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Analysis of Deep Learning Approach in Grade 8 Mathematics Textbook on Statistics

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Abstract: Analysis of Deep Learning Approach in Grade 8 Mathematics Textbook on Statistics. The deep learning approach is considered strategic to answer the challenges of 21st century education, especially in developing students' critical and creative thinking skills. This study aims to analyze the extent to which the principles of the deep learning approach are reflected in a grade 8 mathematics textbook, especially in statistics. The method used is content analysis of a grade 8 mathematics textbook from the Merdeka Curriculum, with indicators compiled based on the principles of the deep learning approach from the Ministry of Education and Culture, namely mindful learning, meaningful learning, and joyful learning. This instrument has been validated by experts and tested for reliability through the intra-rater reliability technique. The results showed that 9 out of 15 indicators were met, so the percentage of eligibility was 60%. The book's strengths lie in its mindful learning and joyful learning aspects, which are reflected in the presentation of concepts with more than one method and not dogmatic, the use of diverse visual and contextual approaches, as well as fun activities and building students' confidence. However, meaningful learning aspects such as integration between subjects and the use of digital technology are still minimal. These findings indicate the need to strengthen the content of the book through the insertion of open-ended questions, collaborative activities, and exploratory projects to realize a full deep learning approach. This study recommends the development of more exploratory, contextual, and transdisciplinary textbooks as learning instruments.

Keywords: deep learning, statistics, textbook analysis.

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INTRODUCTION

21st century education demands innovation in the learning process. Previously, traditional learning was dominated by a teacher-centered approach, but now there is more emphasis on a student-centered approach, with the teacher's role as a designer and supporter of the learning process (Lee & Hannafin, 2016). This change reflects a broader pedagogical shift from the teacher-centered learning paradigm to a student-centered paradigm (Keiler, 2018). In this case, surface learning that emphasizes memorization and end results is no longer sufficient. Instead, deep learning is important because students can actively construct knowledge by utilizing available resources and applying that knowledge meaningfully in real-world contexts (Fullan, Quinn, & McEachen, 2018).

The Ministry of Education, Culture, Study and Technology of the Republic of Indonesia responded to the challenges of the 21st century by introducing the Merdeka Curriculum. This curriculum provides flexibility in the learning process, so teachers can apply more creative

teaching methods (Saputri & Yasin, 2024). As a result, math learning is no longer limited to memorizing formulas. Instead, students are encouraged to think critically and creatively through challenging, contextual mathematics tasks (Stein, Grover, & Henningsen, 2019).

One of the changes introduced in Merdeka Curriculum is the implementation of a deep learning approach, which is based on three main principles, namely mindful learning, meaningful learning, and joyful learning (Kemendikdasmen, 2025). According to the academic paper by Kemendikdasmen (2025), mindful learning emphasizes the importance of awareness in the learning process, where students understand learning objectives, are motivated to learn, and actively develop learning strategies. Meaningful learning focuses on the application of knowledge in the real life context, so that the learning process becomes relevant and applicable. Meanwhile, joyful learning aims to create a positive, interesting, and fun learning environment so that students are motivated to continue learning. The application of these three main principles of the deep learning approach allows students not only to master academic material, but also to develop a complete personality and be ready for global challenges (Fullan & Langworthy, 2014).

Along with the implementation of the Merdeka Curriculum, the supporting elements of education need to be re-aligned to achieve quality learning outcomes. One element that plays an important role in the successful implementation of the curriculum is textbooks (Rittle-Johnson, Fyfe, & Loehr, 2016). A well-designed textbook can assist students in understanding abstract concepts and support students' active involvement in the learning process through the presentation of interesting and interactive materials (Dewi, Dahlan, & Turmudi, 2025; Martin & Bolliger, 2018). In this context, the selection and development of textbooks need to be adjusted to the curriculum objectives and student learning needs in the 21st century, including in the field of statistics relevant to the development of digital technology.

Statistics is one of the topics in mathematics that addresses the process of collecting, organizing, interpreting, analyzing, and drawing conclusions from data (Fielding, Makar, & Ben-Zvi, 2025). In today's digital era, statistics plays a role in supporting data literacy and data-driven decision making (OECD, 2019). Therefore, students need to develop a strong understanding of statistical concepts to prepare them for the demands of industry and digital society. To support this, the deep learning approach is relevant as it emphasizes students' active engagement conceptually, contextually, and pays attention to affective and motivational aspects (Fullan, Quinn, & McEachen, 2018; Mason, Murphy, & Jackson, 2020).

The analysis of deep learning approaches in mathematics textbooks, especially in statistics, is important to evaluate the extent to which the textbooks support deep and contextualized learning processes. If textbooks do not reflect the principles of the deep learning approach, then there is a risk that the learning process will be shallow, less contextualized, and unable to develop students' higher order thinking skills (Fullan & Langworthy, 2014). A number of studies have been conducted to analyze mathematics textbooks, such as analysis based on the Standards for Mathematical Practice (Araiku et al., 2020), Bell criteria (Fendiyanto & Siregar, 2024), Book Center standards (Dewi, Dahlan, & Turmudi, 2025), content of mathematical reasoning and proof (Utari & Hartono, 2019), and scientific approaches (Fajriatin & Dafik, 2015; Kusumawati & Haqiqi, 2023). Study comparing mathematics textbooks in Indonesia with those abroad has also been conducted (Hidayah & Forgasz, 2020; Hendriyanto et al., 2023; Utami et al., 2025). However, study that focuses on analyzing the deep learning approach

in statistics content in textbooks is still very rare. This gap needs to be filled because statistics is a material that is relevant to students' data literacy and critical thinking skills, and has the potential to be developed through a deep learning approach.

Based on this background, this study focuses on the question: "How are the principles of the deep learning approach reflected in the presentation of statistics content in grade 8 mathematics textbooks of the Merdeka Curriculum?" Theoretically, the deep learning approach requires active cognitive and emotional involvement of students in building knowledge (Fullan, Quinn, & McEachen, 2018). This can be achieved if teaching materials, including textbooks, are able to present contextual, challenging, and fun content. In Merdeka Curriculum, deep learning is the main foundation to create reflective, collaborative, and adaptive Pancasila learners (Kemendikdasmen, 2025). Therefore, analyzing the deep learning approach in mathematics textbooks is crucial, considering that textbooks are the main reference for learning in schools. The results of this study are expected to provide input for educators, curriculum developers, and publishers in improving and developing textbooks that are more effective, exploratory, and contextual, so that they can support the achievement of learning objectives in accordance with the Merdeka Curriculum and the needs of the 21st century.

METHOD

Participants

The subject of this study is the book "Matematika untuk SMP/MTs Kelas VIII" published by the Ministry of Education, Culture, Study, and Technology in 2022. This book was chosen because it is the main textbook of the Merdeka Curriculum and is widely used in the learning process in junior high schools. The analysis focused on Chapter 6 which discusses statistical content.

The selection of statistics content was done purposively by considering several reasons. First, statistics is a topic that is very relevant to the challenges of the 21st century because it is closely related to data literacy, which is a basic competency of the digital era (OECD, 2019; Fielding, Makar, & Ben-Zvi, 2025). Statistics plays an important role in data-based decision making and building students' critical thinking skills. Secondly, statistics content provides opportunities for the application of deep learning approaches because they allow active student involvement through contextual data analysis activities, reflection, and making meaning of information. Third, statistics content has a stand-alone content structure and does not depend on other chapters in the book, so it can be analyzed as a whole in a content analysis study. In addition to the reasons already mentioned, the focus on statistics content is also based on considerations of limited time and resources in conducting the study. Therefore, statistics content is considered representative and strategic to assess the application of the principles of mindful learning, meaningful learning, and joyful learning in a grade 8 mathematics textbook of Merdeka Curriculum.

Study Design and Procedures

This study employs a content analysis approach suitable for systematically analyzing documents based on specific indicators (Miles, Huberman, & Saldaña, 2014). This method was chosen because it allows researchers to evaluate the representation of deep learning approach in the statistics content in the textbook. The study procedure began with (1) determining deep learning indicators based on theory and official documents, namely the academic text of the Ministry of Education and Culture (2025), as well as theories from Langer (2016), Ashburn & Floden (2006), and Mason, Murphy, & Jackson (2020); (2) compiling a content analysis sheet based on deep learning indicators; (3) conducting intensive reading of the book content in the

statistics chapter; and (4) matching the book content with the predetermined indicators. The process was conducted systematically to ensure analytical validity.

The indicators were developed by operationalizing theoretical concepts into clearly identifiable and measurable observation items. The principle of mindful learning from Langer (2016), which emphasizes learning awareness and openness to various perspectives, is derived into indicators of "presenting concepts from more than one approach," "encouraging reflection," and "not dogmatic." Meanwhile, the meaningful learning principle from Ashburn & Floden (2006), which emphasizes the relevance of context and the application of concepts in real life, is derived into indicators of "material is related to real situations," "encourages understanding of concepts," and "connections between topics." The principles of joyful learning from Mason, Murphy, & Jackson (2020) and Kemendikdasmen (2025), are derived into indicators of "interesting visuals", "fun activities", and "presentation of challenging but not frustrating problems". In total, 15 indicators were developed to represent the three principles of deep learning, each consisting of five indicators. All indicators were designed to be explicit, measurable, directly observable in the textbook, and allow replication for similar study.

Instrument

The main instrument used in this study is the content analysis sheet which is prepared based on three principles of deep learning, namely mindful learning, meaningful learning, and joyful learning. The whole instrument consists of 15 indicators derived from relevant theories and documents.

Content validity was conducted by two mathematics education experts who are senior lecturers in mathematics education. The validation process was carried out through a review of each indicator, including aspects of (1) clarity of the editorial; (2) relevance of the content to the theory; and (3) measurability in the context of the textbook. The experts provided descriptive qualitative feedback, without a numerical scale, because the focus of the validation was on improving the content. Based on the validation results, the experts' input was used as the basis for revising the indicators to make them more operational and contextual. This validation ensured that the instrument developed was content valid and had replication potential in similar studies.

Reliability was tested using the intra-rater reliability technique, by having the same section of statistics content analyzed twice by the same researcher within a week. The results of the two assessments were compared to identify the consistency of the scores obtained. Of the 15 indicators, there were 13 indicators that showed the suitability of the assessment. The reliability level was calculated using the percent agreement formula (Miles, Huberman, & Saldaña, 2014):

This value indicates a high level of consistency and is acceptable in content analysis study (Miles, Huberman, & Saldaña, 2014). Thus, the instruments used have sufficient internal stability for the purposes of this study.

$$R = \frac{13}{15} \times 100\% = 86.67\%$$

Data Analysis

The data were analyzed using a descriptive qualitative content analysis technique, following the interactive model of Miles, Huberman, and Saldaña (2014) which consists of three stages, namely (1) *data reduction*, by selecting parts of the book that match the indicators; (2) *data presentation* in the form of tables and narratives as a visualization of the findings; and (3) *conclusion drawing* through interpretation of the indicators met. To strengthen the qualitative

findings, quantitative calculations were carried out in the form of a percentage of feasibility (p) calculated by the formula:

$$p = \frac{number\ of\ fulfilled\ indicators}{total\ number\ of\ indicators} \times 100\%.$$

The final results are used to assess the extent to which the textbook represents the principles of deep learning in statistics.

The assessment of fullfilled or not an indicator is done by matching the content of the book with the practical description that has been formulated for each indicator. This description is designed to avoid the subjectivity of the assessment. The assessment is carried out using a content analysis sheet that contains a check column (✓ /✗) for each indicator, accompanied by notes or excerpts of book content as evidence of assessment.

Researchers conducted repeated reflections on the findings and coding process. The results of the analysis were discussed collaboratively between researchers to ensure the appropriateness of the interpretation with the theoretical principles used. This discussion serves as an internal peer debriefing that helps maintain the objectivity and consistency of the textbook content evaluation process, so that the results of the analysis can be accounted for methodologically and theoretically.

In general, the design of the method in this study was structured so that the textbook analysis process was systematic, objective, and accountable. The assessment instruments were developed based on relevant theories, validated by experts, and tested for reliability through repeated analysis. The analysis process refers to the Miles, Huberman, and Saldaña (2014) approach, reinforced by practical descriptions of each indicator, and discussions between researchers. Thus, this study is expected to produce valid and relevant findings related to the analysis of deep learning approaches in statistics content in mathematics textbook.

■ RESULT AND DISCUSSION

Description of the Textbook and Overview of Indicator Fulfillment

The data source used in this study is a grade 8 mathematics textbook based on the Merdeka Curriculum, with a special focus on the topic of statistics. The following is a description of the mathematics textbook analyzed in this study.

Title: Matematika untuk SMP/MTs Kelas VIII;
Authors: Mohammad Tohir, Abdur Rahman As'ari, Ahmad Choirul Anam, and Ibnu Taufiq;
Publisher: Ministry of Education, Culture, Study, and Technology
Publication Year: 2022 (Tohir, et al., 2022).

The results of the analysis of the application of deep learning approaches to the topic of statistics in grade 8 mathematics textbook published by the Ministry of Education, Culture, Study and Technology are presented in Table 1.

Table 1. Results of the deep learning approach analysis

Deep Learning Principles	Indicator	Checklist	Findings
Mindful learning	1. Present concepts with more than one approach or method of solution.	✓	Presented through graphs and real context (example: Covid-19 graph).
	2. Provide open-ended problems or multiple solutions.	✗	Problems are convergent, leaving no room for variation in solutions

	3. Encourage students to reflect on their learning process or strategies.	✓	Provide reflective questions such as "What can you conclude?"
	4. The book is not dogmatic and encourages critical thinking of concepts/formulas.	✓	Formulas are not given immediately, students are invited to build concepts
	5. Provide space for discussion or exchange of viewpoints between students.	✗	There are no activities for discussion or exploration of strategies
Meaningful learning	6. The material is related to the real situation/daily life of students (contextual).	✓	Examples are presented based on real situations around students.
	7. Activities promote understanding of concepts, not just procedures.	✓	Students are asked to process data, compile tables, and draw conclusions.
	8. There is a connection between topics or between subjects.	✗	Relationships between topics in chapters exist, but between subjects is still missing.
	9. Provide room for exploration of strategies according to students' learning styles.	✗	There is no variety of learning approaches that are adaptive to students' learning styles.
	10. Direct the use of digital technology/resources where available.	✗	There is only one reference video, the use of technology has not been integrated into learning activities
Joyful learning	11. Attractive visualization, clear illustrations, and pleasant layout.	✓	Use graphs, tables, and layouts that support
	12. Contains fun activities such as puzzles or quizzes.	✓	Exercises are linked to real-world contexts in a quiz format.
	13. Rewarding students' thinking process.	✓	Questions for reflection are available in many sections.
	14. The problems presented are challenging but not frustrating.	✓	Questions are tiered, with clear guidelines.
	15. Provide space for student expression such as projects or stories of problem-solving strategies.	✗	There are no assignments or projects based on students' interest.
Number of indicators fulfilled		**9**	
Percentage		**60%**	

Notes:
✓ : Indicator fulfilled
✗ : Indicator not fulfilled

Based on Table 1, 9 out of 15 indicators of the deep learning approach that are in accordance with the presentation of statistics content in grade 8 mathematics textbook published by the Ministry of Education, Culture, Study and Technology. Therefore, the percentage of feasibility (p) is:

$$p = \frac{9}{15} \times 100\% = 60\%.$$

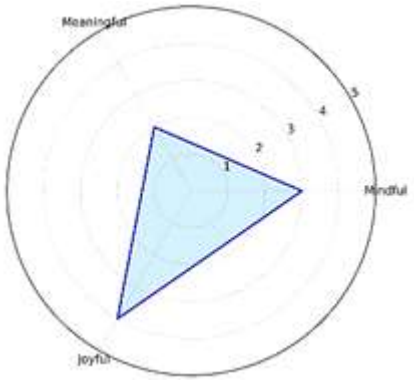


Figure 1. Radar chart of fulfilled deep learning indicators in the statistics chapter

To strengthen the understanding of the results in Table 1, a spider chart is presented in Figure 1 that maps the number of indicators met in each principle, namely mindful learning (3 out of 5), meaningful learning (2 out of 5), and joyful *learning* (4 out of 5). This visualization shows that the joyful learning and mindful learning aspects have been sufficiently accommodated, while the meaningful learning aspect still needs to be strengthened. This diagram helps identify the strengths and weaknesses of the deep learning approach in the analyzed textbook. Furthermore, the discussion will be presented based on the three principles.

Mindful Learning

Several mindful learning indicators are met in the statistics content in the grade 8 mathematics textbook, especially in the way the concepts are presented to students. The concepts are presented with more than one approach, not only through mathematical definitions but also through real-life contexts, such as the graph of the Covid-19 case shown in Figure 2. This approach is not only actual but also brings students closer to data that they have encountered in their daily lives. This presentation is in line with the principle of openness to novelty from Langer (2016), and supported by Araiku et al. (2020) which states that variations in material presentation can encourage higher-order thinking skills. This principle is also reinforced by the academic paper by Kemendikdasmen (2025), which highlights the importance of flexible understanding and contextualized meaning formation in the learning process.


TEMUAN KASUS POSITIF COVID−19 BULANAN

1. **Modus**

Untuk memahami modus dari suatu data, coba perhatikan data kasus Positif Covid-19 di salah satu Provinsi di Indonesia pada gambar 6.2. Dalam grafik tersebut dipaparkan data kasus Covid-19 di salah satu Provinsi di Indonesia mulai bulan Maret 2020 sampai April 2022. Dari tabel tersebut terlihat jelas bahwa data terendah pada bulan Maret 2020 dan data tertinggi pada bulan Juli 2021 sebesar 9.651 kasus.

Figure 2. Presentation of the mode concept through a Covid-19 case graph

However, the statistics content in the grade 8 mathematics textbook does not yet contain open-ended problems or tasks with various possible solutions. The problems are convergent, leaving no room for solution variation. This condition is in line with the findings of Hidayah and Forgasz (2020), where Indonesian mathematics textbooks are still dominated by closed problems, with a percentage of open-ended tasks of less than 3%. This may be due to the consideration that grade 8 students do not yet have the cognitive readiness to answer open-

ended questions, or teachers in the field are not ready to manage alternative assessments that are more exploratory. According to Langer (2016), mindful learning demands openness to uncertainty and opportunities for divergent and explorative thinking. Mindful learning is not just training students to answer questions, but also encouraging them to question, interpret and consider various possibilities.

Although the statistics content in the grade 8 mathematics textbook does not contain open-ended problems or tasks with multiple solutions, it does a good job of encouraging students to reflect on their learning process. As shown in Figure 3, the textbook inserts questions such as "Apa yang dapat kalian simpulkan?" after students complete exercises or analyze data. This shows the presence of learning awareness (metacognition), which is the essence of mindful learning according to Langer (2016), namely the ability to actively make new differences and engage in the current situation. This kind of reflective activity is also in line with the principles of the deep learning approach in the academic paper by Kemendikdasmen (2025), which emphasizes the importance of space for students to be aware of how and why they learn.

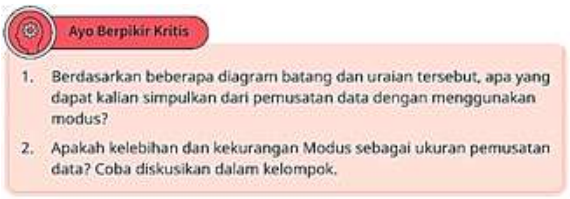


Figure 3. Prompting questions to encourage student reflection on the learning process

The textbook also shows a non-dogmatic approach in presenting mathematical formulas or concepts. On the topic of medians and quartiles, students are not directly given formulas, but are guided through logical thinking steps and data visualization. This approach is in line with the values of constructive uncertainty and meaning creation in mindful learning (Langer, 2016). This book facilitates students to build understanding through critical thinking, rather than simply memorizing procedures.

The last indicator of mindful learning is not yet evident in the statistics content in the grade 8 mathematics textbook, as explicit instructions to discuss or share thinking processes are still very limited. The group activities that do exist generally only ask students to solve problems collaboratively, with no encouragement to debate or consider alternative strategies. However, in the concept of *Mindful School Communities* (Mason, Murphy, & Jackson, 2020), developing a community of empathy and courage to think together is considered an important part of fostering social and emotional awareness in learning. This aspect is also emphasized in the Ministry of Education's academic paper (2025) regarding the importance of a collaborative learning ecosystem that allows for a healthy exchange of ideas.

Thus, the statistics content in the grade 8 mathematics textbook show a fairly good application of mindful learning principles. However, improvements are still needed in incorporating open-ended tasks and creating space for discussion or exchange of viewpoints in mathematics learning so that the essence of mindful learning can be reflected more fully.

Meaningful Learning

The statistics content in the grade 8 mathematics textbook show a fairly good implementation of meaningful learning indicators. In terms of linking concepts with real-life contexts, Figure 2 provides an example where the topic of modes is introduced using concrete data of the Covid-19 case, which not only increases relevance but also helps students understand the real applications of mathematical concepts. This approach is in line with the concept of authenticity in meaningful learning proposed by Ashburn & Floden (2006), where the importance of

connecting knowledge to students' experiences and the real world is emphasized. This principle is also in line with the academic paper by Kemendikdasmen (2025), which defines meaningful learning as learning that is contextually, socially and culturally relevant. However, the context used in the book is still dominated by socio-economic themes such as pandemics and trade, so it does not sufficiently reflect the diversity of students' experiences in everyday life. In addition, students have not been directed to relate the context to personal experiences, which causes the depth of the connection to the real world to be limited.

Learning activities in grade 8 mathematics textbook not only emphasize mechanical procedures, but also encourage students to process, compile, and draw conclusions from data. For example, students are asked to sort data, create frequency tables, and interpret the meaning of medians and quartiles. This activity shows that concept understanding is the main focus of learning, not only the completion of calculations. This reflects the characteristics of learning for understanding described by Ashburn & Floden (2006), where students not only memorize, but also form mental models of the concepts learned. Instead of presenting formulas directly, this textbook provides logical steps that students must follow to perform calculations, thus strengthening in-depth understanding of concepts. This is influenced by the Merdeka Curriculum which shifts the focus from memorization to meaningful understanding, as well as the increasing awareness of the importance of understanding data in the digital era.

However, the statistics content in grade 8 mathematics textbook does not effectively present the interrelationships between subjects. Although the subchapters on measures of data concentration and dispersion are presented with a logical sequence and interrelated, the relationship between subjects is still not optimally developed. This weakness is in line with the findings of Utami et al. (2025) which showed that the structure of Indonesian books tends to be monodisciplinary compared to Japanese books which are more interdisciplinary. This can be attributed to the structural design of national textbooks, which are generally organized thematically by subject. According to the academic paper by Kemendikdasmen (2025), meaningful learning is characterized by the ability to integrate knowledge through interdisciplinary or transdisciplinary approaches. Therefore, this textbook still needs further development to encourage linkages, not only between subchapters, but also between subjects.

The variety of learning strategies in statistics content in grade 8 mathematics textbook is still limited. For example, there are no explicit instructions that allow students to choose an approach based on their individual learning styles. This is because national textbooks are designed for a very broad audience, making it difficult to cater to students' individual preferences. This is contrary to the principle of differentiated instruction in meaningful learning, which emphasizs the importance of responding to student diversity (Mason, Murphy, & Jackson, 2020).

The use of technology is also still limited. In Figure 4, the textbook references videos from *Rumah Belajar Kemendikbud* platform, but there is no more active digital integration such as application-based assignments or interactive data exploration. So the use of digital technology is still optional and not integrated into the learning structure. This could be due to the assumption that not all schools have equal digital access, so infrastructure constraints and school readiness are likely to be factors that influence the lack of technology integration.

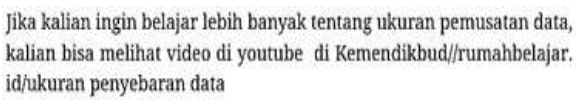

Jika kalian ingin belajar lebih banyak tentang ukuran pemusatan data, kalian bisa melihat video di youtube di Kemendikbud//rumahbelajar.id/ukuran penyebaran data

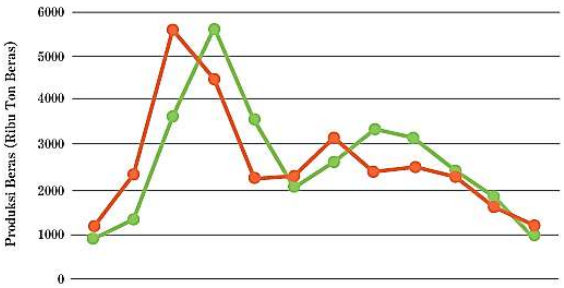
Figure 4. Video-based learning option provided in the textbook

Overall, the statistics content in the grade 8 mathematics textbook reflect the principles of meaningful learning. However, some indicators such as inter-subject linkages, opportunities to explore strategies based on students' learning styles, and the use of technology or digital resources still need to be improved so that meaningful learning can be implemented more effectively and responsively to the diverse needs of students.

Joyful Learning

Most of the joyful learning indicators are met in the statistics content in the grade 8 mathematics textbook. This reflects a conscious effort to create math learning experiences that are fun, engaging and support students' emotional well-being. Visually, the textbook presents graphs, tables and bar charts that enhance students' readability and interest. These features make the content not only more informative, but also more dynamic and communicative, arousing curiosity and emotional engagement. This is in line with the principle of joyful engagement in the academic paper by Kemendikdasmen (2025), which emphasizes that joyful learning should involve visual elements, personal experiences, and relevance to students' daily lives. Although the visualizations in the book are aesthetically appealing, most of the graphs and diagrams are only used as data sources without explicit instructions that encourage students to interpret visual patterns conceptually. So, the function of visualization as a tool to build deep understanding has not been fully utilized.

In addition, this textbook contains various interesting and interactive activities, such as exercises related to real-life situations as well as light quizzes presented in a table format for students to fill in. These tasks are packaged in the form of narratives or real-world contexts, which is in line with the principle of emotional connection in joyful learning, namely providing learning experiences that are able to stimulate students' intrinsic motivation (Kemendikdasmen, 2025; Mason, Murphy, & Jackson, 2020). Activities such as determining the range of rice production data, as shown in Figure 5, not only hone numerical skills, but also arouse curiosity and deepen students' understanding of the real world.



	Jan	Feb	Mar	Apr	Mei	Jun	Jul	Agu	Sep	Okt	Nov	Des
2020	934	1.328	3.632	5.626	3586	2.059	2.578	3.345	3.161	2.455	1.858	935
2021	1.200	2.337	5.570	4.476	2.277	2.326	3.175	2.402	2.464	2.302	1.653	1.174

Tahun	Tertinggi (ton)	Terendah (ton)	Selesih (ton)
2020	.....	.....	.....
2021	.....	.....	.....

Figure 5. Activity on determining the range of rice production data

The textbook shows respect for the students' thinking process, rather than focusing on the final answer. Many exercises are accompanied by questions such as "Apa yang dapat kamu simpulkan?" or "Diskusikan dengan temanmu," indicating that students are encouraged to reflect on their own thinking. This is in line with Mason, Murphy, & Jackson's (2020) *Heart-Centered Learning* principle, which emphasizes the importance of students feeling valued as thinking and evolving individuals, rather than simply as producers of correct answers.

The level of challenge in this textbook is also well designed, the questions are arranged in stages from simple to complex, with adequate guidance. This finding is in line with the study of Araiku et al. (2020) which showed that the problems in the textbooks they analyzed were presented with diverse contexts and graded levels of difficulty, which supported the development

of students' higher-order thinking skills. This approach also helps prevent learning anxiety and fosters students' confidence, which are important elements in the framework of joyful learning and heart-centered education (Mason, Murphy, & Jackson, 2020).

However, opportunities for students' creative expression, such as mini-projects, stories of problem-solving strategies, or interest-based open-ended tasks, are still absent from the statistics content in the grade 8 mathematics textbook. The book tends to focus on procedural problems and exploration of readily available data, rather than encouraging student-initiated activities. The absence of this indicator could be due to the assumption that students are not ready for open-ended tasks or the limitations of a curriculum that does not encourage free expression. This is an important component of joyful learning, as emphasized in the academic paper by Kemendikdasmen (2025) and Mason, Murphy, & Jackson's (2020) compassionate classroom approach.

Thus, the statistics content in the mathematics textbook of grade 8 already reflect the principles of joyful learning. However, indicators related to student expression, such as projects or narratives of problem-solving strategies, still need to be strengthened ensuring that learning remains enjoyable and meaningful on both emotional and intellectual levels.

Interaction among Deep Learning Principles

The analysis shows a complementary interaction between the three principles of deep learning. Indicators of engaging visualizations and real context-based exercises in joyful learning not only increase students' emotional engagement, but also strengthen meaningful learning as concepts become more easily understood and relevant. Visualization of data graphs in the context of Covid-19 supports the formation of conceptual meaning of data centering measures more intuitively. The principle of mindful learning reflected in reflective questioning and non-dogmatic approach also strengthens the depth of thinking required in meaningful learning.

On the other hand, some joyful learning activities, such as quiz questions or data games, tend not to be optimal to foster conceptual exploration of ideas. If the element of fun is not accompanied by depth of thinking or reflection, then joyful learning can be superficial and not contribute to concept understanding. This suggests a potential contradiction between joyful learning and meaningful learning. Thus, the balance of joyful, mindful and meaningful needs to be considered in textbook development. These three principles should ideally support each other to form a complete learning experience.

Overall, the results of the analysis show that the grade 8 mathematics textbook of the Merdeka Curriculum have fulfilled most of the principles of deep learning, especially in the visual, contextual, and problem structure aspects. The main strength lies in the presentation of material that is not dogmatic, the use of contextual illustrations, and the strengthening of the reflective process. This reflects the success in integrating the principles of mindful learning and joyful learning quite well. However, some weaknesses are still evident. For example, indicators of providing explorative spaces such as open-ended questions, discussions between students, interest-based projects, and integration of learning technology are still not optimal. These shortcomings have an impact on the weak dimension of meaningful learning and limited opportunities for the full development of 21st century skills, such as collaboration, open-ended problem solving and digital literacy.

■ CONCLUSION

Based on the analysis of the deep learning approach in statistics content in the grade 8 mathematics textbook of the Merdeka Curriculum published by the Ministry of Education, Culture, Study and Technology, it can

be concluded that the implementation of this approach is quite good, with a percentage of eligibility of 60%. Indicators of mindful learning are reflected through the use of various approaches in presenting material, conveying concepts that are not dogmatic, and providing space for student reflection. However, opportunities for open thinking and discussion with peers are still limited. Meaningful learning can be seen from the connection of content with real-life contexts and in-depth presentation of concepts, although it is still lacking in terms of interdisciplinary integration, adjustment to students' learning styles, and effective use of digital technology. As for the joyful learning aspect, the textbook succeeds in creating a pleasant learning atmosphere through attractive visual displays, activities that involve students, appreciation of students' thinking processes, and the preparation of challenging but appropriate questions. However, opportunities for student self-expression, such as creative projects or personalized problem-solving strategies, have not been fully optimized in the book. Thus, these findings emphasize the importance of the teacher's role in bridging the limitations of book content with students' pedagogical needs through the provision of open-ended questions, discussion activities, the use of technology, and interest-based exploration.

To strengthen the deep learning approach in statistics content in grade 8 mathematics textbook, it is recommended that the authors include open-ended problems to encourage students' cognitive exploration. In addition, it is important to include group discussion activities and open-ended problems to further develop the mindful learning dimension. Integration between subjects is also crucial in encouraging meaningful learning, especially if supported by digital technology such as statistics applications. The textbook should offer a more flexible learning approach that accommodates students' diverse learning styles and provides opportunities for creative expression through mini-projects or interest-based challenges. Teachers can modify exercises in books to be more reflective and open-ended, for example by asking students to evaluate different strategies or relate data to personal experiences. This is important to ensure that the limitations of the book do not become an obstacle to deep learning approaches in the classroom. Thus, this textbook serves not only as a source of information, but also as a transformative learning medium that holistically fosters students' 21st century competencies.

This study is still limited to one textbook and one topic of material, so the space for future exploration is still very open. Future studies can expand the focus on other mathematics topics, compare books from different publishers, or even books used at different levels of education. In addition, classroom observations can also be conducted to assess how the deep learning approach is implemented by teachers and received by students in learning activities. Thus, future study can link the evaluation of book content with its impact on pedagogical practices and students' learning experiences.

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