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Analysis of Algebra Questions in Curriculum 2013 and Merdeka Curriculum Mathematics Textbooks

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Analysis of Algebra Questions in Curriculum 2013 and Merdeka Curriculum Mathematics Textbooks

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Abstract

This study aims to analyze problems in the mathematics textbook of the 2013 curriculum and the independent curriculum in algebra material. This is used to find out what students should do to answer questions on problems in math textbooks. The method used in this study is a five-dimensional analysis method, consisting of mathematical activity, problem complexity, contextual situation, process and type of answer. Data collection techniques are carried out by analyzing and describing the types of algebra problems in the mathematics textbooks of 2013 and the independent curricula. The results of this study show that algebra problems in the 2013 curriculum textbooks and the independent curriculum emphasize calculating/using various calculation operations by 63.78% in the 2013 curriculum and 40.23% in the independent curriculum, direct application of basic knowledge/skills by 68.65% in the 2013 curriculum and building/making connections by 59.77% in the independent curriculum, questions without context amounted to 62.16% in the 2013 curriculum and questions with real-world context amounted to 46.55% in the independent curriculum, using mathematical concepts, facts, procedures and reasoning amounted to 76.76% in the 2013 curriculum and 58.62% in the independent curriculum, closed answers amounted to 63.78% in the 2013 curriculum and 74.14% in the independent curriculum.

Introduction

Mathematics textbooks are one of the most important learning tools in determining the success of students' learning process at school. Foxman Research (1999) shows that students who use mathematics textbooks in class are more successful in TIMSS (Trends in International Mathematics and Science Study) than students who do not. Apart from the material, the textbook also contains questions used measure students' ability to understand the lesson material. The questions provided in mathematics textbooks are adjusted to the applicable content and curriculum standards. Because the

nature of mathematics questions can influence students' thinking, textbooks must balance the various questions in the book (Raditya & Iskandar, 2019). However, mathematics textbooks still have deficiencies, such as books containing conceptual errors used in schools today, such as books containing conceptual errors used in schools today (Syarifah, et al, 2020). Bonyah, et. al., (2023), as mathematics educators strive to improve teaching to enhance learners' learning output, one major concern, or worry, has been the issue of forgetfulness that results from the loss of learned materials from memory.

According to Suratno et al. (2022), a curriculum is a plan to support the learning process, consisting of materials used at each grade level, teacher guides and class assessments. The 2013 curriculum, abbreviated as K-13, is characterized by the development of competencies in the form of attitudes, knowledge, thinking skills and psychomotor skills, which are packaged in various subjects aimed at encouraging students to be better at observing, asking, reasoning and communicating (presenting) what they have learned, after receiving learning materials at school. The government implemented the 2013 curriculum to replace the 2006 curriculum, which is said to be a continuation of the Education Unit Level Curriculum (KTSP). Meanwhile, the independent curriculum is a curriculum with diverse learning. The independent curriculum focuses on essential content so students have enough time to explore concepts and strengthen competencies (Kemendikbudristek, 2019).

The development of the world of education in Indonesia is currently experiencing a lot of changes and progress, of course the process of change and progress is heavily influenced by several factors (Hartono, Arnyana & Dantes, 2023). Currently, Indonesia is implementing an independent curriculum which is still in the trial phase in several schools. However, some schools are still implementing the 2013 Curriculum. Various national and international studies show that Indonesia has been experiencing a learning crisis for quite a long time. This situation has been made worse by the spread of the COVID-19 pandemic over the last three years or so. As of April 1 2020, UNESCO recorded that at least 1.5 billion school-age children were affected by COVID-19 in 188 countries, including 60 million in our country. From 2020 to 2021, Indonesia implemented a physical distancing policy, which became the basis for implementing full online learning, and one of the student learning resources was textbooks.

The COVID-19 pandemic period is a special condition that causes learning delays that vary in students' competency achievement. Suharwoto (2020) stated that all countries affected by COVID-19 have tried to make the best policies to maintain the sustainability of education services. Indonesia is also facing several real challenges that must immediately find solutions. educational units need policies related to curriculum implementation. Education units can use a curriculum that is appropriate to the learning needs of students and must pay attention to the achievement of student competencies in the education unit in the context of learning recovery. Egwuasi, et. al. (2022), the COVID-19 pandemic has profoundly disrupted education systems across the country and around the world, changing what classrooms and learning look like on a day-to day basis.

Prasetya (2017) states that the quality of mathematics textbooks that do not meet standards impacts on student achievement results. Several studies have been conducted to analyze the questions used in

mathematics textbooks in Indonesia. Cahyono and Effendy (2020) said the definition of algebra is the study of finding and solving unknown variables to obtain solutions using symbols that represent unknown variables and factors in an equation. Alsaed (2017) suggests that learning algebra means learning how to represent quantitative relationships in symbols, graphs and tables. Raditya & Fauziah (2019) conducted research on problem analysis in the 2013 Curriculum mathematics textbook and the KTSP Curriculum on Single Variable Linear Equations (PLSV) material in the form of mathematical activities, problem complexity, answer types, contextual situations, response types and mathematical questions. The results show that textbooks do not present various types of questions.

Ozer, E & Sezer, R (2014) show that based on a three-dimensional framework, the questions found in Turkish, Singaporean and American mathematics textbooks and workbooks are based on topics covered in the eighth-grade mathematics curriculum in Turkey that relate to mathematical situations the percentages are 90%, 96% and 85%; contextual situations the percentages are 72%, 76% and 61%; The percentage of response types is 83%, 85% and 66%. In addition, Gracin, (2018) uses a framework of five (5) dimensions, namely mathematical content, mathematical activities, complexity of questions, types of answers, and contextual situations, showing that mathematics textbooks in Croatia are used in grades VI, VII and VIII, which do not provide a wide range of task types, there is an emphasis on computing, while argumentation and interpretation activities, reflective thinking and open answer tasks are underrepresented. Based on the description above, the researcher aims to analyze algebra questions in mathematics textbooks for the 2013 and independent curricula.

Method

This research is descriptive analysis research. The subject of this research is algebra material contained in the 2013 curriculum mathematics textbook and the independent curriculum. The data collection method in this research is collecting questions, both sample and practice questions from mathematics textbooks used in Indonesia in the 2013 curriculum and the independent curriculum including sample questions and practice questions.

Data collection was carried out from February to May 2023. The research data source came from the 2013 curriculum 2013 Middle School/MTs mathematics student book (2017 Revised Edition) written by Abdur Rahman As'ari, et al. (2029). And the independent curriculum mathematics book written by Dicky Susanto, et al. Issued by the Ministry of Education and Culture in 2017. Book selection is based on survey results which are currently used in several schools.

The framework used in this research is a 5-dimensional analysis which includes mathematical activities, complexity level, contextual features, process and answer form to analyze algebra questions. in the 2013 curriculum mathematics textbook and the independent curriculum. With this framework, researchers will classify and code algebra problems contained in mathematics textbooks. The following coding is carried out:

Table 1. Dimensions and Sub-dimensions

| Dimensions | Sub-dimensions |
|-----------------------------|---|
| Mathematical activities (A) | Presenting or modeling (A1) Calculating or using various arithmetic operations (A2) Interpreting (A3) Provide logical arguments or reasons (A4) |
| Complexity of questions (B) | Direct application of basic knowledge or skills (B1) Building or creating a connection (B2) Applying reflective knowledge (B3) |
| Contextual situation (C) | Question without context (C1) Questions with a fictional context (C2) Questions with real-world context (C3) |
| Process (D) | Formulating mathematical situations (D1) Using mathematical concepts, facts, procedures and reasoning (D2) Interpret, implement and evaluate solutions (D3) |
| Type of answer (E) | Closed answer (E1) Open answer (E2) Answer with multiple choices (E3) |

Then each question will be classified according to the existing dimensions and sub-dimensions, then the question will be coded. For the accuracy of the code created to be good, the researcher will carry out an intra-reliability process between the researcher and a mathematician. In this activity, researchers took a sample of 20 questions, then researchers and experts carried out coding. This activity resulted in a value of 0.82. This value when compared with the intra-class correlation coefficient (ICC) value is said to have "Very good" reliability because it is in the range of 0.75 to 1, as in the table below:

Tabel 2. Nilai ICC

| Value | Reliability |
|-------------|-------------|
| < 0,04 | Bad |
| 0,04 - 0,59 | Enough |
| 0,60 - 0,74 | Good |
| 0,75 - 1 | Very Good |

(Raditya & Iskandar, 2019)

Results

After conducting descriptive analysis research on the algebra questions contained in the 2013 curriculum mathematics textbook and the independent curriculum, the results can be seen below:

Table 3. Research Results

| Dimensions | Sub-Dimensions | Kode | K13 | K-Merdeka |
|-----------------------------|---|------|--------|-----------|
| Mathematical activities (A) | Presenting or modeling (A1) | A1 | 18.38% | 10.34% |
| | Calculating or using various arithmetic operations (A2) | A2 | 65.41% | 40.23% |
| | Interpreting (A3) | A3 | 9.19% | 38.51% |
| | Provide logical arguments or reasons (A4) | A4 | 7.03% | 10.92% |
| Complexity of questions (B) | Direct application of basic knowledge or skills (B1) | B1 | 68.65% | 37.36% |
| | Building or creating a connection (B2) | B2 | 26.49% | 59.77% |
| | Applying reflective knowledge (B3) | B3 | 4.86% | 2.87% |
| Contextual situation (C) | Question without context (C1) | C1 | 82.16% | 40.80% |
| | Questions with a fictional context (C2) | C2 | 16.22% | 49.43% |
| | Questions with real-world context (C3) | C3 | 1.62% | 9.77% |
| Process (D) | Formulating mathematical situations (D1) | D1 | 17.84% | 37.36% |
| | Using mathematical concepts, facts, procedures and reasoning (D2) | D2 | 77.30% | 58.62% |
| | Interpret, implement and evaluate solutions (D3) | D3 | 4.86% | 4.02% |
| Type of answer (E) | Closed answer (E1) | E1 | 63.24% | 74.14% |
| | Open answer (E2) | E2 | 25.95% | 25.86% |
| | Answer with multiple choices (E3) | E3 | 10.81% | 0.00% |

Based on Table 3 above, it can be seen that the algebra questions in the 2013 curriculum mathematics textbook and the independent curriculum still do not present various types of questions that are balanced between the existing sub-dimensions. In the mathematical activity dimension (dimension A), algebra questions in the 2013 curriculum mathematics textbook and the independent curriculum both emphasize the sub-dimension of calculating/using various arithmetic operations (A2) with percentages of 65.41% and 40.23% respectively.

Apart from that, the questions in the 2013 curriculum mathematics textbook have the lowest percentage related to the mathematical activity dimension (A), namely the sub-dimension of providing logical arguments/reasons with a percentage of 7.03%. Meanwhile, the lowest percentage related to dimension A in the independent curriculum mathematics textbook is in the presenting/modeling sub-dimension (A1) with a percentage of 10.34%.

In the dimension of problem complexity (Dimension B), algebra questions in the 2013 curriculum mathematics textbook emphasize the sub-dimension of direct application of basic knowledge/skills (B1) with a percentage of 68.65%. Meanwhile, the independent curriculum mathematics textbook emphasizes the sub-dimension of building/making connections (B2) with a percentage of 59.77%. On the other hand, the two mathematics textbooks both present algebra questions with low sub-dimensions of applying reflective knowledge (B3), namely with respective percentages of 4.86% and 2.87%.

In the contextual situation dimension (dimension C), algebra questions in the 2013 curriculum mathematics textbook emphasize the sub-dimension of questions without context (C1) with a percentage of 82.16%. Meanwhile, algebra questions in the independent curriculum mathematics textbook emphasize the sub-dimensional questions with a fictional context (C2) with a percentage of 49.43%. Apart from that, the algebra questions in the 2013 curriculum mathematics textbook in the sub-dimensional questions with real-world context (C3) have a low percentage, namely 1.63%. Meanwhile, algebra questions in the independent curriculum mathematics textbook have the lowest percentage, namely the sub-dimensional questions with real-world context (C3) at 9.77%.

In the process dimension (D dimension), algebra questions in the 2013 curriculum mathematics textbook emphasize the sub-dimension using mathematical concepts, facts, procedures and reasoning (D2) with a fairly high percentage, namely 77.30%. Likewise, algebra questions in the independent curriculum mathematics textbook emphasize sub-dimensions using mathematical concepts, facts, procedures and reasoning (D2) with a percentage of 58.62%. Apart from that, the two mathematics textbooks also have the lowest percentages in the sub-dimensions of interpreting, implementing and evaluating solutions with percentages that are not much different, namely 4.86% and 4.02%.

Furthermore, in the answer type dimension (E dimension), algebra questions in the 2013 curriculum mathematics textbook and the independent curriculum emphasize on the closed answer sub-dimension (E1) with respective percentages of 63.24% and 74.14%. On the other hand, the two mathematics textbooks also have almost the same percentage in the open answer sub-dimension (E2) with percentages of 25.95% and 25.86%. Algebra questions in the 2013 curriculum mathematics textbook and the independent curriculum also have the lowest percentage in the sub-dimension of answers with multiple choices (E3), namely 10.81% in the 2013 curriculum textbook and 0.00% in the independent curriculum textbook, which do not present questions with sub-dimension E3 in the textbook.

Discussion

The algebra questions contained in the SMP/MTs mathematics student book for class VII semester 1 of the 2013 curriculum, consist of questions, let's dig up information, try, reason, practice, problems, and competency tests. There are 126 questions with a total of 185 questions. Meanwhile, the algebra questions contained in the SMP/MTs mathematics student book for class VII semester 1 of the independent curriculum consist of exploration questions, let's try, think critically, think creatively, practice, financial literacy, and competency tests. There are 80 questions with a total of 174 questions.

The number of questions analyzed shows the amount of data studied. Ismail & Imawan. (2023), various studies have been conducted to examine the essence of character values, their development, and their impact on various aspects of individuals' lives.

After analyzing the algebra questions in the 2013 curriculum mathematics textbook and the independent curriculum based on the 5-dimensional framework (Glasnovic Gracin, D., 2018) which includes the sub-dimensions of representing/modeling (A1), calculating/using various arithmetic operations (A2), interpreting (A3), providing logical arguments/reasons (A4), direct application of basic knowledge/skills (B1), building/making connections (B2), applying reflective knowledge (B3), questions without context (C1), questions with a fictional context (C2), questions with a real-world context (C3), formulating mathematical situations (D1), using mathematical concepts, facts, procedures, and reasoning (D2), interpreting, implementing, and evaluating solutions (D3), closed answers (E1), open answers (E2), and answers with multiple choices (E3). So data was obtained in the form of the appearance of sub-dimensional algebra questions in mathematics textbooks for the 2013 curriculum and the independent curriculum, namely the types of algebra questions in the 2013 curriculum mathematics textbook are dominated by questions with sub-dimensions A2, B1, C1, D2 and E1. Meanwhile, the types of algebra questions in the independent curriculum mathematics textbooks are dominated by questions with sub-dimensions A2&A3, B2, C1&C2, D2, and E1 and there are no questions at all with sub-dimension E3.

Conclusion

Questions with sub-dimension A2 65.41% dominate the types of algebra questions in the 2013 curriculum mathematics textbook; B1 68.65%; C1 82.16%; D2 77.30%; and E1 63.24%. Meanwhile, the types of algebra questions in the independent curriculum mathematics textbooks are dominated by questions with sub-dimensions A2 40.23% & A3 38.51%; B2 59.77%; C1 40.80% & C2 49.43%; D2 58.62%; E1 74.14% and there are no questions at all with sub-dimension E3. The algebra questions in the 2013 curriculum mathematics textbook still do not present various types of questions. This can be seen in the quite large percentage difference between the percentage of the highest sub-dimension and the lowest sub-dimension, namely in dimension A there is a difference of 58.58%, dimension B 63.79%, dimension C 80.54%, Dimension D 72, 44%, dimension E 52.43%. Meanwhile, in the independent curriculum textbooks, two dimensions are almost diverse, namely dimension A and dimension C, where the percentage difference between the sub-sub dimensions is below 50%. For dimension B, it is still not diverse enough, with a percentage difference of 56.9%, dimension D 54.6 %, and dimension E 74.14%.

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