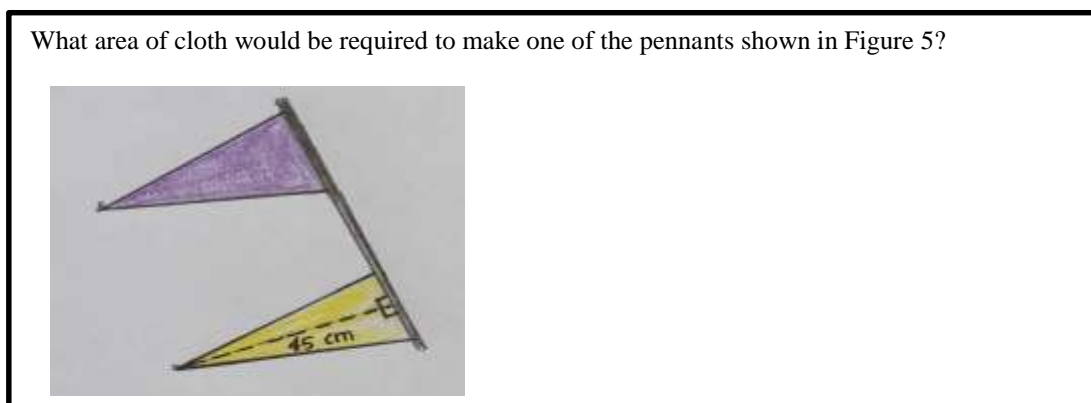


Figure 14. Tasks with insufficient data
Adopted from Aus_1

The task in Figure 14 cannot be solved since there was no information about the length of the base. Meanwhile, the task in Figure 15. was coded as insufficient data because of the lack of parallel signs in the lines provided. The lack of information related to the sign of parallel lines can cause positive and negative effects. For students that have a deep understanding about the concept of parallel lines,

this task can be used to provoke their critical thinking. On the other hand, students who just follow the procedures or formula are likely not to notice it and think that all of the lines that look parallel are parallel without thinking about the importance of the parallel signs.

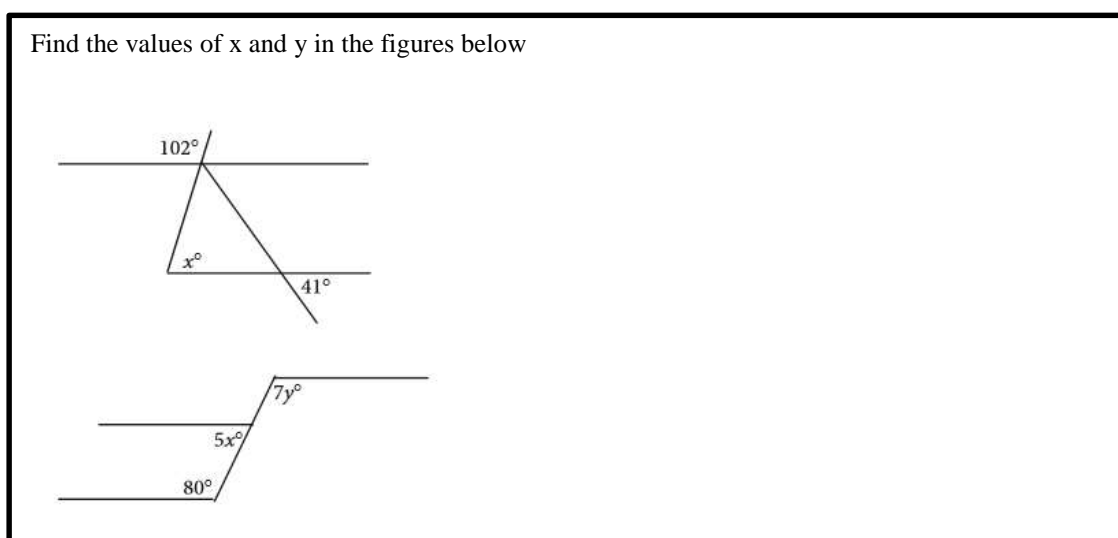


Figure 15. Tasks with insufficient data
Adopted from Ind_1

Single Step, Two Steps, and Multiple Steps

The first category related to solution is the number of steps required to solve the task. In this study the number of steps were classified into three types: single step, two steps, and multiple steps. The coding results of the tasks in the four textbooks based on the number of steps required in finding the solutions can be seen in [Figure 16](#).

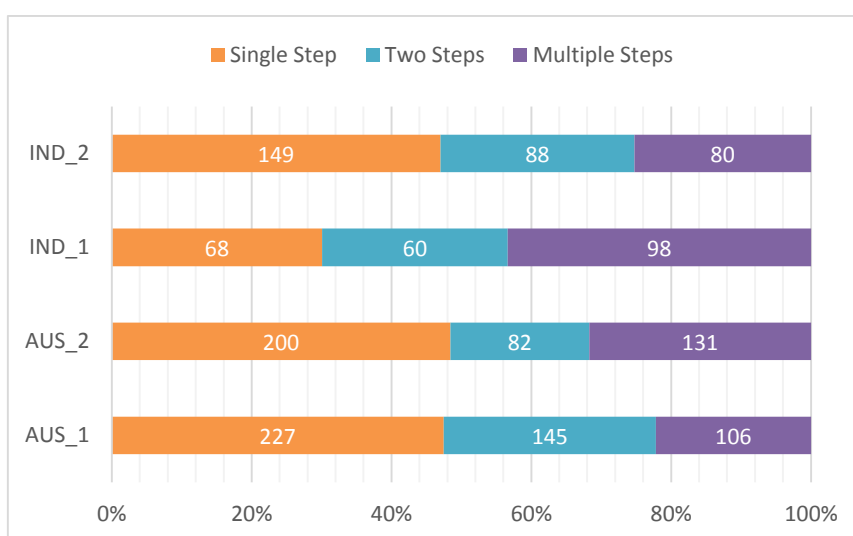


Figure 16. The number of steps required in finding the solution

In terms of the number of steps required to solve the tasks, this study revealed that one of the Indonesian textbooks, Ind_1, seemed more challenging than the other three textbooks, Aus_1, Aus_2, and Ind_2. More than 42% of the tasks in Ind_1 required many steps to solve, while such tasks were

approximately 22% in Aus_1, 31% in Aus_2, and 25% in Ind_2. The two Australian textbooks revealed a high percentage of tasks, over than 40%, requiring a single step procedure. This finding aligns with the results of research by Gatabi et al. (2012) in their comparative study of Australian and Iranian textbooks. They found that there were few tasks that required multiple steps in Australian textbooks

The somewhat lower proportion of multi-step problems in the Australian textbooks might also be seen as further evidence that the Australian textbooks provide more material for less able students. (Gatabi et al., 2012, p. 416)

The Australian textbooks, especially Aus_2, showed a high proportion of tasks requiring a similar step or procedure repetitively (see Figure 17). This finding is consistent with the results of research by Gatabi et al. (2012) which revealed a high degree of repetition in two Australian textbooks with under 10% of tasks requiring a new procedure. Vincent and Stacey (2008) in their study of mathematics textbooks in Australia, also found that 71% of geometry tasks in the textbooks were repetitive. According to Gatabi et al. (2012), this repetition is aimed at students who have a wide range of abilities, especially those who need much more practice than other students. An example is shown in Figure 17.

1. a. Draw a large capital Z and mark two alternate angles with α and β
- b. Draw a large capital N and mark two alternate angles with α and β
- c. Draw a large capital H and mark two co-interior angles with α and β
- d. Draw a large capital H and mark two alternate angles with α and β
- e. Draw a large capital F and mark two corresponding angles with α and β

Figure 17. Task with repetition in Aus_2

The types of multiple step tasks in Australian and Indonesian textbook were also quite different. In the Indonesian textbooks, many tasks required students to find the solutions without giving procedures or clues, while in the Australian textbooks, some of the tasks consisted of sub-questions that guide the students to find the answers, and some of the tasks provide students with a hint (see Figure 18). The red line in the task, shown in Figure 18, is a hint to solve the problem (the insertion of another parallel line).

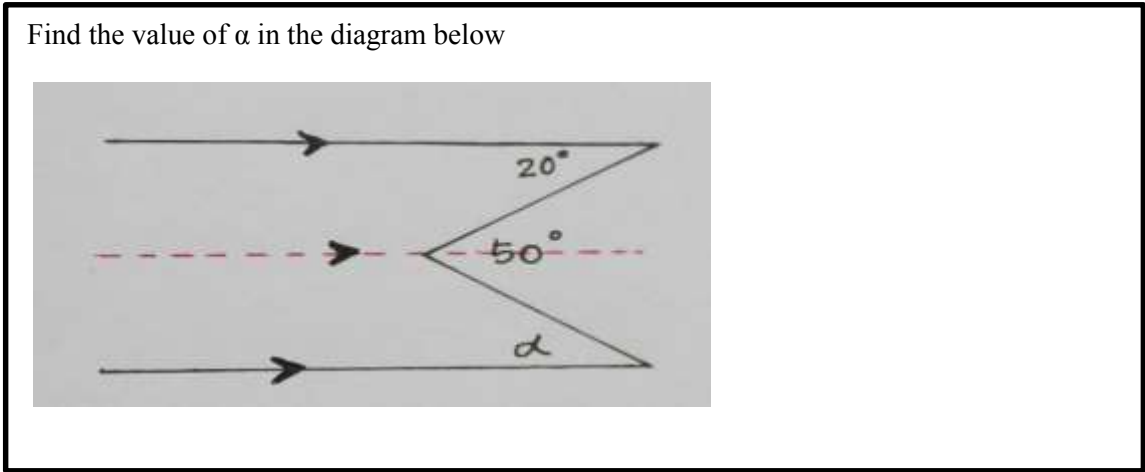


Figure 18. Task with a given clue (red line)
Adopted from Aus_2

Open-ended vs Closed

The last category is based on the number of answers, divided into two types: open-ended task and closed task. A closed task was defined as a task that has one solution and an open-ended task was a task that has more than one solution. The distribution of open-ended and closed tasks in the four textbooks is shown in [Figure 19](#).

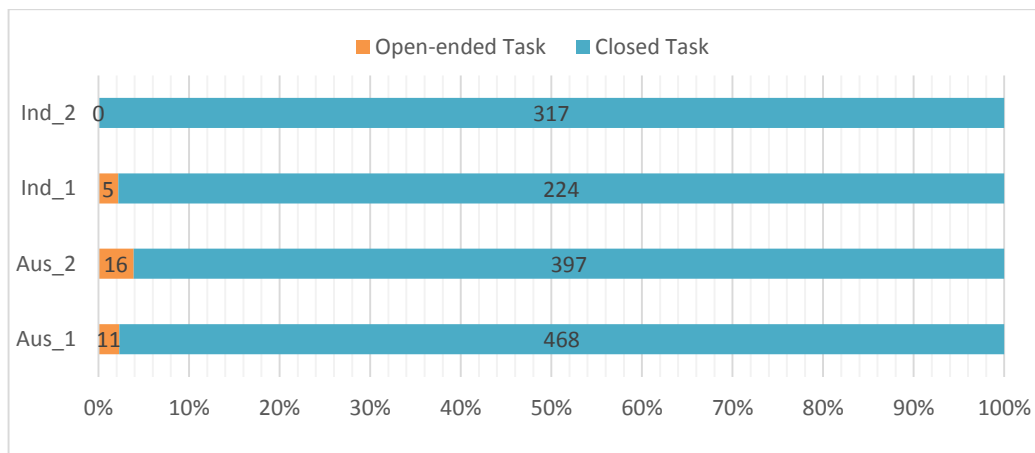


Figure 19. The number of answer (open-ended vs closed)

The majority of tasks in the four textbooks were close-ended questions. One of the Indonesian textbooks, Ind_2, had 100% close-ended tasks. These results reveal that open-ended questions are still not common in both countries. Overall, the Australian textbooks had more open-ended tasks, 3.9% in Aus_2 and 2.3% in Aus_1 than the Indonesian textbooks. One Indonesian textbook, Ind_1, only had 2.2% open-ended questions. The tasks below in [Figure 20](#) and [Figure 21](#) are examples of open-ended questions in the Australian and Indonesian textbooks.

Find one example in your classroom or home of each of the six types of triangles described in this chapter. Describe clearly where the triangle occurs, draw the triangle and classify it according to both side and angle types.

Figure 20. Open-ended task from Aus_1

In Aus_1, some tasks required students to provide their own reasoning. The provision of tasks with this kind of mode of reasoning in Australian textbooks might be one of the factors leading Australian students to achieve higher scores in the reasoning domain in TIMSS 2011 than Indonesian students.

The low number of open-ended tasks in both countries should be a major concern since open-ended tasks give many benefits to students. Boaler (2013) suggested that in order for mathematics to be considered a 'learning subject' rather than just a 'performance subject', teachers should provide open-ended tasks. Cline (2005) also supported this idea by proposing that open-ended tasks are an effective tool to challenge the smartest students without leaving the weaker students behind. In addition, when students try to solve tasks in their own ways, there are likely to be many different ways and many different solutions. This type of situation can encourage students to explain the reasons for their choices through discussions with their friends. Beside

enhancing students' participation in classroom, open-ended tasks has the potential to also cultivate students' mathematical communication skills (Kwon et al., 2006).

1. Could it be a square has the same area as a rectangle? If yes, find the side length of the square and the rectangle.
2. A square is divided into four parts which have the same size and shape. The perimeter of each parts is 16 cm. Find the area of the first square before it was divided.
(Draw about 3 or 4 ways to divide the square and calculate the area of each of the square)

Figure 21. Open-ended task from Ind_1

This study examined the types of mathematical tasks in two Indonesian and two Australian mathematics textbooks for seventh graders. The tasks were coded based on the presentation, the content and the solutions. In general, this study revealed that the Australian textbooks had more tasks than the Indonesian textbooks. Furthermore, the results showed that the majority of tasks in both the Indonesian and Australian textbooks for geometry topics were presented in combined and verbal forms. The combined form was more dominant in the Australian textbooks. In addition, more than 85% of tasks in the four textbooks were routine tasks, that is, could be solved simply by using certain known formulas or procedures. This study also revealed that there was a big difference in the total number of real-world context tasks in the two Australian textbooks with 26.9% and 4.6% in Aus_1 and Aus_2 respectively. It shows that even though numeracy has been included in the Australian curriculum, there is still a textbook that only provides a small number of real-world context tasks. On the other hand, the Indonesian textbooks were still dominated by non-real context tasks, 83% in Ind_1 and 89% in Ind_2.

In terms of information provided in the tasks, the majority of the tasks in the four textbooks provided adequate information. A small number of tasks with extraneous data were found in the four textbooks. However, some of the extra data were not mathematically accurate, for example, the side length of a right-angled triangle. Furthermore, from the results of the coding, it was seen that more than 47% of tasks in the two Australian textbooks could be solved in a single step operation. The study also showed that both Australian and Indonesian textbooks were dominated by more than 95% closed tasks. This means that the proportion of open-ended tasks in the textbooks was less than 5%; one Indonesian textbook, Ind_2, did not include any open-ended tasks.

Many researchers have agreed that practical mathematics, -commonly known as numeracy in Australia, - should be the major focus of the school mathematics curriculum in the compulsory years (Sullivan, 2011). Martin (2007) also asserted that when students raise the question of "when are we ever going to use this?" it means that they do not see the relevance and the importance of what they are learning. Thus, understanding the reason why they need to gain mathematical skills and see the relevance of the knowledge in other subjects and in the world outside the classroom has the potential to enhance their motivation to learn mathematics (OECD, 2014).

Both the Indonesian and Australian textbooks could also include more tasks with missing or extraneous information, because this type of tasks can encourage students to consider the contexts used

and make them learn to choose the relevant information that is needed to solve the problems (Wijaya et.al., 2015). Furthermore, the provision of open-ended tasks may provide many benefits to students and teachers since it is considered as an effective tool to challenge the smartest students without leaving the weaker students behind (Cline, 2005). The open-ended tasks are also dedicated to completing the deficiencies of closed tasks; one of them is disclosing students' misconceptions (Cline, 2005). This means that through the use of the open-ended tasks, teachers will get much more information about students' ways of thinking about a concept in mathematics (Sanchez, 2013; Pehkonen, 1997).

Lastly, as explained by Stein et al. (1996), the nature of mathematical tasks in the textbooks can be changed as they are implemented in the classroom because the implementation is influenced by many factors such as teachers' goals, teachers' knowledge, classroom condition and teachers' instructional habits and dispositions. Therefore, studies focusing on how teachers select tasks from the textbooks, and how the tasks are implemented in the classroom, are needed to complement textbook analyses.

CONCLUSION

Both the Australian and Indonesian textbooks have provided various types of mathematical tasks. However, there are several aspects that could be improved to create better learning opportunities for students. Compared to one of the Australian textbooks, the Indonesian textbooks contained fewer tasks contextualized in the real-world context, whereas this type of task always used in the international assessment such as PISA and TIMSS. Thus, it would be better if the Indonesian Government and textbook developers in Indonesia could include more tasks representing real-world situations and enhance the variation of such real-world contexts. Furthermore, it is also recommended that Indonesian and Australian textbooks should include more non-routine tasks that is suited to students' capacities and open-ended tasks. Lastly, even though the comparative analysis of textbooks can be one of the ways to reveal the types of mathematical tasks experienced by students across countries, it would be better if there is further research on the implementation of the textbooks in the classroom.

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