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Derivative in Indonesian textbook curricula: A praxeological analysis of learning obstacles in Indonesian mathematics textbooks

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Abstract
Indonesia's frequent curriculum changes necessitate corresponding adjustments in educational components, particularly textbooks, which must align with the epistemic objectives of education. As didactic representations of curriculum content, textbooks are crucial in guiding teachers and students toward learning goals. This study compares textbooks from the 2013 curriculum (TB) and the Merdeka curriculum (MB), examining their potential to create learning obstacles. Using praxeology theory (T, τ, θ, Θ) and focusing on derivation, this document analysis is conducted within the framework of didactic design research. Findings reveal notable similarities and differences in task presentation across both textbooks, with some tasks exclusive to TB or MB. Broadly, both textbooks predominantly employ testimonial solution techniques, which may contribute to epistemological learning obstacles. Additionally, unsystematic task sequences in both texts suggest a risk of ontogenic obstacles. These findings provide insights into developing textbooks that better address the demands of evolving curricula.

Keywords: derivative, curriculum, textbook, learning obstacle, praxeology

INTRODUCTION

The epistemic goal of education is to instill useful information and cognitive abilities that can be applied in new situations in students (Barzilai & Chinn, 2018; Charikova & Zhadanov, 2017; Pritchard, 2013). In the epistemic goal of education, students are required to actively seek understanding and not just to passively acquire knowledge (Heikkilä et al., 2023). Personal epistemological beliefs, which reflect an individual's view of knowledge, play an important role in this process (Kampa et al., 2016; Muis et al., 2018). These epistemological beliefs can influence educational strategies (Brownlee et al., 2017; Gök et al., 2019; Green & Hood, 2013; Tezci et al., 2016). The epistemic purpose of education should be used as a reference in determining the learning objectives to be achieved in the curriculum (Tombolato, 2022).

The curriculum is a comprehensive framework that includes not only the content to be taught, but also the methodology, approach, and desired learning objectives (Madani, 2019; Nordin & Sundberg, 2018; Remillard & Heck, 2014). It is a dynamic tool that guides teachers and students in the learning process (Goldman & Pellegrino, 2015; Pepin et al., 2017). A well-designed curriculum is very important in the learning that is carried out, because the curriculum serves as a theoretical basis and becomes a reference in planning the learning that will be carried out (Watagodakumbura, 2017). Thus, the educational curriculum must be tailored to achieve educational objectives. Generally, the school education curriculum in a country has been designed by the government in accordance with a condition that the country wants to achieve. This includes Indonesia, where the education curriculum used nationally must refer to the curriculum set by the Ministry of Education, Culture, Research and Technology of the Republic of Indonesia.

Indonesia is one of the countries that often changes the national curriculum. Since 1945, the national

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Contribution to the literature

- This study offers insights into the similarities and differences in the presentation of mathematical knowledge in two different curricula in Indonesia.
- This study describes a critical evaluation of the didactic design presented to students.
- This study serves as a basis for conducting further research related to the development of didactic design, especially on the assigned materials.

education curriculum in Indonesia has undergone many changes, namely in 1947, 1952, 1964, 1968, 1975, 1984, 1994, and 2004, 2006, 2013, and 2021. These changes are often followed by a revision or replacement of the education curriculum and the government often provides concrete reasons for such changes, such as adjusting to the times, global demands, or updating the approach to education.

This research will compare the 2013 curriculum (TB) textbooks with the Merdeka curriculum (MB) as an urgency in the dynamics of curriculum change in Indonesia. In this case, the curriculum must be structured to better suit the needs of the growing demands of education in accordance with the epistemic goals of education, namely providing explanations related to the foundation of knowledge so that students can be actively or independently involved in seeking knowledge based on their own understanding as a form of justified true belief (Brownlee et al., 2017). The epistemic goals of education that must be included in the curriculum are not only related to the pedagogical abilities of a teacher but also related to mathematical knowledge (content knowledge) as a form of knowledge construction by students that must be adapted to the developmental needs of learners in the context of diffusion and acquisition of new knowledge (Barzilai & Chinn, 2018). Therefore, the epistemic goals of education can be identified through significant differences between the changing curricula. Identification is done to see the differences between the changing curricula in terms of didactics related to the formation of knowledge by students as a form of justified true belief and in terms of pedagogics to determine the possibility of student learning obstacles in understanding the material. One way that can be done to see whether curriculum changes are in accordance with epistemic goals is by analyzing textbooks.

In mathematics learning, textbooks reflect the content of the curriculum from the didactic side that must be conveyed by teachers to students to achieve learning objectives (Hendriyanto et al., 2023; Remillard et al., 2019). Textbooks are one of the curriculum sources, usually a central component to improve mathematics learning practices. Textbooks can be used as a source of teaching materials taken by teachers and used as instructional tools (Ball & Cohen, 1996). Textbooks can be used as a reference for teachers in establishing collegial discussions and in classroom learning practices, i.e., as a form of curriculum representation that contains rules to encourage and limit teachers' actions (Remillard, 2000). In carrying out learning in the classroom, besides being important for teachers, textbooks can also be seen as a very important physical tool to be used by students, especially in learning mathematics. Textbooks are the main learning resources other than teachers that can be used by students to learn mathematics. Because of the important role of textbooks in learning mathematics, it is necessary to conduct a study of textbooks used in learning. In this study, researchers are interested in seeing changes that occur in textbooks presented in TB and MB.

In the international mathematics education research community, the study of mathematics textbooks is a well-established field of research (Fan et all. 2018). Textbook analysis provides valuable insights into curriculum implementation and its application in the classroom (Gracin, 2018). Mathematics textbooks play a critical role in shaping students' learning experiences by determining the type and scope of knowledge presented. Previous research has explored how textbooks provide opportunities for students to engage with mathematical concepts. For example, research conducted by Wijaya et al. (2015) on the extent to which Indonesian mathematics textbooks provide opportunities for students to learn through context-based tasks. The study showed that textbook presentations that do not provide opportunities for students to learn independently often cause students to experience difficulties when learning concepts in different contexts. Furthermore, research by Wahyuni et al. (2023) highlighted the differences in the presentation of mathematics problems, especially algebra material, in TB textbooks and MB, which differ in terms of emphasis on numeracy skills, application of concepts in solving problems, mathematical connections or contexts, and the use of facts, concepts and procedures. Given these differences, textbook analysis allows for a comparative study of how knowledge is represented and delivered across different curriculum frameworks. Several researchers, such as Sadieda et al. (2022), Zafirah et al. (2024), and Martatiyana et al. (2023), have noted that MB textbooks were designed with a new approach compared to heir predecessor, TB. From these studies, it is generally known that MB aims to develop students' potential and character through more essential coverage of material, while TB places more emphasis on student competence. Based on these findings, further

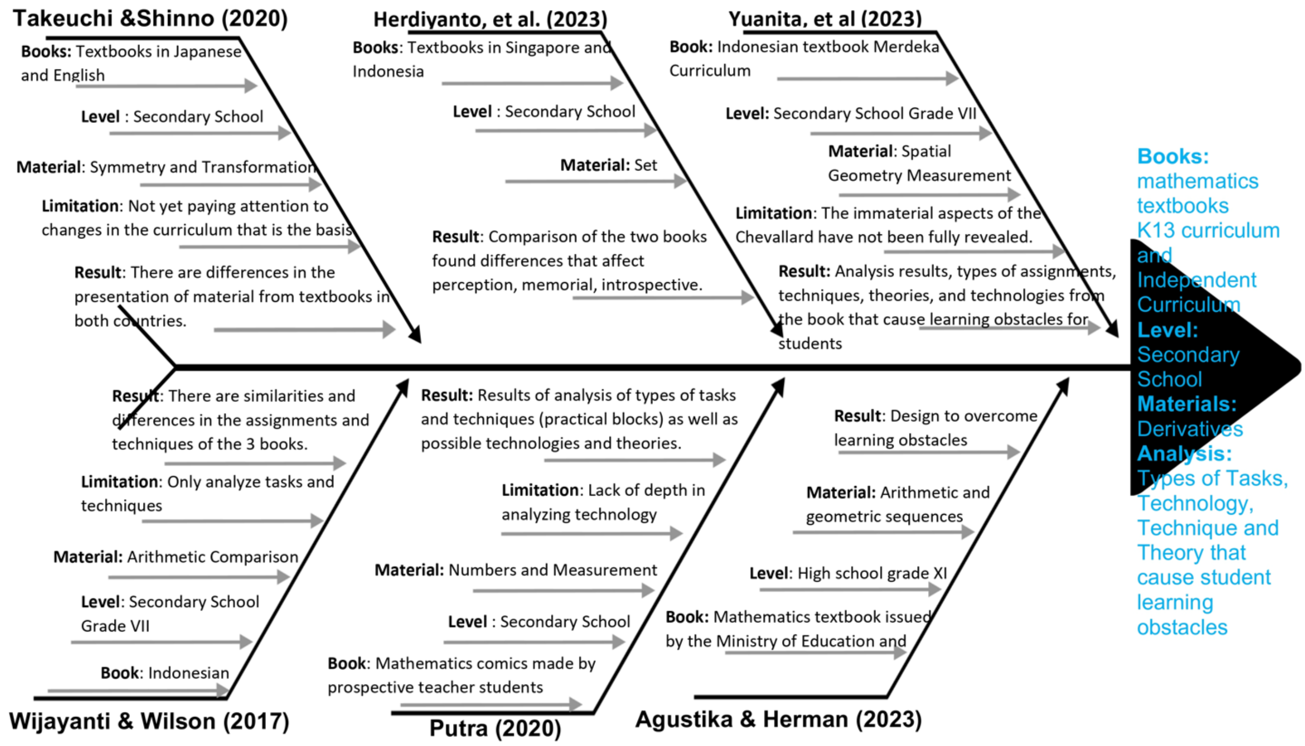

Figure 1. Fishbone diagram of research gap (Source: Authors' own elaboration)

examination of Indonesian mathematics textbooks, particularly in MB, is needed to assess their effectiveness in fostering mathematical understanding. Such an analysis would provide deeper insights into how curriculum reforms affect classroom practices and student learning.

Many theories can be used to analyze textbooks, namely

(1) the theory of tactical situations (Artigue et al., 2014; González-Martín et al., 2014; Yenil et al., 2023),

(2) hermeneutic phenomenology (Hausberger, 2020; Isnawan et al., 2022);

(3) praxeologist (Agustika & Herman, 2023; Hendriyanto et al., 2023; Putra et al., 2021; Takeuchi & Shinno, 2020; Wijayanti & Winsløw, 2017; Yunianta et al., 2023);

(4) Transposition theory (Bosch & Gascón, 2014).

One of the most famous is the praxeology theory where this theory has been widely used by researchers such as Hendriyanto et al. (2023) have studied praxeology to compare Indonesian and Singaporean mathematics textbooks on set material in junior high school; Takeuchi and Shinno (2020) studied praxeology to compare Japanese and English mathematics textbooks on symmetries and transformations in geometry for junior high school students; Wijayanti and Winsløw (2017) examined the praxeology of mathematics textbooks on arithmetic and geometric rows for high school students; Maharani and Putra (2023) reviewing math comic books in praxeology, and Yunianta et al. (2023) analyzed the types of tasks, techniques, theories, and technologies from seventh grade mathematics textbooks that cause students' learning obstacles. These studies have compared books from various perspectives, both two books in the same country, books between countries, and books in various materials presented. Based on the description above, the researcher found a gap that has the potential to be studied more deeply. The gap is visualized in a fishbone diagram which can be seen in **Figure 1**.

Based on the fishbone diagram in **Figure 1**, the research gap can be determined which can be seen in the blue writing. First, not many have studied praxeology research in high school textbooks. Second, there is no praxeology research that examines the comparison of TB and MB textbooks in Indonesia on derivative material. Third, many praxeology studies have only been carried out to analyze the types of tasks, techniques, theories, and technologies and have not yet reached how the offerings in the curriculum are reviewed based on the systemic and epistemic nature of the knowledge presented. It means that research in praxeology is still limited to the analysis of technical components (tasks, techniques, theories, and technologies), but has not yet reached the level of curriculum analysis that considers the structure of knowledge and how to convey it systematically and epistemologically. Research conducted by Zafirah et al. (2024), Martatiyana et al. (2023), and Wahyuni et al. (2023) generally explain that different curricula have a significant influence on the design and structure of a textbook. However, specifically these studies have not analyzed the structure of knowledge and how to convey it systematically and epistemologically. In this case, textbooks that are not systemic or epistemic can provide opportunities for students to experience learning obstacles. So far, only a few studies on textbook presentation have come to the study of learning obstacles caused by the presentation in the textbook. Therefore, in this study, mathematics textbooks from TB and MB will be compared on derivative material in terms of tasks, techniques, theories, and technology systemically and epistemically to the possibility of learning obstacles that can be caused.

Theoretical Foundation: Praxeology

Praxeology theory is a sub-theory of the anthropological theory of didactics (ATD) which argues that any human endeavor related to the generation, dissemination, or assimilation of knowledge should be interpreted as a distinctively human activity (Chevallard, 2005). The notion of praxeology was introduced as an important tool in analyzing human activity, be it mathematical or otherwise (Suryadi, 2023). In praxeology as a sub-theory of ATD, there are 4 main components, namely task T, technique τ, technology θ, and theory Θ (Chevallard, 2019). The point of departure is the (anthropological) postulate that every activity a performed in an institution I is divided into several basic "parts" called tasks, a fact we will write about: $a = t_1 \wedge t_2 \wedge \ldots \wedge t_n$ (Chevallard, 2019). Each task t_i is a specific type of T_i, which is generally expressed by an action verb with a direct object. A task $t \in T$ is called a specimen of T. In performing a task T, a technique τ is required. First, to perform a technique τ is to perform a series of tasks $t_1 \wedge t_2 \wedge \ldots \wedge t_n$. There is a dialectical interaction between technique and task type, the choice of τ must be appropriate in performing the task T. Such a discourse that can differ from institution to institution, and even from position to position within a given institution, is called the technology of τ and is denoted by the Greek letter θ. The purpose of the technology θ is to make the technique τ understandable, to explain why it is so and why it happens and not the other way around. In ATD, a theory is a "discourse" (in a broad sense such discourse can include symbols, calculations, diagrams, etc.), generally denoted by the capital Greek letter Θ, that can generate, control, justify, and make comprehensible a particular technology (or set of technological discourses).

Praxeology stands as a fundamental unit for dissecting human action, which includes two intricately related components: praxis, which denotes the practical dimension, and logos, which represents the reason or justification underlying the action (Bosch & Gascón, 2014; Suryadi, 2023). According to ATD, every human action requires some form of explanation or validation, thus requiring the interweaving of praxis and logos. Within the framework of praxeology, each entity is further broken down into practical and theoretical components. The practical aspect consists of task types and related techniques, while the theoretical dimension

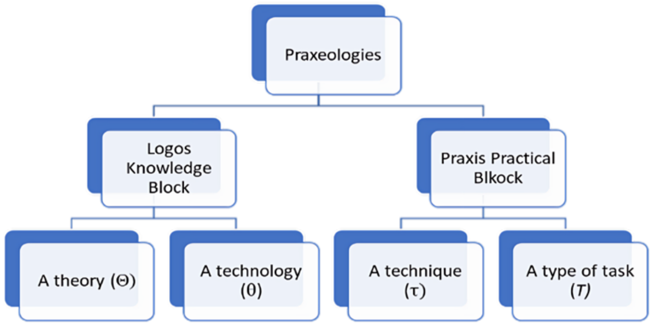

Figure 2. Components in praxeology (Chevallard, 2019; Hendriyanto et al., 2023)

encompasses the level of discourse and justification, which are called "technology" and "theory", respectively (Chevallard, 2019). The praxeology component consists of a logos block and a praxis block which can be seen in **Figure 2**.

Based on **Figure 2**, it can be seen that praxeology includes four different components, commonly referred to as the "four T's": task type, technique, technological discourse, and theory. Behavior the logos block corresponds to what most people think of when they use the term "knowledge" - although there is good reason to argue that knowledge is a dialectical unity between logos and praxis. In fact, the logos block $\Lambda = [\theta/\Theta]$ that is usually associated with the praxis block $\Pi = [T/\tau]$ "coupled" with it constitutes a praxeology, as shown here: $\Pi \oplus \Lambda = [T/\tau] \oplus [\theta/\Theta] = [T/\tau/\theta/\Theta]$. The quadruplet $\wp = [T/\tau/\theta/\Theta]$ is what is called praxeology.

Research Objective

This study will investigate the knowledge of derivatives presented in two different curricula in Indonesia, namely TB and MB. During this time, Indonesia has often changed the curriculum which has made various policies in the field of education change according to the content of the curriculum. One of them that has also undergone changes is textbooks as a curriculum presentation used in education units. Therefore, it is good to compare mathematics textbooks from two curricula used in Indonesia. In both curricula, the material about derivatives is the material studied at the high school level. This study offers a more detailed perspective by focusing on the didactic presentation of derivative material, how the presentation in the books studied provides opportunities for learning obstacles for students in learning derivative material. In summary, through praxiological analysis, this study examines how derivative material is presented in mathematics textbooks in TB and MB, and how the presentation of material in the two books has the opportunity to cause students to experience learning obstacles when viewed epistemically according to the theory of knowledge diffusion and systematically according to the knowledge presented in scholarly knowledge.

In addition, another contribution of this study is to provide insights into the phenomenon and its interpretation for the potential of better organization of derivative knowledge. This analysis makes it possible to illustrate the practical and theoretical sides of the textbook, and to form conjectures about the possibility of further development of knowledge presentation in learning design.

METHODOLOGY

Research Design

In examining the knowledge presented in the book, this research uses praxeology theory, which is an analysis of the knowledge structure in mathematics textbooks. Praxeology allows an examination of the types of tasks posed, learning techniques used, and interactions between teachers and students reflected in the text. This provides a deeper insight into how mathematical knowledge is presented and understood in the classroom environment. Praxeology not only reveals the complexity and interconnectedness between different aspects of knowledge formation but also provides a foundation for a deeper understanding of how mathematical knowledge is constructed in educational contexts. Through this approach, the analysis of the knowledge structure of mathematics textbooks becomes more comprehensive, enriching the understanding of the dynamics of mathematics learning in the classroom environment. Furthermore, the researcher also views this study within the framework of design didactical research as a prospective study, where the expected results do not determine how the presentation should be, but as a basis for the formation of knowledge that should be (Suryadi, 2023). Overall, this research consists of two main parts:

An in-depth analysis of the textbook from an epistemic and systemic perspective, focusing on the way the subjects' thinking was influenced by the didactic design. In addition, the study also identifies learning barriers that may arise from the experience.

An introspective process that unpacks the research results based on previous research and relevant theories. The aim is to clarify the findings of this research in the context of previous research, as well as provide a strong basis for justifying the resulting research results.

Curricula and Textbook Selection

Curriculum 2013 (K13) is a curriculum framework introduced by the Indonesian government in 2013. In general, K13 aims to improve the relevance and quality of education in Indonesia by emphasizing the holistic development of student potential (Nursobah et al., 2018). K13 emphasizes the development of student competencies in various aspects, including cognitive, affective, and psychomotor (Gunawan, 2017). K13 provides flexibility for schools to choose textbooks and learning materials that suit local needs, but the government also provides standard textbooks compiled in accordance with the K13 curriculum for use by schools throughout Indonesia which are provided online and can be accessed by anyone. MB is a new curriculum framework introduced by the Indonesian government as a replacement for the prototype curriculum in the post-COVID-19 period, later MB will be designated as the Indonesian national curriculum which will come into effect in March 2024. MB provides greater autonomy to schools in designing their own curriculum, according to local needs and contexts (Fauzan et al., 2023). Schools have the freedom to choose textbooks that are suitable for the curriculum they have developed. They can use textbooks provided by the government or choose from a wide selection of textbooks available from private publishers or other sources deemed appropriate to local needs and the pedagogy applied.

In this study, mathematics textbooks from TB and MB published by the Indonesian Government will be selected. A diagnostic survey conducted by the Indonesian Ministry of Education and Culture found that many mathematics teachers in Indonesia use mathematics textbooks published by the Indonesian government. The selected mathematics textbook from TB is the X1 grade mathematics textbook for senior high school published by the Ministry of Education and Culture of the Republic of Indonesia (Sudianto et al., 2017). Meanwhile, MB textbook chosen is the advanced mathematics textbook for grade XII high school published by the Ministry of Education, Culture, Research and Technology of the Republic of Indonesia (Utami et al., 2022). Both books are available online and can be accessed for free by all parties. In this study, the section is limited to comparing "derivative concepts" in mathematics textbooks in TB and MB. The two subsections discuss the same discussion, so that their presentation can be compared.

Data Analysis

This research uses the document analysis method to collect data in accordance with the research objectives. The documents analyzed in this study are high school mathematics textbooks in TB and MB published by the Ministry of Education and Culture. In these two books, the design of the tasks presented will be analyzed according to the relevant conceptual framework. The data analysis procedure in this study is in the form of task mapping: here the tasks, techniques, technologies and theories that exist in the derivative material in TB and MB textbooks are identified in a table and coded. After analyzing the derivative material in the two curricula, the reliability of the coding that has been made will be assessed. At this stage, inconsistencies will be sought in the taxonomy table that has been made. If it is found that the task design is inconsistent with the code

Table 1. Analysis of block praxis and logos on TB

Task (T)	Technique (τ)	Technology (θ)	Theory (Θ)
T_1. Analyzing tangent problems	τ_1. Describe the problem in the form of a graph and find the relationship between the tangent line and the normal line	θ1. Using visualization in the form of a picture to express the relationship between the normal line and tangent line on a curve	Θ1. Gradient and tangent line
T_2. Determine the equation of a tangent line	τ_2. Finding the gradient, and substituting into the equation of the tangent line τ_3. Find the value of y_1, the gradient, and substituting it into the equation of the tangent line	θ2. Point P(a, b) is on the curve $y = f(x)$ if $f(a) = b$. The gradient of a tangent line is $m = f'(x)$. Equation of the tangent line of the curve $f(x)$ at the point $P(a, b)$ is $y - b = m(x - a)$	
T_3. Determine the derivative of a function	τ_4. Used the definition of derivative τ_6. Summarize answers by comparing steps and difficulties encountered	$\theta3.\ f'(x) = \lim_{\Delta x \to \infty} \frac{f(x+\Delta x)-f(x)}{\Delta x}$	Θ2. Derivative function
	τ_8. Using derivative rules (derivative properties)	$\theta4.\ f(x) = ax^n \to f'(x) = n.ax^{n-1}$	
	τ_9. Using chain postulates and derivative search rules	θ5. Using the chain postulate formula	
T_4. Sketch the graph of a function and analyze the derivative at a point	τ_5. Draw a graph of the function and analyze the derivative at point $O(0, 0)$ shown on the graph by comparing the left and right limit values on the graph	θ6. Draw a graph and determine the left and right limit values, if the values are the same then the derivative at that point exists	
T_5. Proving the derivative rule	τ_4. Used the definition of derivative and substituted the function in the formula	$\theta3.\ f'(x) = \lim_{\Delta x \to \infty} \frac{f(x+\Delta x)-f(x)}{\Delta x}$	

that has been determined, it will be reviewed again adjusted to the opinions of measurement and assessment experts. Researchers rely on how scientific knowledge of derived materials, curriculum offerings and learning by looking at studies on related topics.

RESULTS

In analyzing textbooks as an implementation of this praxeology theory, two things will be studied, namely the study of block praxis and block logos. In this case, TB mathematics textbook is represented by TB and MB Textbook is represented by MB. In this study, T is symbolized as the tasks presented to students in both TB and MB textbooks. Each category of the same task in the textbook is given a different number T with the symbol T_1, T_2, T_3, …, T_n. The logos and praxis block analysis of TB can be seen in **Table 1**, the logos and praxis block analysis of MB can be seen in **Table 2**. Based on the results of the analysis that has been done, praxis block learning materials for derivative concepts on TB are presented in five task categories with different forms of presentation, namely T_1, T_2, T_3, T_4, and T_5 which can be seen in **Table 1**.

In its presentation, the techniques τ_1 techniques used in T_1 are only presented perceptually and testimonially. This means that the techniques presented in T_1 are not epistemic so that it provides an opportunity for epistemic barriers in students. For example, giving examples related to the sky problem used, is actually unrealistic for Indonesian students because sky does not exist in Indonesia. This has the opportunity to provide epistemological barriers to students, because there may be students who have difficulty in imagining tangent line problems in the context of sky games. In the next explanation presentation explaining mathematical concepts related to gradient and equation of tangent line, a mathematical model of sky problem illustration is presented. The mathematical model was used as the basis for presenting the concept in building the definition of the derivative. However, illustrating the basic concept on the graph, it is presented on the left side. x_2 which is placed on the left x_1 on the cartesian coordinates and then explained that $x_1 = x_2 + \Delta x$. This will make students experience confusion because the context presented is not common for students. Usually, students understand the form of positive addition on the number line as a form of adding points to the right. Both of these, of course, have the opportunity to cause students to experience epistemological obstacles.

The task of finding the tangent line of T_2 is contained in 2 types of technique, namely τ_2 and τ_3. The steps to find the tangent line on T_2 that are included in the technique τ_2 and τ_3 technique is not yet epistemic, because the technique τ_2 and τ_3 technique is only presented testimonially and memorially. Thus, it provides an opportunity for epistemological learning obstacles in students. However, the presentation of the task T_2 displayed is systematic because the completion steps to find the tangent line are in accordance with what is explained in scholarly knowledge starting with making sure the point is on the curve, followed by finding the gradient which can be done by finding the first derivative of the function on the curve as stated in

Table 2. Analysis of block praxis and logos on MB

Task (T)	Technique (τ)	Technology (θ)	Theory (Θ)
T_1. Determine the slope of the line	τ_1. Determine the gradient of a line using limits	$\theta 1.\ m = \lim_{\Delta x \to \infty} \frac{f(x+\Delta x)-f(x)}{\Delta x}$	$\Theta 1$. Function gradient
T_2. Showing derived properties with friends	τ_2. Discuss with friends to show the nature of derivatives	$\theta 2$. Use appropriate functions and use the derivative property to find the derivative	$\Theta 2$. Derivative function
T_3. Determine the derivative of a function	τ_3. Using derivative, algebraic, and exponent properties	$\theta 3$. Constant addition, multiplication, division, derivative properties, exponent and algebraic properties	$\Theta 2$. Derivative function
	τ_4. Using derivative, algebraic, and exponent properties, trigonometric identities	$\theta 4$. Constant addition derivative rules, trigonometric rules, algebraic and exponent properties	
	τ_5. Using derivative properties, algebraic properties, and trigono-metric identities	$\theta 5$. Constant multiplication and addition derivative rules, algebraic properties, and trigonometric identities	
	τ_6. Using chain postulates and properties of algebraic derivatives	$\theta 6$. Using the chain postulate, and the derivative rule	
	τ_7. Using the postulate of the chain and trigonometric rules	$\theta 7$. Chain postulates, derivative rules, and trigonometric rules	
T_4. Determine the equation of the tangent line	τ_8. Finding the gradient using the derivative, substituting the point passed and the gradient obtained in the formula for the equation of a straight line.	$\theta 5$. Point P(a, b) is on the curve $y = f(x)$ if $f(a) = b$. The gradient of a tangent line is $m = f'(x)$. Equation of the tangent line of the curve $f(x)$ at the point $P(a, b)$ is $y - b = m(x - a)$	$\Theta 3$. Equation of tangent line

T_1, in the last step substituting the gradient and point in the tangent equation. .

T_3 TB contains tasks that ask students to determining the derivative of the function. In general, almost all of the techniques used in T_3 are almost all presented testimonially in TB, only a small number of techniques are added to the memorial presentation to complement the answers previously presented in TB. This shows that the presentation of knowledge in T_3 is not epistemic, so it is likely to cause students to experience epistemological learning obstacles. For example, when the techniques presented in a textbook only contain testimonial presentations, then students will experience difficulties when faced with other types of problems with different contexts from what is presented in the textbook. In addition to not being epistemic, the presentation of tasks contained in T_3 is also not all presented systematically in accordance with existing theories in scholarly knowledge. Such as tasks that are completed using the chain postulate technique (τ_9) as mentioned earlier. Before presenting examples related to the use of chain postulates, students should have been given a task as a basic foundation for the chain postulate formula, so that students' understanding is intact regarding the concept of chain postulates. Thus, because it is not presented systematically, the task presentation in T_3 has the opportunity to make students experience ontogenic type learning obstacles.

T_4 TB illustrates for students that there are certain functions that do not have derivatives through graphical representations. This is to show students that the function does not have a derivative because the left limit and right limit values are not the same which results in the left and right derivative values also becoming unequal, so that the function can be concluded to have no derivative. So that T_4 which is done using the τ_5 is systemic, because the analysis steps on the derivative of a function are in accordance with the theory in scholarly knowledge, where to find the derivative of a function, it must first be ensured that the left and right limit values of the function are the same which is represented either in the form of a graph or in the form of a mathematical sentence. However, the presentation of the technique used in task T_4 is not yet epistemic, because TB only presents the technique as a form of solving task T. τ_5 as a form of solving task T_4 perceptually and testimonially. This has the opportunity to make students experience epistemology learning obstacles, because if the technique is only presented testimonially from the textbook, then students will experience difficulties when faced with other problems with different contexts. This will certainly provide opportunities for students to experience epistemology learning obstacles.

In TB, only some properties of derivatives and their proofs are presented directly and followed by a task asking students to prove other properties presented in T_5. T_5 is solved using the technique of τ_4, using the definition of derivative and substituting the function in the formula. So that T_5 can help students learn the concept of derivative properties meaningfully because students are directed to construct their own understanding related to the derivative properties of algebraic functions. The presentation of T_5 is systemic because the techniques used are in accordance with those in scholarly knowledge. However, the presentation of the technique τ_4 technique used to solve T_5 is not epistemic because it is only presented memorially and introspectively, without involving other knowledge presentations such as perceptual, testimonial, and a priori. So it allows students to experience difficulties when solving the T_5 . This is what provides an opportunity for students to experience epistemological learning obstacles.

Furthermore, praxis block learning materials for derivative concepts on MB are presented in four task categories with different forms of presentation, namely T_1, T_2, T_3, and T_4 which can be seen in **Table 2**.

The concept of derivative in MB is presented in T_1 begins with an explanation related to the concept of the gradient of the secant line which is sought using the limit. In MB, the concept of the gradient of the secant line is presented using the technique of providing illustrative images on the cartesian coordinate graph. The picture illustrates to students how the concept of gradient is sought. Furthermore, to form the concept of line gradient, which is connected to the concept of limit, students are asked to find the gradient of the line using the concept of limit. τ_1 technique is not presented epistemically, because it is only presented perceptually and testimonially, without involving other ways of presentation such as memorial, introspection, and a priori. Illustrations shown in the form of general conditions of the concept of tangent gradient are presented perceptually in MB. Students with high abstract understanding will be able to adjust to the presentation displayed. However, for students with less abstract understanding, more explanation is needed to help students construct their understanding. This will cause epistemological barriers in students. In addition, the presentation of T_1 on MB is not presented systematically in accordance with the order of presentation of knowledge in scholarly knowledge. This is because after explaining the concept of gradient associated with the limit, there is no justification for the definition of derivative associated with the concept of limit. This kind of presentation will certainly also raise questions in students, why the definition of the derivative is suddenly presented in the form of $f'(x) = \lim_{\Delta x \to 0} \frac{f(x_1+\Delta x)-f(x_1)}{\Delta x}$, if the limit value exists, without memorially presenting the technique to link the definition of the derivative with the concept of tangent described earlier. This kind of presentation is certainly not systematic and provides opportunities for students to experience ontogenic and didactic obstacles related to understanding the concept of the derivative that is not associated with the gradient of the line, so that it will affect the construction of the definition of the derivative concept of students' functions that are not based on a clear foundation, because the explanation conveyed in MB is incomplete.

T_2 MB contains tasks that ask students to show the derived properties that have been presented previously. T_2 has been presented systematically in MB, which is in accordance with the order of knowledge about derivatives in scholarly knowledge. However, the presentation of the technique used in solving T_2 is not epistemic because it only involves the presentation of memorial knowledge. This is likely to make students experience epistemological barriers, due to limited context, if the properties are applied to other cases.

T_3 MB contains tasks that ask students to determining the derivative of a function. The presentation of tasks contained in T_3 category is systemic because the order displayed is in accordance with the order in the scholarly knowledge book. However, the presentation of the techniques used to solve T_3 not yet epistemic, because all techniques consisting of $\tau_3, \tau_4, \tau_5, \tau_6, \tau_7$ presented as a testimonial and there are 3 techniques, namely τ_3, τ_5, τ_6 which in addition to being presented testimonially is also presented memorially because students are asked to complete the answers presented by MB. Based on this, it can be seen that the presentation of techniques in T_3 is not epistemic because all the techniques used are only presented testimonially and three techniques are presented both testimonially and memorially, not involving other types of knowledge presentation as previously described. This provides an opportunity for students to experience epistemological learning obstacles.

On the task of finding the tangent line of T_4 completed by students using the τ_8 technique. The sequence of T_4 solution steps is systematic because it is in accordance with what is in the scholarly knowledge book. However, the technique τ_8 technique used to solve T_4 is not epistemic because it is only presented testimonially, without involving other types of knowledge presentation.

After analyzing the block praxis of TB and MB, then the block logos analysis of TB and MB will be carried out. The components of the logos block consist of technology θ and theory Θ. θ is a tool or in the form of a method used to justify a technology. τ, while Θ is a form of inference from theoretical knowledge used to generalize the process at T , θ, Θ.

Based on the analysis results in **Table 1**, it can be seen that TB used 6 types of θ as a tool to justify τ presented, namely $\theta 1, \theta 2, \theta 3, \theta 4, \theta 5$, and $\theta 6$. In TB there are also three Θ as a form of inference from theoretical experience to justify T, θ, Θ namely $\Theta 1$, and $\Theta 2$.

On T_1, there is only $\theta 1$, which uses visualization in the form of a tangent curve drawing to find the relationship between the normal line and the tangent line on a curve (τ_1), with $\Theta 1$ is the theory of tangency. At T_2 , there is also only $\theta 2$ as a tool used to justify τ_2, which is related to a point P(a, b) that is on the curve $y = f(x)$ if satisfies $f(a) = b$, the gradient of the tangent line is $m = f'(x)$, and the equation of the tangent to the curve $f(x)$ at the point $P(a, b)$ is $y - b = m(x - a)$. At T_2 the theory used is still the same as at T_1, namely $\Theta 1$.

At T_3, there are three θ ($\theta 3$, $\theta 4$, $\theta 5$) that are used to determine the equation of the tangent line, as a tool used to justify the $\tau_4, \tau_6, \tau_8, \tau_9$ which is used. In this case, $\theta 3$ is $f'(x) = \lim_{\Delta x \to \infty} \frac{f(x+\Delta x) - f(x)}{\Delta x}$ as the method to justify τ_4 and τ_6 in order to determine the derivative of the function using the definition and conclude the answer by comparing the steps and difficulties faced in the previous problem related to the derivative of the function. $\theta 4$ is using the properties of the derivative, namely $f(x) = ax^n$ then $f'(x) = n.ax^{n-1}$, as a method to justify τ_8 namely using the algebraic derivative search rule (derivative properties) to determine the derivative of a function. Lastly, $\theta 5$ is using the chain postulate formula $f(x) = (u(x))^n$ so $f'(x) = n\big(u(x)\big)^{n-1}.u'(x)$ and $f(x) = ax^n - ax \rightarrow f'(x) = (n.ax^{n-1}) - a$ as a method to justify τ_9 i.e., using the chain postulate and derivative properties to determine the derivative of a function.

At T_4, there is only $\theta 6$ which is to draw a graph and determine the left and right limit values. If the values are the same then the derivative at that point exists, i.e., $f'(x) = \lim_{\Delta x \to \infty} \frac{f(x+\Delta x) - f(x)}{\Delta x}$ if the limit exists (the right limit is equal to the right limit). This rule is used as a method to justify to sketch a graph and analyzing the derivative at a point as a method used to justify τ_5 which is to draw a graph of the function and analyze the derivative at the point O(0, 0) shown on the graph by comparing the left and right limit values on the graph.

T_5 also uses $\theta 3$ is $f'(x) = \lim_{\Delta x \to \infty} \frac{f(x+\Delta x) - f(x)}{\Delta x}$ as a method to justify τ_4, which is to determine the derivative of the function using the definition to prove the derivative rule. In T_3, T_4, and T_5 all use the same theory $\Theta 2$, which is the derivative of the function.

In contrast to TB which uses 6 types of θ, based on the analysis results in **Table 2**, it can be seen that MB uses 5 types of θ as a tool to justify the τ presented, namely $\theta 1, \theta 2, \theta 3, \theta 4,$ and $\theta 5$. In TB there are also 3 Θ as a form of inference from theoretical experience to generalize T, θ, Θ, namely $\Theta 1, \Theta 2,$ and $\Theta 3$.

On T_1, there is only $\theta 1$, which uses the formula $m = \lim_{\Delta x \to \infty} \frac{f(x+\Delta x) - f(x)}{\Delta x}$ to determine the gradient of the tangent line τ_1 with $\Theta 1$ is a theory about tangent lines. At T_2 there is also only $\theta 2$, which is to use the corresponding function and use the derivative property to show the applicability of the derivative property (τ_2). On T_3 there are 5 types θ which are used to justify ($\tau_3, \tau_4, \tau_5, \tau_6, \tau_7$), namely $\theta 3, \theta 4, \theta 5, \theta 6, \theta 7$. In this case, $\theta 3$ is the derivative rule of constants, derivative rule of addition, derivative rule of multiplication, derivative rule of division, exponent properties and algebraic properties to justify the use of derivative properties, algebraic properties, exponent properties τ_3 in determining the derivative of a function. $\theta 4$ is the constant derivative rule, the derivative rule of addition, trigonometric rules, algebraic properties and exponent properties to justify the use of derivative properties, algebraic properties, exponent properties, and trigonometric identity τ_4 in determining the derivative of a function. $\theta 5$ is the constant derivative rule, multiplication and addition derivative rule, trigonometric rules, algebraic properties, and trigonometric identities to justify the use of derivative properties, algebraic properties, and trigonometric identities in determining the derivative of a function. τ_5 in determining the derivative of a function. $\theta 6$ is to use chain postulates, and derivative rules to justify the use of chain postulates and algebraic derivative properties τ_6 to determine the derivative of a function. $\theta 7$ is chain postulates, derivative rules, and trigonometric rules as tools to justify the use of chain postulates, algebraic derivative properties, and trigonometric rules τ_7 to determine the derivative of a function. At T_2 and T_3 the theory of $\Theta 2$ is the derivative of the function. Finally, T_4 only has $\theta 5$ which is the use of the concept that the point P(a, b) is on the curve $y = f(x)$ if $f(a) = b$; the gradient of a tangent line is $m = f'(x)$ and the equation of the tangent to the curve $f(x)$ at the point $P(a, b)$ is $y - b = m(x - a)$ to justify in finding the gradient using the derivative, substituting the point passed and the gradient obtained τ_8 to determine the equation of the tangent line, with $\Theta 3$ is the equation of the tangent line.

DISCUSSION

In the philosophy of knowledge, education must be implemented with an orientation towards epistemic goals. This is because it is expected that education can develop all the potential that exists in humans so that they can construct and acquire their thoughts in order to justify knowledge (Suryadi, 2023). In the end, students who receive education at school must be able to be directed to be independent to be able to use all their intellectual potential in justifying their own knowledge using the intellectual characteristics that exist in themselves (Pritchard, 2018). In this case, the entire process of learning tools used must be able to direct students to achieve this, including the tasks presented in the textbook used as a learning resource. In completing these tasks, students must use or be involved in using all their potential. According to Audi (2020) and Pritchard (2018) stated that the potential that humans have in justifying their knowledge is perceptual, memorial, testimonial, introspective, a priori. Perceptual. The following further explains the definition of each of these potentials.

Memory is the potential that students have in storing information to maintain general beliefs. Memory is an agent of conservation and does not produce beliefs or knowledge. Memory will utilize the beliefs that humans have to be the foundation for higher cognitive processes. Perception is the potential that students have to produce a knowledge that is intrinsically related to the five human senses. In this case, evidence from the five senses will provide justification for one's beliefs, so that knowledge can be formed, Introspective is the potential that students have to explain how things happen in their own minds consciously. With awareness allows humans to gain a large amount of knowledge. Everything that humans can observe in their own minds, as a form of mental belief, tends to make knowledge more real for a person. Testimonial is a potential that comes from outside oneself, for example from teachers, other people, other media, or from textbooks. This source should be ascertained whether it can be trusted or not. Finally, a priori is the potential that a person has based on deep scientific knowledge.

The five potentials should appear when students work on the tasks presented in the textbook. If the five potentials do not appear, then the presentation of tasks in the textbook will potentially cause students to experience epistemological learning obstacles. When the textbook presentation is not presented epistemologically by utilizing all the potential that students have, then the knowledge, experience, way of thinking, and potential of students becomes not diverse (Hendriyanto et al., 2023). This results in the absence of verification of the validity of the newly acquired knowledge of students as a true and justifiable belief in their findings.

Based on the analysis of praxis and logos in TB and MB, it can be seen that there are some similarities and differences in the presentation of tasks in both books. In certain parts, TB is more complete than MB in presenting concepts related to function derivatives, but for other parts MB is more complete. For example, TB provides a more in-depth presentation of concepts accompanied by real examples and visual representations through graphs in bridging students to construct their understanding of the definition of derivatives according to limits that are built with a strong foundation. Meanwhile, MB is not so deep in providing a presentation of the construction of the derivative concept. MB does not provide tasks related to determining the derivative using the definition according to the limit, but the tasks given directly on determining the derivative using the rules or properties of the derivative. In addition, TB and MB also both provide the same task and technique in finding the gradient equation of a function using the concept of derivative. In this case, the incomplete presentation of the concept will certainly cause students to experience learning difficulties. This is in line with Panjaitan & Juandi (2024) which states that learning difficulties can occur due to errors in the delivery of material in textbooks, resulting in students experiencing misunderstandings in processing knowledge. Further explained by Bouck et al. (2016) that students with learning disabilities are very vulnerable to making mistakes due to a lack of understanding of the material. This is the cause of ontogenic learning barriers in students. The incomplete presentation of concepts is certainly not systematic, in the sense that the order of the concepts presented does not match the order in scholarly knowledge, which in turn has the opportunity to cause students to experience ontogenic learning obstacles. Didactics as a science considers scholarly knowledge, both in terms of sequence and content structure of the mathematical material itself, which in its presentation must be in accordance with the cognitive development of students. This is in accordance with the opinion of Aprizal Bintara and Prabawanto (2024), which states that learning that is presented not according to a systematic sequence of thinking according to the stages of students' cognitive development will cause students to experience ontogenic learning obstacles.

Praxiological analysis of learning barriers related to the concept of derivatives in Indonesian mathematics textbooks reveals a misalignment between praxis (problem-solving techniques) and logos (theoretical justification). Referring to Chevallard's (2019) research on ATD, the epistemic barriers identified reflect the gap between know-how (savoir-faire) and know-why (technologies and theories). This is evident from the dominance of procedural exercises without adequate conceptual explanations, in line with the findings of González-Martín et al. (2018) on ecological constraints in calculus learning. Based on the praxeological framework developed by Bosch and Gascón (2014), the analysis shows that textbooks tend to emphasize praxeological equipment limited to computational techniques, while discourse technology required for deep understanding is not adequately elaborated. This finding correlates with the research objective to identify epistemic barriers in derivative learning, where the praxeological framework helps uncover the root of the problem at the institutional level of the Indonesian mathematics curriculum.

In addition, if a concept is presented too testimonially in a textbook, then students will not be able to construct their own understanding, students will tend to depend on textbooks and will eventually experience difficulties when faced with different contexts. This difficulty indicates that students experience epistemological learning barriers, which are barriers that occur due to the limited concepts that students understand. This is in accordance with the opinion of Siagian et al. (2022) which states that students will experience epistemological learning obstacles when students only receive conceptual understanding from one direction, such as only getting a testimonial presentation of concepts in textbooks which will result in limited concepts owned by students.

Of the tasks in both books, there are only 2 types of tasks that are the same, namely , T_2 TB which is the same as T_4 MB which both ask students to find the equation of the tangent line and T_3 TB is the same as T_3 MB which asks students to determine the derivative of a function. As for the other tasks in TB (T_1, T_4, T_5) and MB (T_1, T_2) there are differences as described previously. The following will describe the similarities of the 2 types of tasks contained in TB and MB.

T_2 TB is the same as T_4 MB which both ask students to find the equation of the tangent line. It's just that there is a difference in the solution technique. On T_2 TB, the solution technique used is τ_2, while in T_4 MB the solution technique used is τ_8. At τ_2 before finding the gradient of the tangent line in question, students are directed to investigate whether the point presented in the problem is on the curve or not. After ensuring that the point is on the curve, then find the gradient of the tangent line which is the first derivative of the function on the curve at the requested tangent point. The last step is to substitute the obtained line gradient and the known tangent point into the straight line equation, as the final answer of the requested tangent equation. While in τ_8 for the last step, students are not directed to investigate the point presented in the problem, but students are directly directed to find the gradient of the line and substitute the point presented when finding the gradient of the line. The last step is the same as the technique in τ_2. When examined in depth, T_4 MB uses an incomplete solution technique, in this case it only applies to T_4. Students are not trained to develop their analytical skills in completing the T_4 task. T_4 only contains tasks that can be completed using low-level thinking skills, which will cause students to experience difficulties when given tasks that require higher thinking skills (Hendriyanto et al., 2023; Siagian et al., 2022). This presentation has the potential to cause epistemological learning barriers in students. The techniques used by MB in τ_8 will provide opportunities for students to experience epistemological barriers. If students are presented with other different contexts, such as if the point presented is not on the curve, then students will later be confused about solving the problem, so that it can cause students to experience epistemological barriers.

In addition, the task type T_3 TB tasks are the same as T_3 MB tasks. Of the tasks in T_3 TB and T_3 MB, there are several tasks that are the same. Based on the analysis conducted, it can be seen that in the same task, the techniques used are also the same, namely τ_8 TB is the same as τ_3 MB and τ_9 MB is the same as τ_6 MB. τ_8 TB is the same as the τ_3 MB technique, which uses the derivative search rule (algebraic derivative properties) to determine the derivative of a function. τ_9 MB technique is the same as the τ_6 TB technique is the same as TB technique, namely using the chain postulate and the algebraic derivative search rule to solve the task of determining the derivative of a function. However, MB provides a clear and complete presentation of the formation of the concept of trigonometric derivatives and chain postulates to students, so that students can know the knowledge base related to finding derivatives in trigonometric functions and finding derivatives using chain postulates. Meanwhile, TB did not provide a presentation of concepts related to the derivative of trigonometric functions and for the chain postulate, the basis for how the concept was formed was not presented. TB only directly gives examples of the use of the chain postulate. If a textbook does not provide a strong foundation related to the formation of knowledge, then what is conveyed by the textbook is not systemic. This certainly shows that the presentation of the concept of derivatives solved using chain postulates and trigonometric derivatives in TB is not presented systemically, because it is not in accordance with the presentation of concepts in the content structure of derivative material using chain postulates. So that the presentation of the concept of chain postulates and derivatives of trigonometric functions can provide opportunities for epistemic learning obstacles in students. This is in accordance with the opinion of Fuadiah (2015) and Prediger (2008) who stated that a material presentation that is not in accordance with the structure of the mathematical content itself will provide opportunities for students to experience epistemic learning obstacles.

In general, the tasks presented in both TB and MB textbooks do not differ much. Both textbooks prefer to use completion techniques that are presented testimonially to present the completion techniques in the tasks given. The testimonial presentation in question is that both textbooks directly present in full how the completion technique of the given task. This is the same as the presentation of concepts presented directly by the two textbooks. Directly presenting all the solution techniques until the final answer is obtained like this certainly does not involve students actively to construct their own understanding. Students who are not actively involved during the learning process will result in the knowledge gained by students becoming meaningless (Ayuwanti et al., 2021; Thakuri, 2023). This meaningless knowledge will make students experience difficulties when faced with similar contexts and other task contexts. With this kind of student activity featured in both textbooks, it will likely cause students to experience epistemological learning obstacles, because the tasks presented in the book are not epistemic, resulting in students will experience difficulties when faced with other contexts that are different from what was presented previously (Fuadiah, 2015; Hidayat et al., 2019). Although there are some tasks whose completion techniques are a combination of 2 knowledge presentation techniques, such as memorials with testimonials or others. However, the presentation of techniques for solving such tasks cannot be said to be epistemic because it does not use other knowledge presentations simultaneously in one task, such as memorial, perceptual, priori, and introspective.

CONCLUSIONS

In general, the presentation of tasks in TB and MB does not differ much. There are some tasks presented in TB, but not in MB, and vice versa. But in general, the two books from different curricula have many similarities in the presentation of tasks. Almost all of the tasks presented in the two books use solving techniques that are presented testimonially, which will likely cause students to experience epistemological learning obstacles, because the tasks presented in the book are not epistemic. In addition, there are some parts of the task presentation sequence that are displayed unsystematically, which is not in accordance with the sequence of concepts in scholarly knowledge, so it is likely to cause students to experience ontogenic learning obstacles. In the research that has been conducted, it can be seen that praxiological analysis can provide an overview of the characteristics of knowledge presented in textbooks in TB or MB.

Praxiological analysis of derived concepts in Indonesian mathematics textbooks reveals the need for balancing between praxis and logos components, where both textbooks analyzed show limitations in integrating tasks and solution techniques with their theoretical justifications. Based on these findings, several practical recommendations can be made to textbook authors and curriculum developers: the development of learning sequences that make explicit the relationship between praxis components, the development of examples and exercises that include technological justifications, and the provision of activities that build theoretical understanding before introducing formal techniques. Curriculum developers need to set standards that ensure praxis-logos balance in textbooks and encourage the development of materials that facilitate the transition from informal to formal understanding, so that textbooks can be realized that not only teach procedures for solving derivative problems but also build a deep understanding of the derivative concept as an integral part of a coherent system of mathematical knowledge.

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