



## Analysis of Mathematical Content in Junior High School Mathematics Textbooks Based on Learning Outcomes

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### Abstract

This study aims to describe the results of an analysis of the alignment between the mathematical content of the 2022 Merdeka Curriculum junior high school mathematics textbooks and the Learning Outcomes (LO) established in the 2024 Merdeka Curriculum, published by the Ministry of Education, Culture, Research, and Technology of the Republic of Indonesia. This study was conducted to identify competencies that have not been adequately covered in Merdeka Curriculum mathematics teaching materials, through an analytical method that breaks down learning outcomes into more specific learning objective sequences, particularly within the mathematical content of the 2022 Grade VII, VIII, and IX junior high school textbooks. This study employed a qualitative approach using content analysis as its research type, analyzing the 2022 Merdeka Curriculum Mathematics textbooks for Grades VII, VIII, and IX, published by the Center for Publishing under the Standards, Curriculum, and Educational Assessment Agency of the Ministry of Education, Culture, Research, and Technology of the Republic of Indonesia. Data were collected through careful reading and recording of the mathematical content in the textbooks by decomposing the Learning Outcomes (LO) into Learning Objective Sequences (LOS). From a total of 249 LOS, a sample of 172 indicators was drawn using purposive sampling. The research instrument consisted of an alignment analysis sheet that was semantically validated by experts and tested for reliability using Fleiss' Kappa coefficient involving three raters, yielding an average value of 0.705 (substantial agreement). Data analysis followed Krippendorff's content analysis steps, comprising unitizing, sampling, recording/coding, inferring, and narrating, with alignment level categorization based on Stufflebeam & Shinkfield's merit evaluation standards. The findings reveal that the alignment of the Merdeka Curriculum junior high school mathematics textbook content with the Learning Outcomes stands at 56.40% for subject matter exposition, 60.47% for worked examples, and 73.10% for practice exercises, all of which fall within the aligned category. The Algebra content showed the highest alignment percentage at 66.25%, followed by Number content at 61.31%, and Data Analysis and Probability content at 59.59%. These findings indicate that the depth and breadth of the junior high school mathematics textbooks differ from the LOS developed by one particular Subject Teacher Working Group (MGMP), with the latter's LOS being comparatively deeper and broader. This study recommends that mathematics teachers use the analysis results as a guide to supplement insufficiently covered material and to maximize the use of practice exercises. Further research is also recommended to examine the implementation of the textbooks in actual classroom learning using more comprehensive assessment standards.

**Keywords:** Content Analysis; Mathematics Textbook; Learning Outcomes; Merdeka Curriculum; Junior High School

## Introduction

Education plays a central role in building and developing competent human resources in accordance with the national education goals set forth in Law No. 20 of 2003 on the National Education System. In order to achieve these goals, the government established the National Education Standards (NES) through Government Regulation No. 57 of 2021, encompassing eight education standards. Four of these are the graduate competency standard, content standard, process standard, and education assessment standard. These four standards serve as the primary reference in curriculum development. This foundation underpins the implementation of the Merdeka Curriculum, which was officially enacted through the Decree of the Minister of Education, Culture, Research, and Technology No. 262/M/2022.

The Merdeka Curriculum is designed to provide flexibility to educational institutions and focuses on essential material to develop students as lifelong learners with a Pancasila character (Ministerial Regulation No. 12 of 2024). The expected competencies are expressed in Learning Outcomes (LO), which are competencies that students must achieve by the end of each phase. For mathematics at the junior high school level, the LO falls under Phase D, covering Grades VII, VIII, and IX, with five main content areas: numbers, algebra, geometry, measurement, and data analysis and probability. Since LO are still general in nature, teachers need to break them down into operational Learning Objectives (LObj), and then arrange them into a systematic and structured Learning Objective Sequence (LOS) (BSAKP, 2022).

In the context of curriculum implementation, textbooks play a critically important role. Textbooks are the primary learning resource for teachers and students (Ministerial Regulation No. 8 of 2016; Sievert et al., 2021) and act as a mediator between the official curriculum and the curriculum implemented in the classroom (Valverde et al., 2002). Haggarty & Pepin (2002) assert that textbooks not only provide mathematical content but also determine the pedagogical approaches used by teachers. The TIMSS study (Mullis et al., 2011) also shows that textbooks are the most important learning resource in mathematics education. This finding is reinforced by research in Finland, which found that 95% of teachers use textbooks as the basis for instruction in mathematics learning (Tim Oates-Assessment Research & Development University of Cambridge, 2015).

Problems arise when there is a misalignment between textbook content and the prevailing curriculum standards. Based on a survey conducted at Muhammadiyah junior high schools in D.I. Yogyakarta, the mathematics textbooks used for Grade VIII still refer to the 2022 LO, while the updated 2024 LO has already been enacted. This gap has caused certain competencies, particularly in geometry, to lack adequate supporting material in the available textbooks, forcing teachers to seek additional supplementary resources. A similar condition was documented by Schmidt et al. (2001), who found that misalignment between learning materials and curriculum standards frequently occurs when teachers use textbooks that do not fully support learning objectives. Polikoff (2015) also found significant misalignment between textbooks and competency standards in mathematics.

The impact of this gap is reflected in students' low numeracy achievement. The results of the Regional Education Standardization Assessment (ASPD) in D.I. Yogyakarta in 2024 showed that numeracy literacy scores were the lowest (38.01) compared to reading literacy (53.69) and science literacy (39.43). The National Council of Teachers of Mathematics (NCTM, 2000) asserts that a person cannot solve problems without fully understanding and applying mathematical content. Schmidt et al. (2001) findings reinforce this by demonstrating a direct relationship between the proportion of topics covered in textbooks and student achievement. Therefore, the alignment of textbooks with the curriculum is a critical factor in achieving the expected competencies.

Theoretically, the urgency of aligning textbooks with LO can be explained through the concept of constructive alignment (Biggs, 1996), which states that optimal learning outcomes will be achieved when learning objectives, teaching materials, and assessments are mutually aligned. The principle of content

validity (Lawshe, 1975; Webb, 1997) also affirms that teaching materials must adequately cover the targeted competency domain. From a constructivist perspective (Piaget, 1970; Vygotsky, 1978), teaching materials that are structured and appropriate to students' cognitive development will facilitate meaningful and progressive learning. Porter (2002) adds that misalignment between the planned and taught curriculum can significantly hinder the achievement of competencies.

Although a number of studies have examined the content of mathematics textbooks — including analyses of reasoning and proof tasks (McCrary & Stylianides, 2014), problem contexts (Wijaya et al., 2015), and cross-country comparisons (Abdullah & Shin, 2019; Hidayah & Forgasz, 2020) — research that systematically analyzes the alignment of Merdeka Curriculum junior high school mathematics textbooks with the latest 2024 LO remains very limited (Hanifah et al., 2023; Muhlis, 2024; Bebbe et al., 2024). This study fills that gap by conducting a systematic content analysis of the Grade VII, VIII, and IX junior high school mathematics textbooks published by the Ministry of Education, Culture, Research, and Technology in 2022, using an approach that breaks down LO into more operational LOS as the analytical framework. The findings of this study are expected to identify competencies that have not been adequately covered and to serve as a reference for textbook improvement, ultimately enhancing the quality of mathematics learning in D.I. Yogyakarta.

### *Method*

This study employed a qualitative approach using content analysis as its research type. Krippendorff (2018) defines content analysis as a research technique for making replicable and valid inferences from texts or other meaningful material in the context of their use. The qualitative approach was chosen because it aims to reveal the deepest meaning of the phenomenon under study comprehensively through narrative description (Creswell & Creswell, 2023). The object of this study is the mathematical content based on Learning Outcomes in the 2022 Merdeka Curriculum junior high school mathematics textbooks published by the Ministry of Education, Culture, Research, and Technology.

The data source of this study is the 2022 Merdeka Curriculum Mathematics textbooks for Grades VII, VIII, and IX, published by the Center for Publishing, Standards, Curriculum, and Educational Assessment Agency (BSKAP), Ministry of Education, Culture, Research, and Technology of the Republic of Indonesia. These books were selected because they meet the textbook eligibility standards set by BSNP and are the primary textbooks used by junior high school students nationally.

Data collection was conducted through careful reading and recording of the mathematical content in the textbooks, covering subject matter exposition, worked examples, and practice exercises. Reading was performed repeatedly to ensure consistency of findings. Findings were recorded using an alignment analysis sheet by decomposing Phase D Learning Outcomes (LO) into more specific and operational Learning Objective Sequences (LOS) as the analytical framework.

The unit of analysis in this study is the Learning Objective (LObj) contained in the LOS within the mathematical content of the 2022 Merdeka Curriculum junior high school textbooks. From a total population of 249 LObj, purposive sampling was used to focus the study on content most relevant to the research objectives. All LObj from the Number, Algebra, and Data Analysis & Probability content areas across Grades VII, VIII, and IX were included in the sample, as they represent core mathematical competencies encompassing arithmetic skills, algebraic reasoning, and data analysis and interpretation. Based on these considerations, 172 LObj were obtained as the sample, exceeding the recommended figure of 152 from the Krejcie & Morgan table, thereby enhancing the representativeness of the analysis.

Table 1. Distribution of the Learning Objective (LObj) Population by Content and Grade

Math Content	Number	Data				Total
		Algebra	Geometry	Measurement	Analysis & Probability	
Grade VII	39	29	23	-	9	100
Grade VIII	14	48	7	23	19	111
Grade IX	5	4	14	10	5	38
Total	58	81	44	33	33	249
% Total	23.29%	32.53%	17.67%	13.25%	13.35%	100%

Table 2. Distribution of the Learning Objective (LObj) Sample by Content and Grade

Math Content	Number	Algebra	Data Analysis & Probability	Total
Grade VII	39	29	9	77
Grade VIII	14	48	19	81
Grade IX	5	4	5	14
Total	58	81	33	172
% Total	33.72%	47.09%	19.19%	100%

Data validity was based on validity and reliability. The validity used is semantic validity (Krippendorff, 2018), which examines the extent to which text analysis categories correspond to the meaning of the text in the chosen context. Semantic validation was conducted through expert review by Prof. Dr. Jailani, M.Pd. Reliability was tested using the Fleiss' Kappa coefficient involving three independent raters, chosen because it accommodates inter-rater reliability analysis for three or more judges with nominal data (Fleiss, 1971). The reliability test was conducted on 172 items across three aspects: subject matter exposition (SM), worked examples (WE), and practice exercises (PE).

Table 3. Inter-Rater Reliability Test Results (Fleiss' Kappa)

Aspect	Kappa Value	Po	Pe	Interpretation
Subject Matter Exposition (SM)	0.704	0.969	0.896	Substantial
Worked Examples (WE)	0.709	0.917	0.714	Substantial
Practice Exercises (PE)	0.701	0.939	0.795	Substantial
Average	0.705	-	-	Substantial

The average Fleiss' Kappa value of 0.705 ( $> 0.60$ ) indicates a substantial agreement level (Landis & Koch, 1977), confirming that the instrument is reliable and suitable for further analysis.

Data analysis followed Krippendorff's (2018) content analysis steps, comprising: (1) unitizing, which involves defining the unit of analysis consisting of sampling units (Grades VII–IX textbooks), recording units (subject matter exposition, worked examples, and practice exercises), and context units (Phase D LO); (2) sampling, which involves selecting 172 LObj purposively; (3) recording/coding, which involves recording and coding content alignment with LOS indicators; (4) inferring, which involves drawing conclusions based on alignment percentage calculations using the formula  $Pm = (nm/Nm) \times 100\%$  for subject matter exposition,  $Pc = (nc/Nc) \times 100\%$  for worked examples, and  $Pl = (nl/Nl) \times 100\%$  for practice exercises; and (5) narrating, which involves describing the analysis results both quantitatively and qualitatively.

Table 4. Categorization of Mathematical Content Alignment Levels

Percentage Range	Category
81–100%	Highly Aligned
61–80%	Aligned
41–60%	Sufficiently Aligned
21–40%	Poorly Aligned
0–20%	Not Aligned

The alignment level categorization refers to the merit evaluation standards of Stufflebeam, D. L., & Shinkfield (2007). This categorization provides a qualitative interpretation of quantitative data as the basis for formulating descriptive, evaluative, and recommendatory conclusions.

## Results and Discussion

### Results

The alignment analysis was conducted on three components of the textbooks — subject matter exposition, worked examples, and practice exercises — across three mathematical content areas, namely Number, Algebra, and Data Analysis and Probability, as presented in the 2022 Merdeka Curriculum textbooks for Grades VII, VIII, and IX. From the 172 LOS analyzed, alignment data were obtained as presented in Tables 5 and 6 below.

Table 5. Summary of Mathematical Content Alignment by Textbook Component

Component	Aligned LOS	Not Aligned LOS	Percentage	Category
Subject Matter Exposition	97	75	56.40%	Sufficiently Aligned
Worked Examples	104	68	60.47%	Aligned
Practice Exercises	125	47	73.10%	Aligned

Table 6. Summary of Mathematical Content Alignment by Content Area

Content Area	Total LOS	Aligned LOS	Not Aligned LOS	Percentage	Category
Algebra	81	54	27	66.25%	Aligned
Number	58	36	22	61.37%	Aligned
Data Analysis & Probability	33	20	13	59.59%	Sufficiently Aligned

The data in Tables 5 and 6 reveal a consistent pattern: practice exercises have the highest alignment rate (73.10%), followed by worked examples (60.47%), and subject matter exposition (56.40%). This pattern indicates that the textbooks are stronger in providing practical exercises than in building conceptual foundations through content exposition. From a content perspective, Algebra records the highest alignment (66.25%), followed by Number (61.37%), and Data Analysis & Probability (59.59%). Although most components fall within the "Aligned" range, 43.60% of the LOS in the subject matter exposition remain uncovered, which could potentially affect the completeness of students' competency attainment.

Table 7. Mathematical Content Alignment Matrix by Content Area and Component (%)

Content Area	Subject Matter Exposition (%)	Worked Examples (%)	Practice Exercises (%)	Average (%)
Number	58.62	56.90	68.42	61.31
Algebra	54.32	67.90	76.54	66.25
Data Analysis & Probability	57.58	48.48	72.73	59.59
Average	56.40	60.47	73.10	63.32

Table 7 shows that out of nine matrix cells, only the worked examples for Data Analysis and Probability (48.48%) fall below the Aligned category. Practice exercises consistently record the highest alignment percentages across all content areas, while subject matter exposition consistently records the lowest. This pattern holds true for all content areas without exception.

### **Alignment of Mathematical Content in Subject Matter Exposition**

Of the 172 LOS analyzed, 97 indicators (56.40%) have aligned subject matter exposition, while 75 indicators (43.60%) were not found in the textbooks. By content area, Algebra has the highest number of aligned indicators (44 out of 81 LOS), followed by Number (34 out of 58 LOS), and Data Analysis & Probability (19 out of 33 LOS).

The Number content in subject matter exposition shows 58.62% alignment (34 out of 58 LOS). Alignment is evident in the Integer material for Grade VII, which builds concepts contextually — from thermometer temperature experiences to number line representation — in accordance with the principle of meaningful learning (Vygotsky, 1978). However, misalignment was found in LOS such as "Identifying numbers that belong to decimal numbers": the textbook only mentions decimals as the result of fraction conversion without building a conceptual understanding of decimal numbers as a distinct category.

The Algebra content in subject matter exposition records 54.32% alignment (44 out of 81 LOS). Alignment is found in the Relations and Functions material for Grade VIII, which systematically presents the descriptive method for expressing sets, in accordance with the LOS "Expressing a set using words (description)." Conversely, misalignment appears in the LOS "Determining the domain of a function": although the definition of a function is discussed, the concept of domain is not explicitly elaborated with step-by-step procedures and varied examples, potentially hindering students' holistic understanding.

The Data Analysis and Probability content in subject matter exposition records 57.58% alignment (19 out of 33 LOS). Alignment is prominent in the LOS "Identifying relative frequency of an event" in the Grade IX textbook through experimental exploration activities that effectively build empirical understanding. On the other hand, the LOS "Identifying the expected value of an event" is not met: the textbook only presents the definition of expected frequency without developing it into the concept of expected value, which is a competency explicitly required in the 2024 LO.

### **Alignment of Mathematical Content in Worked Examples**

Of the 172 LOS analyzed, 104 indicators (60.47%) have aligned worked examples, while 68 indicators (39.53%) were not found in the textbooks. Unlike subject matter exposition, the distribution of worked example alignment varies more across content areas: Algebra has 55 aligned indicators out of 81 LOS (67.90%), Number has 33 out of 58 LOS (56.90%), while Data Analysis and Probability has only 16 out of 33 LOS (48.48%) — making it the only content area in the Sufficiently Aligned category.

The Number content in worked examples records 56.90% alignment (33 out of 58 LOS). Alignment is evident in the Integer chapter for Grade VII, where worked examples on integer comparison use number line visualization contextually and systematically, in accordance with the LOS "Comparing two integers." Conversely, misalignment is found in the LOS "Identifying types of integers": although definitions of whole numbers and natural numbers are available in the subject matter exposition, no applied worked examples asking students to identify and classify types of integers are provided.

The Algebra content in worked examples records the highest alignment at 67.90% (55 out of 81 LOS). Alignment is prominent in the Relations and Functions chapter for Grade VIII through worked examples on determining the domain and co-domain of a relation, presented in three representations: arrow diagrams, Cartesian coordinates, and sets of ordered pairs, in accordance with the LOS

"Determining the domain and co-domain of a relation." Misalignment is found in the LOS "Distinguishing collections that are sets and those that are not": no worked examples on the well-defined concept as a prerequisite for classifying a collection as a set are provided, depriving students of practice in distinguishing sets from ordinary collections.

The Data Analysis and Probability content in worked examples records the lowest alignment among all components and content areas at 48.48% (16 out of 33 LOS), in the Sufficiently Aligned category. Alignment is found in worked examples on determining quartile values in the Statistics chapter for Grade VIII, which presents structured steps from data sorting to determining Q1, Q2, and Q3, in accordance with the LOS "Determining the quartile values of a data set." A critical misalignment appears in the LOS "Determining the interquartile range of a data set": although the definition of the quartile range is available on page 282, no worked example demonstrates how to calculate the interquartile range using the formula  $Q3 - Q1$ , along with its interpretation in data spread analysis.

### Alignment of Mathematical Content in Practice Exercises

Practice exercises represent the component with the highest alignment level among the three textbook components. Of the 172 LOS analyzed, 126 indicators (73.10%) have aligned practice exercises, while 46 indicators (26.90%) are not available. By content area, Algebra records the highest alignment with 62 out of 81 LOS (76.54%), followed by Data Analysis and Probability with 24 out of 33 LOS (72.73%), and Number with 39 out of 58 LOS (68.42%). The high alignment of practice exercises compared to subject matter exposition and worked examples indicates that the textbooks focus more on training competencies than on building conceptual understanding incrementally.

The Number content in practice exercises records 68.42% alignment (39 out of 58 LOS). Alignment is found in the Powers chapter for Grade VIII, which provides systematic exercises on multiplication and division of powers by applying exponent rules, in accordance with the LOS "Determining the results of multiplication and division of powers." Misalignment is found in the LOS "Converting scientific notation to decimal numbers": the available exercises only cover conversion from decimals to scientific notation, without providing exercises for the reverse direction, which is equally important in solving contextual problems such as interpreting physical or astronomical quantities.

The Algebra content in practice exercises records the highest alignment at 76.54% (62 out of 81 LOS). Alignment is prominent in the Algebraic Forms chapter for Grade VII through word problems set in a financial literacy context that apply the commutative property in algebraic form operations, in accordance with the LOS "Determining solutions to word problems related to the commutative property in algebraic form operations." A significant misalignment is found in the LOS "Identifying the meaning of a statement": practice exercises related to mathematical logic are not found anywhere in the textbook, indicating a substantial content gap in this fundamental topic.

The Data Analysis and Probability content in practice exercises records 72.73% alignment (24 out of 33 LOS), within the Aligned category. Alignment is found in the Probability chapter for Grade IX, which presents exercises on determining expected frequency in the context of coin tosses and playing cards using the formula  $\text{Expected Frequency} = \text{Probability} \times \text{Number of Trials}$ , in accordance with the LOS "Determining the expected frequency of an event." Misalignment is found in the LOS "Identifying the relative probability of an event": although relative frequency exercises are available, no exercises specifically address relative probability as a probabilistic interpretation of experimental observation results — an important conceptual distinction that is not practiced.

## ***Discussion***

The analysis results show that the 2022 Merdeka Curriculum junior high school mathematics textbooks have generally accommodated most of the demands of the 2024 LO, but with varying degrees of alignment across components and content areas. The most prominent pattern is the gradation of alignment from subject matter exposition (56.40%) to worked examples (60.47%) and practice exercises (73.10%), indicating that the textbooks are relatively stronger in practicing procedural skills than in building conceptual understanding incrementally. This finding is consistent with Biggs (1996), who emphasizes that optimal learning requires alignment between learning objectives, teaching materials, and assessment — a principle known as constructive alignment.

### **Discussion of Alignment in Subject Matter Exposition**

The 56.40% alignment in subject matter exposition indicates that nearly half of the competencies demanded by the 2024 LO lack adequate conceptual exposition in the textbooks. The textbooks generally present material using a constructivist and contextual approach, such as the use of thermometer analogies for integer concepts. However, the depth of explanation for a number of LOS remains insufficient. Vygotsky (1978) explains that students learn better when actively engaged in learning with adequate scaffolding support. Ausubel (1968) adds that new material is more easily understood when explicitly linked to students' prior knowledge.

The Number content has 58.62% alignment, with gaps primarily in decimal, interest, tax, scientific notation, and number sequence materials. The absence of explicit decimal number concept exposition and financial literacy material (interest and tax) could potentially weaken students' readiness in real-life contexts. The OECD (2020) demonstrates a positive correlation between financial literacy and economic well-being, and the PISA framework affirms that understanding numerical representations in science is essential for 21st-century competency. The Algebra content with 54.32% alignment presents its own challenges, given that the transition from arithmetic to algebra represents a significant cognitive leap for junior high school students (Kieran, 2004). Gaps in material on statements, open and closed sentences, and quadratic functions warrant attention, as these are important foundations for high school mathematics learning. The Data Analysis and Probability content (57.58%) shows good potential, but gaps in the concepts of expected value and experiment-based probability indicate the need for more comprehensive statistical material, in line with Gal's (2002) view on the importance of statistical literacy in the digital age.

### **Discussion of Alignment in Worked Examples**

The 60.47% alignment in worked examples represents an improvement over subject matter exposition, but with uneven distribution. Polya (1945) emphasizes that good worked examples should help students develop problem-solving strategies incrementally through four stages: understanding the problem, devising a plan, carrying out the plan, and looking back. Algebra worked examples (67.90%) are relatively the strongest and have covered three of Usiskin's (1988) four algebraic conceptions: generalized arithmetic, procedural tool, and study of relationships, though they still need strengthening in the structural aspect. Number (56.90%) and Data Analysis and Probability (48.48%) worked examples still require significant enrichment.

The most critical finding is the 48.48% alignment of Data Analysis and Probability worked examples — the only component falling below the Aligned category. The absence of worked examples for determining interquartile range, experiment-based relative probability, and measures of central tendency represents a substantial gap. Budé et al. (2012) assert that effective statistics learning requires worked examples that encourage students to pose questions, collect data, analyze, and interpret results — a cycle of statistical thinking that is not yet fully facilitated by the existing textbooks.

## Discussion of Alignment in Practice Exercises

The high alignment of practice exercises (73.10%) indicates that textbook authors gave greater attention to guided reinforcement and practice. This finding is consistent with Rosenshine's (2012) principles of effective instruction, which emphasize that structured practice — from initial guidance to independent practice — is one of the most effective instructional strategies. Bjork & Bjork (2011) add that variability in difficulty level and distributed practice can enhance long-term learning outcomes.

However, the gradation pattern of alignment from practice exercises (73.10%) to subject matter exposition (56.40%) raises its own concern: students are trained to solve problems that exceed the scope of the conceptual exposition provided. This condition potentially creates procedural fluency without adequate conceptual understanding — what Skemp (1976) describes as relational understanding versus instrumental understanding. Bahr & Bossé (2008) affirm that effective mathematics learning requires a balance between the two. The most prominent gap is in Number content (18 LOS not accommodated), particularly in topics of scientific notation conversion, tax, and number sequences — all of which are directly related to life skills emphasized in the Merdeka Curriculum vision.

## Implications and Recommendations

Overall, there is a significant difference between the depth and breadth of the textbooks and the LOS developed by the D.I. Yogyakarta Subject Teacher Working Group (MGMP). Several materials listed in the MGMP LOS — such as decimals, scientific notation, number sequence patterns, complete functions (domain, co-domain, range), quadratic functions, statements and open/closed sentences, tax, and interest — have not been explicitly accommodated in the textbooks. In line with Webb's (1997) view, the success of mathematics learning is determined by the alignment between learning objectives, presented material, and student learning outcomes.

Based on these findings, strengthening textbook content can be carried out incrementally in three priority stages. First, strengthening Algebra content by adding quadratic function material and reinforcing mathematical reasoning, given the strategic role of Algebra in the continuity of high school mathematics learning. Second, enriching financial literacy in Number content, covering concepts of interest, tax, and simple financial calculations relevant to 21st-century life skills. Third, strengthening statistical thinking skills in Data Analysis and Probability content through the addition of contextual critical data analysis material. With development planning that involves teacher input and trials across various schools, the Merdeka Curriculum junior high school mathematics textbooks can become increasingly aligned with the demands of the 2024 LO and better prepare students for challenges in the data-driven digital era

## Conclusion

Based on the results of the alignment analysis of the 2022 Merdeka Curriculum junior high school mathematics textbook content with the 2024 Learning Outcomes, it can be concluded that the textbooks as a whole have an average alignment rate of 63.32%, which falls within the Aligned category. However, there is significant variation across components and content areas that warrants further attention.

First, the alignment of mathematical content in subject matter exposition reaches 56.40% with variation across content areas: Number (58.62%), Data Analysis and Probability (57.58%), and Algebra (54.32%). The constructivist and contextual approach applied is consistent with modern learning theory and provides a foundation for active learning. Core materials such as integers, LCM/GCD, algebraic forms, linear equations, and data presentation are well covered. However, there is still a 43.60% development space, particularly in decimal, scientific notation, quadratic function, like-term grouping, and applied statistics materials.

Second, the alignment of mathematical content in worked examples reaches 60.47%, with Algebra as the highest content area (67.90%), followed by Number (56.90%), and Data Analysis and Probability (48.48%). The pattern of worked example arrangement already supports concept mastery and procedural skills, but a number of LOS in decimal, interest, tax, scientific notation, number sequences, quadratic functions, and measures of central tendency materials have not been accommodated. The alignment of Data Analysis and Probability falling below 50% is a finding that warrants special attention.

Third, the alignment of mathematical content in practice exercises reaches the highest level at 73.10%, with Algebra (76.54%), Data Analysis and Probability (72.73%), and Number (68.42%). The pattern of exercise arrangement demonstrates a systematic and structured approach, consistent with effective learning principles. Nevertheless, gaps remain particularly in decimal, scientific notation, quadratic function, and certain measures of central tendency materials that have not been fully accommodated.

These findings imply that mathematics teachers need to use the results of this analysis as a guide to supplement inadequately accommodated material, particularly through supplementary teaching materials. For textbook authors, strengthening needs to be carried out incrementally with priorities on: (1) adding advanced Algebra materials such as quadratic functions and mathematical logic, (2) enriching financial literacy in Number content, and (3) strengthening statistical thinking in Data Analysis and Probability content. Further research is recommended to examine the implementation of textbooks in actual classroom learning using more comprehensive assessment standards.

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