

EMPOWERING MATHEMATICS TEACHERS IN EVALUATING TEXTBOOKS: A PRAXEOLOGICAL APPROACH TO ENHANCING CONSTRUCTIVE SKEPTICISM

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ABSTRACT

This study aims to empower mathematics teachers in evaluating textbooks through the praxeological approach and the development of a constructive skepticism attitude. Textbooks are often used without critical evaluation, which can hinder the development of students' critical thinking skills. The praxeological approach provides a framework based on practical experience, while constructive skepticism encourages in-depth analysis of textbook content. The study employed a qualitative method with a hermeneutic phenomenological approach, involving 20 mathematics teachers in Sukabumi. Data were collected using semi-structured interviews and questionnaires, which explored teachers' criteria for textbook evaluation, challenges in using textbooks, and their attitudes toward textbook content. Thematic analysis was used to analyze the data, allowing the identification of patterns and themes related to teachers' evaluation practices. The results showed that training based on praxeology and constructive skepticism improved teachers' ability to evaluate textbooks, identify weaknesses, and select more relevant materials. This study recommends collaborative training programs to support more critical textbook evaluations, with the goal of enhancing the quality of mathematics education in Indonesia.

Keywords: Evaluation of Textbooks, Mathematics Teacher Empowerment, Mathematics Learning Quality, Praxeology Approach, Constructive Skepticism.

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PRELIMINARY

Textbook evaluation is one of the fundamental aspects of mathematics education (Yacob & Landani, 2020), considering that textbooks often serve as the primary learning resource for students (Onesi-Ozigagun et al., 2024). Textbooks not only function as material guides but also as tools to build students' conceptual understanding, critical thinking skills, and creativity. However, the quality of textbooks used in schools is often a

concern (Mahmood & Saeed, 2011), as not all textbooks meet ideal pedagogical standards. According to the Programme for International Student Assessment (PISA) report, the quality of textbooks has a significant impact on students' learning outcomes (Lewis, 2014). A good textbook not only presents accurate content (McConachy, 2018), but must also be relevant to students' needs and capable of stimulating critical thinking (Jamil et al., 2024). Therefore, a systematic and in-depth evaluation of textbooks is an essential step to ensure that the material taught aligns with students' needs and supports meaningful learning.

Mathematics teachers play a central role in the textbook evaluation process. As the primary facilitators of learning, teachers are not only responsible for delivering material (Gulo, 2024) but also for assessing the effectiveness of the textbooks used. A study by Reynolds et al., (2022) shows that teachers who actively engage in textbook evaluation tend to better understand students' needs and can select textbooks that are more relevant to the learning context. However, in practice, many teachers are not yet empowered to critically evaluate textbooks. This is due to a lack of adequate training, time constraints, and pressure to meet curriculum targets (Busari et al., 2002). As a result, textbooks are often used without undergoing a thorough evaluation process (Mahmood & Saeed, 2011), potentially hindering the development of students' critical thinking skills. In this context, empowering teachers to systematically and critically evaluate textbooks becomes an urgent need.

One approach that can be used to empower teachers in evaluating textbooks is the praxeological approach (Hendriyanto et al., 2023; Melani & Herman, 2023). Praxeology, rooted in action theory, emphasizes the importance of practical experience and the interaction between individuals and their environment (Cohen, 1996). In the context of education, this approach provides a framework that enables teachers to evaluate textbooks based on their real-life classroom experiences. According to Futerman and Block (2017), praxeology focuses on how individual actions shape knowledge and how that knowledge is applied in practical situations. By using this approach, teachers can identify the strengths and weaknesses of textbooks (Ahmadi & Derakhshan, 2016) based on their relevance to students' needs and their effectiveness in supporting learning. The praxeological approach also encourages teachers to integrate their experiences into the evaluation process, resulting in a more contextual and in-depth analysis (Winterbottom & Mazzocco, 2016).

In addition to the praxeological approach, fostering a constructive skepticism attitude among teachers is also a crucial element in textbook evaluation. Constructive skepticism is a critical mindset that encourages individuals to question, analyze, and

evaluate information objectively (Quiring et al., 2021). In the context of textbook evaluation, this attitude enables teachers to avoid accepting information at face value and instead consider various perspectives before making decisions (Laabidi & Nfissi, 2016). According to Dewey (1993), skeptical and critical thinking is key to achieving deeper understanding. In mathematics education, a skeptical attitude is essential to ensure that the material being taught is not only accepted but also understood and applied by students. By developing a skeptical mindset, teachers can identify weaknesses in textbooks, such as misalignment with the curriculum, lack of local context, or insufficient stimulation for critical thinking.

However, despite its importance, the development of constructive skepticism among teachers faces several challenges. One of the main challenges is the lack of training specifically designed to develop textbook evaluation skills. Most teacher training programs focus more on mastering subject matter and teaching methods (Brown et al., 2020), while the aspect of textbook evaluation is often overlooked. Additionally, the pressure to meet dense curriculum targets (Cameron-Jones & O'hara, 2023) often leaves teachers with little time to conduct in-depth textbook evaluations. This creates a significant research gap, namely the lack of studies focusing on empowering teachers to evaluate textbooks through the praxeological approach and the development of constructive skepticism. This research aims to address this gap by offering an integrated approach to empower mathematics teachers in textbook evaluation.

Previous research on book evaluation mostly used direct analysis techniques. The study by Ahmadi & Derakhshan (2016) evaluated textbooks using a direct approach, as did the study by Mohammadi & Abdi (2014). The novelty of this research lies in the integration of the praxeological approach with the development of constructive skepticism as a framework for textbook evaluation. This approach not only provides practical guidance for teachers but also encourages them to adopt a more critical and analytical way of thinking. By combining these two approaches, this study offers an innovative solution to improve the quality of textbook evaluation, which ultimately can enhance the quality of mathematics education in schools.

The urgency of this research cannot be overlooked, especially in the context of education in Indonesia. According to the National Council of Teachers of Mathematics (NCTM, 2014), many students struggle to understand abstract mathematical concepts, a challenge often exacerbated by the use of ineffective textbooks. Additionally, a dense curriculum and the pressure to meet learning targets frequently reduce opportunities for

teachers to encourage critical thinking among students (Lujan & DiCarlo, 2006). In this situation, empowering teachers to critically evaluate textbooks becomes a strategic step toward improving the quality of mathematics education. By empowering teachers, it is expected that they can select and use textbooks that are not only relevant but also capable of fostering critical and creative thinking in students.

This study aims to empower mathematics teachers in evaluating textbooks through the praxeological approach and the development of a constructive skepticism attitude. In conclusion, empowering mathematics teachers to evaluate textbooks through the praxeological approach and the development of constructive skepticism is a crucial step in improving the quality of mathematics education. This approach not only helps teachers select more effective textbooks but also encourages them to adopt a more critical and analytical mindset. Therefore, this research is expected to make a significant contribution to creating an education system that is more high-quality and relevant to the needs of students in an increasingly complex and dynamic era.

METHODS

This study employs a qualitative approach with a focus on hermeneutic phenomenology. This approach was chosen because it allows the researcher to deeply understand the experiences of mathematics teachers in evaluating textbooks. According to Creswell and Creswell (2018), phenomenological research aims to explore the meaning of individual experiences, which in this context refers to the experiences of teachers in using and assessing mathematics textbooks. By applying a hermeneutic approach, the researcher can interpret and understand the social and cultural contexts that influence teachers' perspectives on the textbooks they use.

The selection of this method is based on the need to explore the subjective viewpoints of mathematics teachers, which are often not represented in quantitative research. In the context of education, a deep understanding of how teachers evaluate and use textbooks can provide valuable insights for curriculum and instructional material development. A study by Smith (2024) demonstrated that a thorough understanding of teachers' experiences can enhance the quality of teaching and learning. Therefore, the hermeneutic phenomenological approach is expected to provide a more comprehensive picture of the textbook evaluation process conducted by teachers.

Research Subjects

The subjects of this study consist of mathematics teachers who are members of the Mathematics Subject Teacher Forum (Musyawarah Guru Mata Pelajaran or MGMP) at Madrasah Aliyah schools in Sukabumi Regency. The selection criteria for the subjects include a minimum of three years of teaching experience and active participation in MGMP activities. These criteria are expected to yield relevant and representative data regarding textbook evaluation practices among teachers. A total of 20 mathematics teachers were involved in this study, and all of them participated in semi-structured interview sessions. The research was integrated into a Community Service (PkM) program.

The subject selection technique used was snowball sampling, where the researcher began with a few known teachers and then asked them to recommend other teachers who met the study criteria. This method is effective in reaching hard-to-access populations, such as teachers who may not actively participate in public forums. A study by Noy (2008) highlights that snowball sampling can help researchers identify participants with similar experiences, thereby enhancing the validity of the collected data.

Data Collection Techniques

The primary data collection technique in this study is in-depth interviews with mathematics teachers. The interviews will be conducted in a semi-structured format, where the researcher will use an interview guide while allowing participants the freedom to share their views and experiences openly. According to Vaivio (2012), in-depth interviews enable researchers to explore the meaning and context of individual experiences. This approach is expected to provide rich and detailed data on how teachers evaluate textbooks and the challenges they face in the process. The interview questions were designed to explore several key indicators related to textbook evaluation practices, including:

1. Teachers' criteria for selecting and evaluating textbooks.
2. Challenges faced in using textbooks in classroom teaching.
3. The alignment of textbook content with the curriculum and students' needs.
4. Teachers' perceptions of the relevance and effectiveness of tasks, techniques, technology, and theoretical frameworks presented in the textbooks.
5. Suggestions for improving the quality and usability of textbooks.

Textbook evaluation was conducted using a praxeological perspective, analyzing the textbooks based on four key components: tasks, techniques, technology, and theory

(Chevallard, 2019). This approach allows for a comprehensive and systematic assessment, examining the relevance and effectiveness of the tasks and activities, the appropriateness of the teaching techniques, the optimal use of technology to enhance learning, and the relevance and currency of the underlying theoretical framework. By analyzing these four components, educators can identify the strengths and weaknesses of the textbooks more thoroughly, enabling them to adapt or supplement the materials to be more contextual and relevant to students' needs.

The textbooks evaluated in this study were mathematics textbooks commonly used in Madrasah Aliyah schools in Sukabumi Regency. The evaluation process was guided by a praxeological perspective, focusing on four key components:

1. Tasks: The types of exercises and problems provided in the textbooks.
2. Techniques: The teaching methods and strategies suggested in the textbooks.
3. Technology: The integration of tools and resources, such as digital platforms or manipulatives, to enhance learning.
4. Theory: The underlying theoretical framework and its alignment with current educational standards and practices.

In addition to interviews, questionnaires will also be used as a data collection tool to gather supplementary information about teachers' perspectives and attitudes toward textbooks. The questionnaire will be designed with both open-ended and closed-ended questions to allow for a more comprehensive analysis. The study examined teachers' attitudes toward textbooks using specific indicators, including:

1. Perceived usefulness of the textbook in supporting teaching and learning.
2. Satisfaction with the content quality and relevance of the textbook.
3. Willingness to adapt or supplement the textbook to meet students' needs.
4. Level of trust in the textbook's alignment with the curriculum.

According to Fink (2024), a well-designed questionnaire can provide valid and reliable data, as well as help researchers identify trends and patterns in teachers' responses.

Data Analysis Techniques

The data analysis in this study was conducted using qualitative analysis techniques, specifically thematic analysis. Thematic analysis allows researchers to identify, analyze, and report patterns (themes) within the collected data. The steps in this analysis include familiarization with the data, coding, searching for themes, and reviewing themes. According to Braun and Clarke (2006), thematic analysis is a flexible method that can be applied in various research contexts. By using this technique, the researcher aims to

uncover in-depth insights into how mathematics teachers evaluate textbooks and how this process can contribute to fostering constructive skepticism among teachers.

RESULT AND DISCUSSION

The initial findings from in-depth interviews indicate that the primary learning resource used by teachers is the textbooks published by the Indonesian government. A small number of teachers ($n=3$) also reported using supplementary teaching materials published by private publishers. In the teaching process, the majority of teachers ($n=15$) stated that they fully adopt the content of the textbooks as their main guide. Modifications made by teachers are generally limited to the teaching approaches or models used, while the sequence of materials, example problems, and the presentation format remain aligned with the structure provided in the textbooks.

One teacher stated, "I always use the government-issued textbooks as my main guide. If there are any additions, they are usually from other books that I find relevant, but that's very rare." (Subject A, Interview, 2024). Another teacher added, "I follow the materials and sequence from the textbooks. I only adjust the teaching methods, such as using group discussions or Q&A sessions, to make it more engaging for students." (Subject B, Interview, 2024). However, there are also teachers who expressed feeling constrained by the content of the textbooks. "Sometimes I feel that the material in the textbooks doesn't fully meet the students' needs, but I still use it because it's already the standard," revealed another teacher (Subject C, Interview, 2024).

Thus, it can be concluded that government-issued textbooks remain the primary resource in teaching, with minimal variation from other teaching materials. Additionally, although teachers have the freedom to modify their teaching approaches, they tend to strictly adhere to the structure and content of the textbooks.

These findings suggest a tendency to accept something as true or valid without questioning or critically evaluating it in depth. In this context, teachers exhibit a credulous attitude toward government-issued textbooks, where they tend to regard the content of the textbooks as authoritative and unquestionable. This is evident from the teachers' statements, which show that they fully follow the structure, sequence of materials, and example problems provided in the textbooks, even though some of them feel that the material does not fully align with the students' needs.

Based on further interview results, it was found that this credulous attitude is influenced by several factors, such as trust in the government's authority to provide

standardized teaching materials, limited time to search for or develop alternative resources, and a lack of training or encouragement to think critically about learning resources. As stated by Subject C, "I feel that these textbooks are already the standard, so I don't really think about looking for other materials."

In response to the initial findings, which showed a tendency among teachers to fully rely on textbooks without questioning or adapting their content, the researchers organized a training program aimed at encouraging teachers to think critically about learning resources. This training was designed with both theoretical and practical approaches, aiming to provide teachers with a deep understanding as well as analytical skills.

The training began with a theoretical presentation on the nature of knowledge and sources of knowledge, intended to help teachers understand that knowledge is dynamic and not always absolute. Following this, the researchers introduced the concept of praxeology, a theory that emphasizes the relationship between practice and theory in the learning process. This explanation provided teachers with a framework for critically analyzing learning resources.

As part of the training, teachers participated in hands-on practice analyzing textbooks using the praxeological theory. During this session, the researchers emphasized that textbooks are written in a general and subjective manner, meaning they do not always align with the specific needs of students in every learning context. Therefore, teachers were encouraged to make corrections and adjustments to textbook content to better suit their students' needs.

Interviewer : *What did you realize about textbooks after attending the training?*

Teacher : *I just realized that textbooks are not always perfectly aligned with*
(Subject D) *students' needs. Through this training, I learned how to analyze*
materials and adapt them to make them more contextual.

Interviewer : *How did the concept of praxeology influence your perspective on*
teaching and textbooks?

Teacher : *The concept of praxeology really helped me understand that theory and*
(Subject E) *practice must go hand in hand. Textbooks are just one resource, and I*
need to be more critical in using them.

Interviewer : *How has this training impacted your confidence in evaluating textbooks?*

Teacher : *This training opened my eyes to how I can critically evaluate textbooks. I*
(Subject A) *now feel more confident in determining whether a book is suitable for use*
in the classroom.

Survey results conducted after the training showed that 85% (n=17) of teachers found the training very helpful in improving their understanding of textbook evaluation, 10% (n=1) felt it was somewhat helpful, and only 5% (n=1) felt there was no significant

change. This data indicates that the training had a significant positive impact on teachers' evaluation skills. Teachers were not only able to evaluate textbooks more critically but also able to systematically identify the strengths and weaknesses of the books. This was evident from the improved evaluation scores conducted by teachers after the training. One teacher remarked, "I can now view textbooks from a broader perspective. I don't just focus on the content but also on how the material is presented and whether it meets the students' needs." (Subject C, Interview, 2024).

Additionally, survey data revealed that after the training, 90% (n=18) of teachers felt more confident in evaluating textbooks, and 75% (n=15) of them reported having applied these new skills in selecting textbooks for their classes. These training outcomes indicate that teachers have begun to understand the importance of thinking critically about learning resources and have realized that textbooks are not the only source that must be followed rigidly. Thus, the training successfully provided teachers with new insights, enabling them to be more reflective and adaptive in utilizing learning resources.

Empowering mathematics teachers to evaluate textbooks is a strategic initiative to improve the quality of classroom learning. This study highlights the effectiveness of collaborative training programs, such as those conducted through Musyawarah Guru Mata Pelajaran (MGMP, or Subject Teacher Working Groups), in enhancing teachers' confidence and analytical skills. These findings align with research by Jurkowski and Abramczyk (2024), which demonstrated that teacher collaboration fosters knowledge sharing, self-efficacy, and the adoption of innovative teaching methods. Collaboration among teachers from different schools facilitates the exchange of experiences and ideas, enabling them to learn from diverse perspectives and apply these insights to their teaching practices.

Recent studies underscore the positive impact of teacher empowerment programs on education quality in Indonesia. These programs have been shown to improve teachers' evaluation skills, curriculum implementation, and overall performance (Mawardi, 2021; Setiati et al., 2024; Subroto, 2012). For instance, Divayana et al. (2022) found that empowered teachers exhibit enhanced cognitive abilities and satisfaction in evaluating asynchronous learning environments. Such programs are particularly relevant in the context of Indonesia's new Merdeka Curriculum, where teachers are expected to critically assess textbook quality and relevance to support student-centered learning. However, challenges remain, including the need to transition from teacher-centered pedagogies to more student-centered approaches (Zulfikar, 2018). Continuous evaluation of teacher

education programs, such as the Teacher Profession Education Program (PPG), is essential for identifying areas of improvement and providing actionable feedback (Sari et al., 2023). Empowerment evaluation approaches, as suggested by Clinton and Hattie (2015), can further support teachers in their roles as evaluators, fostering ongoing professional development.

The praxeological approach, which emphasizes the interplay between theory and practice, has emerged as a promising framework for textbook evaluation. This approach provides a structured method for analyzing textbooks by examining tasks, techniques, technologies, and theoretical underpinnings (Wijayanti & Winslow, 2017; Yunianta et al., 2023). Recent studies employing praxeological analysis have revealed critical insights into textbook content, including issues such as poor task sequencing, lack of context-relevant examples, and insufficient guidance for independent learning (Melani & Herman, 2023). For example, Yunianta et al. (2023) identified deficiencies in mathematics textbooks that hinder students' ability to acquire theoretical knowledge independently. Comparative studies have also highlighted differences in textbook design across countries, particularly in terms of content organization and cultural considerations (Hendriyanto et al., 2023; Takeuchi & Shinno, 2020). These findings underscore the importance of tailoring textbooks to meet the specific needs of students within their cultural and educational contexts.

Praxeological analysis has been applied to various mathematical topics, including proportion, geometry, and set theory, providing valuable insights into how these subjects are presented in textbooks (Azzahra et al., 2022; Siagian et al., 2023; Wijayanti, 2019). This method has also been extended to other disciplines, such as language education, where it has been used to analyze grammatical features in textbooks (Syihabuddin et al., 2024). Researchers have proposed using praxeological reference models to create quantitative profiles of textbooks, enabling systematic comparisons and evaluations (Wijayanti & Winslow, 2017). Additionally, incorporating student feedback into textbook evaluation and development has been emphasized as a critical factor in creating more effective learning materials (Knecht & Najvarová, 2010). The potential of praxeological learning in teacher education programs has also been explored, highlighting its role in preparing teachers to critically evaluate and adapt educational resources (Winterbottom & Mazzocco, 2016).

Textbook evaluation is a critical process for ensuring the quality of teaching and learning (Kalyany Ponnusamy et al., 2021). Research has consistently shown that teachers

generally hold positive perceptions of textbook evaluation and recognize its importance in selecting appropriate materials for their classrooms (Ahmadi & Derakhshan, 2016). Through evaluation, teachers can identify the strengths and weaknesses of textbooks, such as their coverage of essential skills, alignment with curriculum standards, and cultural relevance (Hanifa, 2018). In recent years, there has been a growing emphasis on incorporating critical thinking skills into textbook evaluation (Nainggolan & Wirza, 2021), as these skills are essential for fostering deeper learning and preparing students for complex problem-solving tasks.

Recent research highlights the importance of constructive skepticism in various domains. In media studies, constructive skepticism is associated with higher media trust, while dysfunctional cynicism leads to lower trust (Quiring et al., 2021). In auditing, professional skepticism is conceptualized as both a mindset and an attitude, crucial for audit quality (Nolder & Kadous, 2018). Skepticism is also recognized as an important factor in human-information behavior, with rational skepticism considered a healthy trait for information-seekers (Giarlo, 2006). These findings underscore the significance of constructive skepticism across various fields. A constructive skepticism attitude has emerged as a key factor in improving the textbook evaluation process. This mindset encourages teachers to move beyond passively accepting textbook content and instead critically question its relevance, accuracy, and quality. By doing so, teachers can ensure that the materials they use are not only aligned with curriculum standards but also meet the specific needs of their students. Constructive skepticism, therefore, plays a vital role in enhancing the quality of textbook evaluations, which ultimately contributes to improving classroom learning outcomes.

Given the importance of textbook evaluation, it is crucial for education stakeholders—including the government, textbook publishers, and teacher training institutions—to actively support teacher empowerment programs that focus on developing evaluation skills and critical thinking. These programs should incorporate collaborative training sessions, the use of information technology, and the integration of innovative frameworks such as the praxeological approach. Collaborative training, such as those conducted through Musyawarah Guru Mata Pelajaran (MGMP), can provide teachers with opportunities to share experiences and learn from one another, fostering a deeper understanding of textbook evaluation practices. Moreover, textbook publishers should involve teachers in the textbook development process to ensure that the materials produced are better aligned with students' needs and the current curriculum. By including teachers in

this process, publishers can gain valuable insights into classroom realities and create textbooks that are not only pedagogically sound but also contextually relevant. This collaborative approach can bridge the gap between textbook design and practical classroom application, ultimately leading to improved teaching and learning experiences.

In conclusion, textbook evaluation is a vital component of quality education, and fostering critical thinking and constructive skepticism among teachers is essential for enhancing this process. By empowering teachers through targeted training programs and involving them in textbook development, education stakeholders can ensure that textbooks serve as effective tools for supporting student learning and achieving curriculum goals.

CONCLUSION

This study highlights the importance of empowering mathematics teachers to evaluate textbooks through the praxeological approach and the development of a constructive skepticism attitude. Textbooks, as the primary learning resource, are often used without critical evaluation, which can hinder the development of students' critical thinking skills. The praxeological approach provides a framework that enables teachers to evaluate textbooks based on practical classroom experiences, while constructive skepticism encourages teachers to question and deeply analyze the content of textbooks.

The findings of the study indicate that training based on praxeology and constructive skepticism significantly improves teachers' ability to evaluate textbooks. Trained teachers were able to identify weaknesses in textbooks, such as misalignment with students' needs and a lack of stimulation for critical thinking. This training also boosted teachers' confidence in selecting and using textbooks that are more relevant and effective. Thus, this approach not only enhances the quality of textbook evaluation but also contributes to improving the quality of mathematics education in schools.

The study recommends the development of collaborative training programs involving teachers, the government, and textbook publishers to support more critical and contextual textbook evaluations. By integrating the praxeological approach and constructive skepticism, it is expected that the quality of mathematics education in Indonesia can be significantly improved.

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