

Shifting Teachers' Attitudes or Developing Innovative Didactical Designs: Which Should Come First?

Anton Nasrullah¹, Didi Suryadi², Agus Hendriyanto³, Lukman Hakim Muhaimin⁴

¹ Universitas Pendidikan Indonesia, Bandung, Indonesia; antonnasrullah@upi.edu

² Universitas Pendidikan Indonesia, Bandung, Indonesia; ddsuryadi1@gmail.com

³ Universitas Nusa Putra, Sukabumi, Indonesia; agus.hendriyanto@nusaputra.ac.id

⁴ Universitas Pendidikan Indonesia, Bandung, Indonesia; muhaiminlukman@upi.edu

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ABSTRACT

In mathematics education, the process of knowledge transposition—how academic content is adapted for classroom use—is shaped by teachers' attitudes and instructional practices. In Indonesia, little is known about how mathematics teachers critically engage with textbooks and curricular materials during this process. This qualitative study employed an interpretative phenomenological analysis to explore the lived experiences of five experienced mathematics teachers from reputable schools in Bandung and Surakarta. Data were collected through semi-structured, in-depth interviews and analyzed thematically to uncover patterns in teachers' perceptions and practices related to instructional materials. The findings reveal a strong reliance on textbooks as primary teaching references, often accompanied by uncritical acceptance of their content. Teachers tended to assume that government-issued or commercially published textbooks were scientifically accurate, without cross-referencing them against academic sources. This passive approach to knowledge adaptation raises the risk of perpetuating conceptual misunderstandings in the classroom. While some teachers expressed skepticism, they lacked the confidence or institutional support to challenge existing materials. These results suggest a need for professional development programs that promote critical curriculum analysis, reflective teaching practices, and collaborative content evaluation. Supporting teachers to act not merely as content deliverers, but as informed and critical mediators of knowledge, is essential for effective didactic transposition and improved student learning outcomes.

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Corresponding Author:

Didi Suryadi

Universitas Pendidikan Indonesia, Bandung, Indonesia; ddsuryadi1@gmail.com

1. INTRODUCTION

The effectiveness of knowledge transmission in mathematics education is significantly shaped by the attitudes, beliefs, and instructional approaches adopted by teachers. Teachers do not merely deliver content; they interpret, filter, and reconstruct knowledge in ways that influence how students understand

mathematical concepts. In the Indonesian educational context, the process of adapting academic knowledge for classroom use—commonly referred to as didactic transposition—remains a critical and complex issue, particularly in the teaching of foundational topics such as set theory. The quality of this transposition process often determines whether students develop a deep understanding of mathematical concepts or instead face persistent misconceptions. Teachers' instructional decisions are deeply intertwined with the resources they rely on, particularly textbooks, which often serve as the primary—if not sole—reference for classroom instruction.

Research indicates that Indonesian mathematics teachers frequently depend on textbooks without thoroughly evaluating the accuracy, depth, or pedagogical soundness of the content they contain (Hendriyanto et al., 2023). This dependence poses a risk when textbooks include conceptual errors, outdated representations, or misaligned curricular content. The uncritical use of such materials may unintentionally propagate misconceptions and hinder conceptual understanding among students. This situation underscores the importance of understanding not only what knowledge is delivered in classrooms, but also how and why it is delivered in particular ways. Didactic transposition is not a neutral process; it is shaped by teacher perceptions, curricular mandates, institutional constraints, and the design of instructional tools such as textbooks.

The Anthropological Theory of the Didactic (ATD), first introduced by Chevallard, offers a comprehensive framework for analyzing how knowledge is institutionally and culturally shaped as it moves from scholarly domains to the classroom (Bosch, 2014; Chevallard, 2019). Central to this theory is the concept that educational knowledge is not simply transferred; rather, it is transformed by various actors—including teachers, textbook authors, curriculum developers, and policymakers—according to institutional norms and pedagogical purposes. ATD provides a powerful lens through which to examine the mechanisms and constraints of knowledge adaptation, shedding light on the systemic factors that influence teaching practices. Despite its relevance, ATD remains underutilized in the Indonesian context, where empirical studies on didactic transposition, particularly in mathematics education, are still relatively scarce.

Recent studies have revealed significant challenges within Indonesian mathematics education, especially in terms of curricular alignment and textbook content. For instance, inconsistencies have been observed between the knowledge presented in textbooks and current mathematical or pedagogical standards (Hendriyanto et al., 2024; Sahara et al., 2025). These inconsistencies contribute to the formation of learning obstacles, as defined by ATD, wherein students struggle with content due to flawed didactic design rather than cognitive incapacity. While some international research has explored the influence of textbooks on teaching practices (Pepin & Haggarty, 2001b; Remillard, 2005), there remains a noticeable gap in studies that critically examine the interaction between teachers' attitudes, textbook use, and the broader processes of knowledge transposition within Indonesia's national curriculum framework.

Addressing this gap, the present study investigates how Indonesian mathematics teachers engage with curriculum materials, particularly textbooks, and how their attitudes and beliefs shape the didactic transposition process. Specifically, the research is guided by two key questions: (1) In what ways do teachers' attitudes influence the transformation of mathematical knowledge for classroom instruction? (2) What best practices can be identified to strengthen knowledge delivery and enhance student learning outcomes? By focusing on these questions, the study aims to uncover both the structural and individual factors that affect the effectiveness of knowledge transmission in Indonesian mathematics classrooms.

Ultimately, this research contributes to the growing body of literature on didactic transposition by contextualizing it within Indonesian mathematics education and grounding it in the theoretical insights of ATD. Furthermore, it provides practical implications for improving mathematics instruction through better textbook evaluation, enhanced teacher training, and more coherent curriculum development. By highlighting the critical role of teacher agency and institutional design in shaping educational content, the study seeks to inform future policies aimed at elevating the quality of mathematics learning across Indonesia.

2. METHODS

This study employs a qualitative approach with an interpretive phenomenological design to gain an in-depth understanding of mathematics teachers' experiences and attitudes in the knowledge transposition process. This research is exploratory in nature, given the limited number of participants, thus the findings are more indicative of an initial mapping and cannot be widely generalized. Therefore, further research with a larger sample size is highly recommended to test and expand upon these findings.

2.1. Participant Selection

The participants in this study consisted of five mathematics teachers from reputable schools in Bandung and Surakarta, each with a minimum of five years of teaching experience. Participants were selected using a purposive sampling method, based on specific considerations relevant to the research objectives, such as teaching experience, educational background, and active involvement in curriculum development or Subject Teacher Deliberation Forum (MGMP). These inclusion criteria were chosen to ensure that participants possessed adequate insights and experiences related to the research topic.

2.2. Interview Process

Data collection was conducted through semi-structured in-depth interviews. Each interview lasted between 45 to 60 minutes, was audio-recorded with the participants' consent, and then transcribed verbatim. The interview guide was developed based on the research objectives, covering questions about teaching experiences, textbook usage, attitudes towards instructional materials, and the process of adapting knowledge before it is delivered to students. During the interviews, the researcher also employed probing techniques to elicit more detailed information based on participant responses.

2.3. Data Analysis

Qualitative data analysis was performed thematically, following these stages:

1. Transcription and Verification: All interview recordings were transcribed and re-verified to ensure data accuracy.
2. Initial Coding: The researchers thoroughly read all transcripts, then performed open coding to identify units of meaning relevant to the research focus.
3. Theme Identification: The emerging codes were grouped based on similarities in meaning, and then developed into main themes. This process was iterative, involving discussions among research team members to reach a consensus.
4. Data Validity Check: Data validity was maintained through triangulation among researchers, focus group discussions (FGDs), and member checking with participants to ensure that the researchers' interpretations aligned with their experiences.

3. FINDINGS AND DISCUSSION

3.1. Teachers' Reliance on Textbooks

The data reveal a strong and consistent reliance on textbooks among mathematics teachers as the primary source for instructional design and classroom practice. Most teachers reported that the textbooks recommended by the school or government serve as the main reference point for lesson planning and content delivery. As Teacher T1 explained: *"When I design teaching materials, I generally use the textbooks recommended by the school. These textbooks provide a basic framework that aligns with our curriculum."*

This reliance is not limited to government-issued textbooks. Some teachers also utilize materials from private publishers and online sources, as described by another participant: *"I am glad that the school supports us in using materials from private publishers. This gives us access to various materials that can enrich learning content. Furthermore, I also actively explore internet sources to find innovative ideas that I can apply in class."*

However, the focus of these efforts is often on increasing content diversity rather than ensuring the conceptual accuracy or epistemic quality of the material. Teachers rarely scrutinize the underlying scientific validity of the content, instead assuming that textbooks—especially those issued by the government—have already been thoroughly vetted by experts. This is evident in Teacher T1's response:

R: *I apologize, sir. Have you never checked the content of the textbook before teaching?*

T1: *Never. The book is already good, primarily since the government issued it, and it must have been reviewed by many experts, right?*

This pattern is consistent with findings from Pepin & Haggarty (2001a), Remillard (2005), and Parks & Wager (2015), who note the centrality of textbooks in shaping teaching practices. The Anthropological Theory of Didactics (ATD) frames textbooks as institutional artifacts that mediate the transposition of scholarly knowledge into classroom practice (Chevallard, 2019). However, the findings here suggest that this mediation is often passive, with teachers acting as implementers rather than critical evaluators or adaptors of knowledge.

3.2. Teachers' Critical Evaluation of Materials

Despite the availability of multiple reference sources, most teachers do not engage in critical evaluation of the alignment between textbook content and scientific or academic knowledge. Teacher T3's responses illustrate this credulous attitude:

R: *In your opinion, is there anything odd about the book?*

T3: *What do you mean by odd?*

R: *Are the materials already appropriate, or does something still need to be fixed?*

T3: *I never checked, but based on its presentation, it already suits the characteristics of middle school students.*

R: *From the perspective of the material's alignment in the textbook with its scientific knowledge?*

T3: *Scientific knowledge?*

R: *I mean, the alignment with the original mathematical theory.*

T3: *Oh, I have never gone that far. I often focus more on presenting material with various content to capture students' attention rather than ensuring the concepts' accuracy because the book has undergone a rigorous selection process.*

Teacher T2, while more skeptical, still does not use their academic background to critically evaluate the material:

R: *Well, you actively seek new references to understand teaching methods. However, have you ever reviewed your understanding of the course during your undergraduate studies so that it becomes a consideration for designing learning?*

T2: *I feel my knowledge during college was too heavy, haha (laughs), especially for kids nowadays. Then, we try to be effective in one lesson. I was just trying to be creative or innovative. If the kids do not understand, it is the same. It is better to be clear about what the kids need to know and understand.*

Teacher T4 shows some critical awareness, but only in certain aspects:

R: *Have you ever checked the materials in this book for acceptance or something like that?*

T4: *Yes, sometimes, you know, some books immediately lead to this set; sometimes, some explanations are more extensive.*

Teacher T5 is sceptical about the validity of questions and answers, but not about the material itself: *He more often evaluates questions than book materials and prefers to find alternative references rather than relying solely on textbooks when looking for question references. However, he also acknowledges that errors in the book materials are rarely found, but he more often needs help with questions.*

This lack of critical engagement is problematic. According to the Anthropological Theory of the Didactic (ATD), teachers are not merely passive transmitters of knowledge but are expected to act as agents who actively interpret, adapt, and justify didactic content for their students (Bosch, 2014; Winsløw, 2011). This role requires a deep understanding of both the subject matter and the institutional context in which knowledge is delivered. Dole (2000) and Crowley (2009) also emphasize the

importance of fostering reflective teaching practices, arguing that educators should not accept curricular materials at face value but should engage in continuous scrutiny of their pedagogical value and epistemological soundness. Reflective practice enables teachers to identify potential learning obstacles and adapt instructional strategies accordingly. However, the findings in this study suggest that several factors inhibit this kind of professional engagement. Institutional pressures—such as a rigid adherence to standardized curricula, an overemphasis on examination outcomes, and hierarchical school structures—often limit teachers' autonomy and discourage innovation in content delivery. In addition, limited time for lesson preparation, high teaching loads, and insufficient training in curriculum analysis further prevent teachers from critically evaluating the resources they use (Strong & Yoshida, 2014). Moreover, a lack of professional learning communities or collaborative planning sessions deprives teachers of opportunities to discuss and refine their interpretations of curricular materials. Without systemic support and professional development opportunities that emphasize critical engagement and didactic reasoning, teachers may continue to rely uncritically on textbooks, perpetuating misconceptions and missed learning opportunities in the classroom.

3.3. Variations in Teachers' Attitudes and Professional Culture

This study reveals a continuum of teacher attitudes toward textbooks and the process of didactic transposition, ranging from uncritical acceptance to emerging, yet constrained, scepticism. Several teachers—such as T1 and T3—demonstrated a high level of trust in the textbook content, using it as the primary and unquestioned source of instructional material. In contrast, others like T2 and T5 expressed some degree of doubt about the accuracy and appropriateness of the material but lacked the confidence, resources, or institutional support to engage in a meaningful critique or make substantial pedagogical changes. This indicates that, while awareness of potential content issues exists among some teachers, the capacity to act upon this awareness remains limited.

A recurring theme in the interviews was the prioritization of practicality and student engagement over conceptual accuracy. Even when teachers identified inconsistencies or inaccuracies in textbook material, they often continued using it for the sake of instructional efficiency. This pragmatic approach underscores the tension between curricular fidelity and pedagogical convenience. As one teacher noted, *"It's easier to follow the book than to try to explain something students are not familiar with, especially when we don't have time to explore alternatives."* This trade-off between content precision and classroom manageability reflects structural constraints that shape teaching decisions, particularly under time pressures and high curricular loads.

The institutional culture surrounding professional development and collaboration also plays a significant role in shaping these attitudes. A teacher who serves as the Chair of the Subject Teacher Deliberation Forum (MGMP) at the school level explained, *"In the City MGMP forum, we hardly ever discuss the inaccuracies of mathematics textbooks regarding whether the concepts or theories are right or wrong. Teachers tend to focus more on discussions related to teacher-student interactions or discuss learning achievements related to the material."* This statement highlights how professional dialogues often emphasize pedagogy and assessment outcomes rather than critical examination of content validity. Other teachers echoed this sentiment, confirming that inter-collegial discussions rarely address the epistemological or theoretical soundness of the materials being used. Such a professional culture reinforces a passive acceptance of textbook content and discourages the kind of reflective practice advocated by scholars like Dole (2000) and Crowley (2009).

According to the Anthropological Theory of the Didactic (ATD), this pattern reflects a broader institutional phenomenon in which teachers operate within a didactic contract shaped by curriculum standards, institutional expectations, and available resources (Bosch, 2014; Chevallard, 2019). In this context, the textbook assumes the role of a stable and legitimized "reference text" (*texte de référence*), and questioning it becomes institutionally marginalized or discouraged. The prevailing norms thus contribute to what might be termed a credulous didactic culture, wherein knowledge is rarely questioned and is instead treated as fixed and authoritative.

However, the study also uncovered moments of critical awakening. After participating in a Focus Group Discussion (FGD) with mathematics experts, several teachers acknowledged that they had been delivering conceptually flawed or incomplete material. For many, this was the first time they had been exposed to an in-depth critique of textbook content from a disciplinary perspective. The FGD served as a catalyst for reflection, unquestioningly prompting teachers to reassess the content they had previously accepted. This shift suggests that professional development programs—especially those that include interaction with content specialists—can foster more critical and reflective stances toward curricular materials.

Such realizations point to the transformative potential of collaborative reflection in professional learning. When given structured opportunities to engage with both content experts and peers in a non-evaluative setting, teachers may begin to reframe their role from implementers of prescribed knowledge to co-constructors of educational meaning. This aligns with the ATD's emphasis on institutional ecology and the necessity for teachers to actively participate in shaping the didactic environment (Winsløw, 2011). Moreover, these findings suggest that fostering critical engagement requires more than individual motivation—it necessitates systemic support, time allocation, and a shift in professional norms that validate questioning as an essential part of teaching practice.

In summary, while credulous reliance on textbooks persists as a dominant trend, the study also identifies points of intervention—namely, reflective dialogue and exposure to disciplinary critique—that can disrupt passive transmission and encourage more nuanced, agentic approaches to knowledge transposition. These findings highlight the need for more robust teacher education and professional development initiatives that explicitly address content analysis, curricular critique, and the sociocultural dimensions of didactic practice.

3.4. Theoretical Implications: Didactic Transposition and the Role of Agency

The findings of this study contribute meaningfully to the theoretical discourse on didactic transposition by illustrating the complex interplay between institutional artifacts—particularly textbooks—and teacher attitudes in shaping the mathematical knowledge that is ultimately presented in the classroom. Drawing on the Anthropological Theory of the Didactic (ATD), the study reaffirms the view that the transposition of knowledge from the scholarly domain to educational settings is not a straightforward or neutral process, but one mediated by institutional norms, curricular frameworks, and the agency of teachers (Bosch & Gascón Pérez, 2009; Chevallard, 2019). While ATD acknowledges the role of institutions and individual actors in this process, the current research extends the theoretical conversation by emphasizing the risks of epistemic stagnation—a condition in which knowledge becomes static and unquestioned—when teachers engage with textbooks uncritically and treat them as authoritative sources without reflective scrutiny.

This stagnation is particularly problematic in contexts where the institutional culture promotes procedural teaching and discourages critical engagement with content. The study demonstrates that when teachers lack the training, time, or confidence to interrogate the materials they use, the didactic transposition process may lead to the reinforcement of misconceptions, rather than their resolution. In such cases, textbooks function less as flexible pedagogical tools and more as rigid epistemic scripts, constraining the possibilities for deeper conceptual understanding. This finding aligns with concerns raised in previous research about the "reification" of curricular materials—that is, their uncritical acceptance as fixed representations of disciplinary knowledge (Ball & Cohen, 1996; Remillard, 2005).

Furthermore, this study challenges the often implicit assumption in education policy and curriculum design that providing high-quality textbooks is, in itself, sufficient to guarantee effective knowledge transmission. Although the quality of instructional materials is undeniably important, the findings suggest that teacher agency and reflective capacity are equally crucial. Without the ability and encouragement to critically adapt, supplement, or even reject parts of the textbook content, teachers may inadvertently perpetuate inaccuracies or omit essential conceptual distinctions. In this regard, the findings underscore the necessity of empowering teachers as reflective practitioners who are not only

deliverers of prescribed content but also active participants in the construction of educational knowledge (Eales-Reynolds et al., 2013; Voss, 2022).

The study also reinforces the argument that professional development must go beyond technical training and include opportunities for deep content reflection, critical curriculum analysis, and collaboration with disciplinary experts. Structured engagement in these practices can help teachers develop the evaluative skills required to navigate the tensions between curricular mandates and disciplinary integrity. Such professional learning environments can disrupt the overreliance on textbooks and foster a culture of epistemic vigilance, where teachers become attuned to the underlying assumptions, omissions, and inaccuracies that may exist in instructional materials.

In sum, the findings of this study provide both a theoretical and practical contribution to the understanding of didactic transposition. Theoretically, they emphasize the dual influence of institutional structures and teacher attitudes in shaping transposed knowledge. Practically, they highlight the urgent need for systemic interventions—particularly in the form of sustained, content-focused professional development—that equip teachers with the critical tools necessary to engage with educational content thoughtfully and adaptively. Ultimately, improving the quality of mathematics education requires not only better materials, but also better-prepared teachers who can critically mediate those materials in ways that align with both disciplinary standards and student understanding.

3.5. Extending and Challenging Previous Research

This study supports earlier work on the influence of textbooks in mathematics education but adds nuance by documenting the limited critical engagement of teachers with these materials in the Indonesian context. While previous studies have noted the potential for textbooks to both support and hinder learning (Kajander & Lovric, 2009; O’Keeffe & O’Donoghue, 2011), this research demonstrates that teacher attitudes are a crucial mediating factor. The findings also suggest that institutional and cultural factors may reinforce credulous attitudes, pointing to the need for systemic interventions at the level of teacher education and curriculum policy.

3.6. Recommendations and Future Directions

Given the exploratory nature of this study and its limited sample size, the findings should be interpreted as indicative rather than definitive. Future research with larger and more diverse samples is needed to further investigate the dynamics of teacher attitudes, textbook use, and didactic transposition across different educational contexts. Professional development programs should prioritize training teachers in critical curriculum analysis and collaborative curriculum development, in line with the principles of the Anthropological Theory of Didactics. Collaborative forums, such as MGMP, should be leveraged not only for pedagogical sharing but also for critical examination of curricular content and alignment with scientific knowledge.

In summary, this study reveals that while textbooks remain central to mathematics teaching in Indonesia, teachers’ uncritical reliance on these materials may perpetuate misconceptions and limit opportunities for meaningful knowledge transposition. By situating these findings within the ATD framework and existing literature, the study highlights the need for a more reflective, critical, and collaborative approach to curriculum implementation and teacher professional development. The inclusion of full interview quotes provides a nuanced and authentic understanding of teachers’ perspectives, while the comprehensive thematic analysis offers a robust foundation for future research and policy recommendations.

4. CONCLUSION

This study reveals that Indonesian mathematics teachers predominantly rely on textbooks as their main instructional resource, often without critically evaluating the accuracy or scientific alignment of the content. The findings highlight a spectrum of teacher attitudes, ranging from unquestioning

acceptance to limited scepticism, with most teachers prioritizing practicality and student engagement over conceptual rigor. This uncritical reliance on textbooks, as framed by the Anthropological Theory of Didactics, risks perpetuating misconceptions and limiting the effectiveness of knowledge transposition in the classroom.

These insights have several practical implications for teaching strategies and educational policy. First, there is a clear need to empower teachers as reflective practitioners who are capable of critically analyzing and adapting curricular materials. Professional development programs should focus on building teachers' skills in curriculum analysis, critical evaluation, and collaborative curriculum development. Schools and educational authorities should encourage and facilitate regular forums—such as MGMP—not only for sharing pedagogical practices but also for collectively reviewing and improving the scientific accuracy of teaching materials.

Second, curriculum developers and policymakers must recognize that high-quality textbooks alone are insufficient. Effective knowledge transposition requires ongoing dialogue between curriculum designers, teachers, and subject-matter experts to ensure that materials are both scientifically sound and pedagogically appropriate. Policies should support collaborative partnerships and provide resources for continuous teacher training and curriculum refinement.

For future research, this study recommends several directions. Further studies should explore the direct impact of teacher attitudes and textbook reliance on student learning outcomes, using larger and more diverse samples. Research should also investigate the role of curriculum developers and institutional structures in shaping the didactic transposition process, as well as the effectiveness of professional development interventions in fostering critical and reflective teaching practices.

In summary, improving mathematics education in Indonesia requires a shift from passive textbook reliance to a more critical, reflective, and collaborative approach among teachers, curriculum developers, and policymakers. By addressing these challenges, the education system can better support meaningful knowledge transposition and ultimately enhance student learning outcomes.

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