Comparative study of geometry tasks in Lao and Indonesian mathematics textbooks from the perspective of revised Bloom’s Taxonomy

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**Abstract**. This study aimed to explore the similarities and differences between the geometry tasks in Lao and Indonesian lower secondary school grade VII mathematics textbooks from the perspective of revised Bloom’s Taxonomy. The method used in this study was the qualitative methodology and the data source was geometry tasks in the two selected textbooks. The data analysis was done by comparing the geometry questions percentages from each textbook based on the revised Bloom’s Taxonomy in the six levels cognitive domain such as remembering (C1), understanding (C2), applying(C3), analyzing (C4), evaluating (C5) and creating (C6). From the analysis geometry tasks from the perspective of revised Bloom’s Taxonomy that present in the Lao textbook was found 86 questions and in the Indonesian was found 135 questions. The study results showed that the proportion of geometry tasks in the Lao and Indonesian lower secondary school mathematic textbooks from the perspective of revised Bloom’s Taxonomy questions percentages on the six cognitive levels were pretty similar. There are some similarities between the geometry tasks in the two selected textbooks such as C2 and C3; which in the Lao textbook C2 (26.74%), C3 (31.39%), and in the Indonesian textbook C2 (26.66%), C3 (33.33%). Opposite, there are some differences between the geometry tasks in the two selected textbooks such as C1, C4, C5, C6; which in the Lao textbook C1 (9.30%), C4 (22.09%) C5 (10.46%), C6 (0%) and in the Indonesian textbook C1 (2.22%), C4 (29.62%), C5 (5.18%), C6 (2.96%). Furthermore, the study result shows that the higher-order thinking skills (HOTS) consist of C4, C5, C6 in the Indonesian mathematics textbook contain more geometry tasks than the Lao mathematics textbook. Despite some differences between Lao and Indonesian curricula, there are similar geometry topics in the Lao and Indonesian mathematics textbooks. This study is expected to be able to obtain mathematics textbooks of good quality for the purpose of developing further mathematics textbooks in the two countries Laos and Indonesia. Suggestion to various sectors of education and ways to improve mathematics are given. Finally, for future research, the deep analysis can be produced in every part includes teacher and student activity how they will use mathematics textbooks in the classroom.

**1. Introduction**

The important source for allowing students to learn is the textbook [1]. They are commonly considered as a source of exercises for students to learn and for teachers to teach and an important indicator for the opportunities to learn mathematic [2]. Besides, the content of the curriculum and the content of textbooks is also considered as the measure of opportunity to learn because they are the important factors that might influence students’ achievement [3]. Mathematics is a universal knowledge and skill that must be mastered by any kind of human being in the world because it is basic for every aspect of human life [4]. For instance, in the latest global change, it has been a great contribution to the development of science, engineering, or technology. Undeniably, mathematics mastery is a must if someone wants to succeed in the modern area. Because of its importance, mathematics is one of the core subjects to be learned by all students at every level of their education. Through mathematics learning, students facilitated to develop their logical, analytical, systematical, critical, and creative thinking as well as develop their ability to work together [5]. One topic which is important in the mathematic textbook for the student to learn in school is geometry.

Geometry is one subject that plays an important role in mathematics education as well as it is very beneficial to solve the real context problem in human life [6], for instance, to specify quantities, to measure figures, land, and earth, and also to make maps [7]. In mathematics curriculum, geometry usually studies at every level in school education either as a separate course or integrated with other mathematics topics [8]. Learning geometry contributes to help students developing their skills of visualization, critical thinking, intuition, perspective, problem-solving, conjecturing, deductive reasoning, logical argument, and proof [9]. Besides that, geometry can be used in helping students to make sense of other areas of mathematics: fractions and multiplication in arithmetic, the relationships between the graphs of functions (both of two and three variables), and graphical representations of data in statistics [8].

Laos and Indonesia have their national curriculum. Indonesia is a big country with many different cultures and varying students’ abilities. As the textbook represents the intended curriculum, the Indonesian government always develops textbooks based on students’ needs and abilities in all areas [10]. Therefore, the Indonesian government always considers the appropriateness of textbooks design with students in those areas in mind. In conclusion, both countries can learn from each other to develop future textbooks related to geometry. Also, the goal of mathematics curriculum education in Laos is “to ensure students also develop mathematical knowledge and skills to apply in other subjects, and to use in higher levels of study, and also emphasized knowledge, skills, and attitudes.” Laos’s school mathematics curriculum is based on teaching and learning model understanding by design framework (UbD) [11]. While in Indonesia, the mathematics curriculum emphasizes more on scientific approaches as a means to facilitate students in investigating phenomena, acquiring new knowledge, or correcting and integrating previous knowledge in learning mathematics [8].

Therefore, this study analyzing geometry tasks because geometry is one of the mathematics topics which is contained in the mathematics textbook used by students in learning mathematics at the basic level to advanced level at school. One of the most basic topics in geometry is the concept of measurement, angle, and polygon. However, the topic is not easy to learn by the student. The student usually memories geometric rules and try to complete the exercises by following the worked example in their textbooks. Such a method or strategy of learning is called traditional mathematics learning where that learning mathematic is considered as a set of computational skills [12]. Geometry has been a standard component of the secondary school curriculum in all countries, usually in the second semester. Accordingly, the purpose of this study was to explore the similarities and differences between the geometry tasks in Lao and Indonesian lower secondary school grad VII mathematics textbooks from the perspective of revised Bloom’s Taxonomy.

**2. Method**

The method used in this study was the qualitative methodology. The type of the study was a descriptive research and aims to describe the geometry tasks in the Lao and Indonesian mathematics textbooks grade VII based on revised Bloom’s Taxonomy. In detail, the Lao mathematics textbook that was chosen for analyzing entitled ແບບຮຽນຄະນິດສາດ ຊັ້ນມັດທະຍົມປີທີ1 revision 2019 and it was published by Lao ministry of education and sport [13]. While the Indonesian mathematics textbook entitled *matematika SMP/MTs Kelas VII* and it was published by the Indonesian ministry of education and culture [14]. The data source in this research was geometry questions in the two selected textbooks will be analyzed from the perspective of revised Bloom’s Taxonomy, by comparing the question percentages for each textbook from each level cognitive domain.

For calculate the percentage of each level cognitive domain questions used the formula as follows:

Information: P = The percentage value sought or expected.

n = The number of questions from each level.

N = The number of questions on the competency test.

The procedure has followed the format in the table (table 1) to analyzing the two selected textbooks by record the geometry tasks and discuss each geometry question based on the indicator and definition of revised Bloom’s Taxonomy. The cognitive aspect of revised Bloom’s Taxonomy consists of knowledge and cognitive process dimensions. The knowledge dimension comprises of factual, conceptual, procedural, and metacognitive knowledge; whereas the cognitive process dimension comprises of six levels such as remembering (C1), understanding (C2), applying(C3), analyzing (C4), evaluating (C5) and creating (C6) [15]. The level of cognitive process dimension moves from the lower order thinking skills (LOTS) to the higher-order thinking skills (HOTS). There are a few researchers who suggested that providing students with tasks or problems which required students to use their higher-order thinking skills could help them so much to become better in problem-solving [16]. Furthermore, asking students to explain their answer or problem-solving process by using words, pictures or diagrams, and numbers or equations is an excellent way to assess whether the students understand the mathematical concept that they have learned. Facilitating students to explain the number pattern is also considered as one of the ways to promote students’ higher-order thinking skills. This research will be gradually analyzed the geometry questions based on the dimensions of cognitive processes, then entered into the Taxonomy table (table 2).

**Table 1.** The format for analysis geometry tasks in Lao and Indonesian mathematics textbooks from the perspective of revised Bloom’s Taxonomy [15].

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Cognitive levels | | | Indicator | Definition |
| L  OTS | **C1** | Remembering | ● Using operational **w**ords to remember back or recognize.  ● Abilities are used to recognize or recall the knowledge that has been previously studied in the form of terms, concept facts, procedures, and methods. | Exhibit memory of previously learned material by recalling facts, terms, basic concepts, and answer. |
| **C2** | Understanding | ● Using operational words interpret, exemplify, classify, summarize, summing up, comparing, or explaining.  ● Abilities used in the form construct the meaning of the learning material, including spoken, written, and drawn by the teacher. | Demonstrate understanding of facts and ideas by organizing, comparing, translating, interpreting, giving descriptions, and stating main ideas. |
| **C3** | Applying | ● Using operational execution or implement.  ● Abilities used in the form of applying or use procedures under circumstances  certain. | Solve problems to new situations by applying acquired knowledge, facts, techniques, and rules differently.  Example: Show me a polygon that is regular and has at least one right angle. Are there any others |
| HOTS | **C4** | Analyzing | ● Using operational distinguish, organizing, or attributing.  ● Abilities used  in breaking the material into its constituent parts and determine the relationships between the sections and the relationship to the whole structure | Examine and break information into parts by identifying motives or causes. Make inference and find evidence to support generalizations.  Example: What are the important steps in calculating the volume of a prism? |
| **C5** | Evaluating | ● Using operational words to check or criticize.  ● Abilities are used to retrieve decisions based on criteria or standards. | Present and defend opinions by making judgments about information, the validity of ideas, or the quality of work based on a set of criteria. Example: How would you convince somebody that the exterior angles of a polygon add up to 360°? |
| **C6** | Creating | ● Using operational words to formulate, plan, or make.  ● Abilities used in combining parts to form | Compile information together in a different way by combining elements in a new pattern or proposing alternative solutions. Example: |

The following table was showing about the questionnaire of geometry tasks that appear in the Lao and Indonesian mathematics textbooks from the perspective of revised Bloom’s Taxonomy.

**Table 2**. The questionnaire in geometry tasks that present in the two selected textbooks from the perspective of revised Bloom's Taxonomy

|  |  |  |  |
| --- | --- | --- | --- |
| Cognitive  levels | | Textbook | |
| **Lao** | **Indonesian** |
| L  O  T  S | **C1** | 1) Give the definitions of the triangle them drawing the triangle that has an angle as follow:  a. 25°, 75°, and 35°; b. 55°, 60°, and 85°; c. 55°, 60°, and 65° Can we draw it? Why?  Translated from the Lao mathematic textbook Page 161 | 1) The angle is defined as. . .  a. two ray lines that intersect  b. two rays aligned at the base  c. two lines that intersect  d. two lines coincide  Translated from the Indonesian mathematic textbook Page 139 |
| **C2** | 2) Drawing the square WIND as follow:  a. The length of the square is 7cm  b. The length of WN= 10cm.  Translated from the Lao mathematic textbook Page 134 | 2) Look at the following picture    List all pairs of lines that are parallel to each other.  Translated from the Indonesian mathematic textbook Page 119 |
| **C3** | 3) In the diagram, find the values of x and the values of each angle.    Translated from the Lao mathematic textbook Page 138 | 3) a. At what time long and short needles form of angle 90 °?  b. At what time long needle and short needle form angle of 180 °?  Translated from the Indonesian mathematic textbook Page 141 |
| H  O  T  S | **C4** | 4) Given P is the midpoint of ∆XYZ. Prove that: 2(PX+PY+PZ) > (XY+XZ+YZ)    Translated from the Lao mathematic textbook Page 142 | 4) Its known that the length of the line segment AB is 12 cm. Divide the line segment AB becomes 5 parts of the same length.  Translated from the Indonesian mathematic textbook Page 130 |
| **C5** | 5) Looking at the diagram, find the values as follow:    Translated from the Lao mathematic textbook Page 158 | 5) Can a triangle be formed, if a stick is provided length as follows? Search it.  a.11 cm, 12 cm and 15 cm.  b. 2 cm, 3 cm and 6 cm.  c. 6 cm, 10 cm, 13 cm.  d. 5 cm, 10 cm and 15 cm  Translated from the Indonesian mathematic textbook Page 256 |
| **C6** | ­­\_\_ | 6) Determine the various possible sizes of the rectangle, if you know the area of the rectangle is 200 cm2  Translated from the Indonesian mathematic textbook Page 217 |

From table 2 was showing about the geometry questions in the two selected textbooks from the perspective of revised Bloom’s Taxonomy. The cognitive domain levels were created to compare the proportion of geometry questions. Them, the process will calculus the percentage at each level by using the formula above. After that, the percentage at each level in the two selected textbooks will be comparing to get the result.

**3. Findings and discussion**

The data source in this study was geometry tasks in the two selected textbooks. The data analysis was done by comparing the geometry questions percentages from each textbook based on the revised Bloom’s Taxonomy in the six levels cognitive domain such as remembering (C1), understanding (C2), applying(C3), analyzing (C4), evaluating (C5) and creating (C6). From the analysis geometry tasks that present in the Lao textbook was 86 questions and in the Indonesian was 135 questions. The final results about the cognitive domain of revised Bloom’s Taxonomy from geometry tasks in the Lao and Indonesian mathematics textbooks for secondary school grad VII displayed in the following table:

**Table 3**. Questions percentages for each textbook according to revised Bloom’s Taxonomy

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Textbook | Frequencies (n) and Percentages (%) | Cognitive domain levels | | | | | | Total |
| **LOTS** | | | **HOTS** | | |  |
| **C1** | **C2** | **C3** | **C4** | **C5** | **C6** |  |
| Lao | n | 8 | 23 | 27 | 19 | 9 | 0 | 86 |
| % | 9.30% | 26.74% | 31.39% | 22.09% | 10.46% | 0% | 100% |
| Indonesian | n | 3 | 36 | 45 | 40 | 7 | 4 | 135 |
| % | 2.22% | 26.66% | 33.33% | 29.62% | 5.18% | 2.96% | 100% |

Table 3 shows the proportion questions percentage in the six levels of revised Bloom’s Taxonomy in The Lao and Indonesian mathematics textbook. The result in the Lao mathematic textbook showed that the highest proportion questions percentage was C3 (31.39%) and the lowest proportion questions percentage was C6 (0%); which C1 (9.30%), C2 (26.74), C4 (22.09%), C5 (10.46%).

The result in the Indonesian mathematic textbook showed that the highest proportion questions percentage was C3 (33.33%) and the lowest proportion questions percentage was C1 (2.22%); which C2 (26.66%), C4 (29.62), C5 (5.18%), C6 (2.96%). The study result shows that the questions percentages on the six cognitive levels in each textbook were pretty similar. But the result showed that the higher-order thinking skills (HOTS) consist of C4, C5, C6 in the Indonesian mathematics textbook contain more geometry tasks than the Lao mathematic textbook.

**4. Conclusion**

From the result of the study, it can be concluded that geometry tasks in mathematic textbooks from different publishers may show a different topic. But, the problem of the exercise still similar. This study showed that there were some similarities and differences between the geometry tasks in the Lao and Indonesian lower secondary school grad VII mathematics textbooks from the perspective of revised Bloom’s Taxonomy. The questions percentages on the six cognitive levels in each textbook were pretty similar. The similarities between the geometry tasks in the two selected textbooks were the proportion questions percentage that present in C2 and C3 in the two selected textbooks; which in the Lao mathematic textbook C2 (26.74%), C3 (31.39%), and the Indonesian mathematic textbook C2 (26.66%), C3 (33.33%). Opposite, the differences between the geometry tasks in the two selected textbooks were the proportion questions percentage that present in C1, C4, C5, C6; which in the Lao mathematic textbook C1 (9.30%), C4,(22.09%) C5 (10.46%), C6 (0%) and in the Indonesian mathematic textbook C1 (2.22%), C4 (29.62%), C5 (5.18%), C6 (2.96%). Furthermore, the study result shows that the higher-order thinking skills (HOTS) consist of C4, C5, C6 in the Indonesian mathematics textbook contain more geometry tasks than the Lao mathematic textbook.

This study is expected to be able to obtain mathematics textbooks of good quality for the purpose of developing further mathematics textbooks in the two countries Laos and Indonesia. Suggestion to various sectors of education and ways to improve mathematics are given. Finally, for future research, the deep analysis can be produced in every part includes teacher and student activity how they will use mathematics textbooks in the classroom.

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