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Assessment of a Mathematics Textbook by a Colombian Rural School Teacher

Valoración de un Libro de Texto de Matemáticas por una Profesora de Escuela Rural Colombiana

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Abstract ∞ This article presents the assessment of a mathematics textbook by a Colombian rural school teacher. This assessment is analyzed based on the didactic suitability facets of the ontosemiotic approach to didactic-mathematical knowledge, such as epistemic, cognitive, interactional, mediational, affective, and ecological suitability. The study involved a content analysis using Atlas.ti software. The research participant provides information on using a textbook to prepare and implement mathematics lessons. She uses the textbook as a guide for lesson planning but supplements it with additional resources. In addition, this participant makes some criticisms of this resource. Overall, the study highlights the importance of considering didactic appropriateness in analyzing textbooks for teaching mathematics in rural elementary schools.

Keywords ∞ Assessment; Didactic suitability; Mathematics teaching; Rural teacher; School textbooks

Resumen ∞ Este artículo presenta la valoración de un libro de texto de matemáticas por una profesora de escuela rural colombiana. Esta valoración se analiza con base en las facetas de idoneidad didáctica del enfoque ontosemiótico del conocimiento didáctico-matemático, tales como idoneidad epistémica, cognitiva, interaccional, mediacional, afectiva y ecológica. El estudio implicó un análisis de contenido utilizando el software Atlas.ti. La participante de la investigación proporciona información sobre el uso de un libro de texto para preparar e implementar lecciones de matemáticas. Ella utiliza el libro de texto como una guía para la planificación de lecciones, pero lo complementa con recursos adicionales. Además, esta participante hace algunas críticas a este recurso. En general, el estudio destaca la importancia de considerar la idoneidad didáctica al analizar libros de texto para la enseñanza de las matemáticas en escuelas primarias rurales.

Palabras clave ∞ Enseñanza de las matemáticas; Idoneidad didáctica; Libros de texto; Profesores rurales; Valoración

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1. Introduction

In Latin America, there needs to be more balance between the learning of rural school students and the productive demands of society (PNUD, 2016). In Colombia, teacher training is one factor that affects the balance (Cadavid, 2019). Rural teachers use school textbooks available at their schools to guide and design class sessions (Colbert, 2006), but such books fail to link mathematical knowledge with students' environment in rural Colombia. The onto-semiotic approach (Godino et al., 2007) offers an opportunity to achieve this connection, from which it is intended to analyze how a teacher uses the facets of didactic suitability spontaneously to assess a textbook in a rural Colombian school.

2. Theoretical Framework

The onto-semiotic approach (OSA) is a theoretical and methodological framework that facilitates both research on teachers' didactic mathematical knowledge and reflection on teaching practice to improve instruction (Breda et al., 2018; Castro, 2011; Font et al., 2010; Godino et al., 2013; Godino & Burgos, 2020; Parra-Urrea, 2021). The theoretical construct of "didactic suitability" is introduced within the OSA, which is key to this research from both a theoretical and methodological perspective.

The OSA considers the didactic suitability of a teaching-learning process as the level at which this process, or part of the process, is adequate to link the meanings achieved by the students with the institutional meanings intended or implemented by the teacher, considering the classroom environment (Beltrán-Pellicer & Godino, 2017; Breda, 2020; Breda et al., 2018; Godino & Burgos, 2020; Godino et al., 2017).

Didactic suitability deals with adaptation to the teaching process. In this paper, we are interested in assessing the didactic suitability of school textbooks; for this reason, the research focus is on adaptation to the teaching process concerning the use of the textbook. Therefore, in this research, the didactic suitability of a school textbook for mathematics teaching is understood according to the level of adaptability to the student or group of students—the possibility of being suitable based on the analysis and articulation of the facets involved in teaching and learning mathematics, such as epistemic, cognitive, interactional, mediational, affective, and ecological (Godino et al., 2007; Pino-Fan & Godino, 2015). In this research, the teacher evaluates the textbook based on criteria that she states spontaneously; however, the researcher uses the aforementioned facets of didactic suitability for the analysis.

Epistemic facet refers to the representativeness of meanings intended, implemented, or evaluated concerning the reference meanings (Alsina & Domingo, 2010; Godino, Bencomo et al., 2006; Godino, Contreras et al., 2006). In this case, the reference meanings are those given by the school textbook. The epistemic facet analysis can be carried out from the components: institutional meanings, relations, processes, and epistemic conflicts (Godino et al., 2021).

Cognitive suitability expresses the degree to which the teacher's intended meanings approximate the students' personal meanings (Godino, Bencomo et al., 2006; Godino, Contreras et al., 2006). Therefore, the cognitive facet includes students' knowledge of how to learn, reason, and understand mathematics and how to progress (Godino et al., 2017). This facet highlights four components: prior knowledge, adaptation to individual differences, personal meanings, and cognitive conflict (Godino, 2021).

Interactional suitability is the degree to which semiotic conflicts, both potential and those arising in the teaching process, can be identified based on a negotiation of meanings (Godino, Bencomo et al., 2006). The interactional facet allows us to assume that the study of mathematics promotes communication, which plays a central role in acquiring knowledge (Alsina & Domingo, 2010). To analyze this facet, there are three components: teacher-student interaction, interaction among students, and formative assessment (Godino, 2021).

Mediational suitability is the availability and adequacy of the material and temporal resources required for teaching and learning (Alsina & Domingo, 2010; Godino, Bencomo et al., 2006; Godino, Contreras et al., 2006). This facet is assessed based on three components: material resources, classroom conditions, and temporary resources (Godino, 2021).

Affective suitability is the degree of involvement in the student's interest and motivation in the study process (Godino, Bencomo et al., 2006; Godino, Contreras et al., 2006). Beltrán-Pellicer and Godino (2017) consider components to analyze affective suitability: interests and needs, which are characterized by the design of tasks that allow assessing the usefulness of mathematics in the daily and professional lives of students; emotions, which enable the student's desire to persevere in the proposed task; and attitudes, which reveal student's ways of approaching the study of mathematics.

Ecological suitability is the degree to which the study process adapts to the curricular guidelines and the social, cultural, and economic environment (Godino, Bencomo et al., 2006). This facet includes four components: adaptation to the curriculum, innovation, intra- and interdisciplinary connections, and socio-professional adaptation (Godino, 2021).

The didactic suitability facets allow us to assume the didactic suitability of school mathematics textbooks as the degree of adaptation to teaching; said adaptation is assessed through the analysis of facets, which is presented in the results section.

This tool provides theoretical elements to analyze the adaptations suggested by rural teachers based on the textbooks they use to prepare and guide the classes. The criteria used spontaneously by the teachers are interpreted from the connection between the textbook and the student's context; the teachers assess whether the textbook's content is adequate, adaptable, or hinders the teaching of the intended meanings. The analysis of the statements generated by the teachers can be carried out in two ways: 1) the researcher instructs the teacher in advance to

recognize the criteria of didactic suitability so that they try to find correspondences between the theoretical framework and the content of the textbook or, on the other hand, 2) the teachers assess the textbook without knowing the theoretical construct in which these criteria are framed, and the researcher establishes relationships between the spontaneous statements of the teacher and the theoretical construct. This research opts for the second option, which is to avoid conditioning responses given by teachers in the assessments they carry out, and because of the interest in investigating the assessments that account for criteria of didactic suitability used by teachers spontaneously. Consequently, the facets of didactic suitability are used for the analysis produced by the researcher and are not necessarily known to the research participants.

3. Method

Analyzing the didactic suitability of school textbooks suggests a qualitative design that emphasizes understanding and deepening the phenomena and attributes importance to daily life and the participants' context. In addition, it seeks to confer meaning to a phenomenon from the participants' points of view (Creswell & Creswell, 2018; Hernández-Sampieri & Mendoza, 2018). The previous implies the recognition of a group that shares a culture to study their practices in specific spatial and temporal conditions.

In this research, qualitative content analysis is pertinent. This is an empirical approach to methodologically controlled analysis of texts in rural contexts, following content analytical rules and step-by-step models that dispense with quantification processes or tools (Cáceres, 2003; Krippendorff, 1997).

Atlas.ti 23.2.3 was used to perform: 1. a word cloud to recognize the importance the teacher places on using the school textbook to prepare and guide teaching sessions; 2. a network of codes and citations to recognize components of didactic suitability in the school text; and 3. network grouping to link information from previously developed networks and to evaluate the school text based on relationships between the facets of didactic suitability. Figure 1 shows data obtained by Atlas.ti. All provisions were taken to protect participants, and informed consent procedures were used during the research.

Figure 1. Word Cloud, Network Codes, and Network Group Generated by Atlas.ti

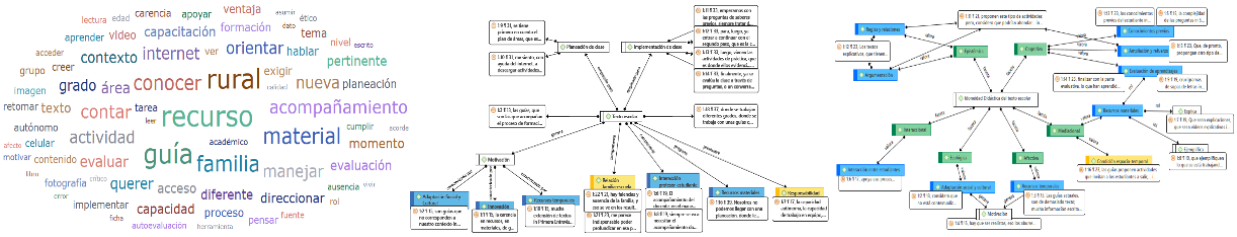


Figure 1 shows the information recorded in Atlas.ti from the responses given by the participants in this research during two semi-structured interviews

inquiring about the way the teacher uses the textbook for the mathematics class. A pseudonym for the participant is used; Ana holds a bachelor's degree in Foreign Languages with an emphasis in English and has not participated in courses or training programs in mathematics education. Ana is a mathematics teacher in primary education; among other subjects, she is responsible for, given that the Colombian Ministry of Education (Ministerio de Educación Nacional, 2016) allows the hiring of teachers to teach in primary education even if they only hold a teaching certificate or have attended continuing teacher training programs.

Ana is a teacher at a rural public school in Jardín, Antioquia, Colombia. She has eighteen years of teaching experience at Escuela Nueva, a municipality-endorsed model for organizing and regulating primary education in rural schools (Colbert, 1999, 2006; McEwan, 1999).

4. Results and Discussion

Colbert (1999, 2006) and McEwan (1999) affirm that the Escuela Nueva has multigrade classrooms; that is, it accommodates students of different levels of schooling in the same room and accepts strategies such as using the textbook in the classroom.

Teacher Ana uses both textbooks by Guevara et al. (2012) to plan and implement classes. She chose them because she considers that they present information closer to the students' cultural environment concerning the books proposed by Castaño and Oicatá (2010). Furthermore, she states that the second edition of the textbook she uses, published in 2020, does not include significant changes; for this reason, she decides to continue working with the text she has selected. The collections above have been donated to the school and are available for classroom study. A brief description of the textbook that she uses for class sessions follows.

The teacher carries out class planning based on the Area Plan[1], which she builds based on her textbook. She says, "For class planning, the Area Plan is taken into account, which is made based on the guides that I mentioned at the beginning, Escuela Nueva guides"[2] (Ana, personal communication, May 2, 2022); however, the textbook is not the only reference, since it refers to other sources to complement the information in the text, as Ana (personal communication, May 2, 2022) states:

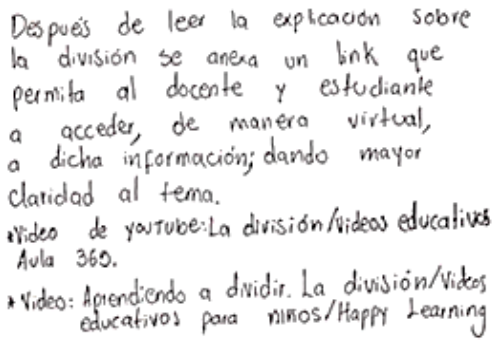
[1] An Area Plan is a curricular document prepared by the teachers of each educational institution to schedule their classes. For this reason, the Plan is prepared before implementing class sessions. An Area Plan document presents objectives, contents, teaching methodology, and evaluation criteria distributed according to the periods in which the school year is made up (Solano et al., 2020). Each Area Plan is organized by grade level, and there are generally four academic terms for each grade level. According to Solano et al. (2020), the mathematics Area Plan is the roadmap that guides the implementation of the mathematics curriculum within Colombian educational institutions.

[2] The teacher names the textbook she uses as a guide, either because it has the label "learning guide" at the top or because, according to Gómez (2010), Colbert (2006), and McEwan (1999), the Escuela Nueva promotes these books as material to support and guide the study process. Furthermore, the teacher affirms in a subsequent interview that this textbook is a guiding resource (Ana, personal communication, 24 de mayo de 2022).

> After having the guides and Area Plan, I sat down, with the help of the Internet, to download activities and see the videos, sheets, and images that allow me to take the class more interactively so that be only book-student, student-book, but that they can interact with other types of resources and materials.

The teacher adapts the resources by incorporating other resources, such as videos, sheets, and images. The teacher assumes that the topics proposed by the textbook are appropriate for the area plan she builds. This statement allows us to recognize that the teacher values both the meanings of the textbook and the adaptation of such information to the curriculum, which relates the epistemic and ecological facets (Castillo et al., 2021; Godino, 2021). In Figures 2 and 3, the reader can see a sheet and two links proposed by the teacher to adapt information from the textbook. She uses these materials to explain the topic. Figure 2 refers to videos proposed by the teacher, while Figure 3 refers to sheets to explain number division. It is worth mentioning that the figures are taken from sessions after the interview, where the teacher chose the division to propose adaptations to the material. In this case, she proposes including this complementary information to expand the topic's explanation.

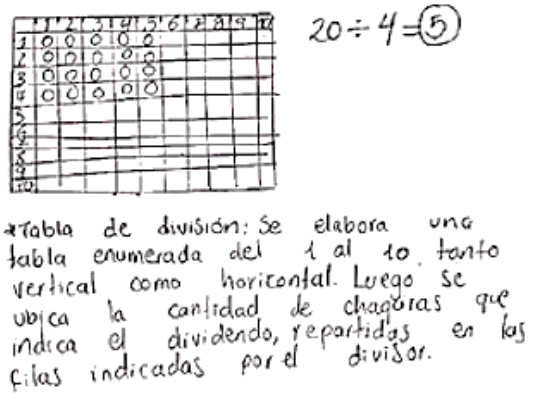
Figure 2. YouTube Videos that Ana Proposes to Expand the Explanation of Numbers Division


Después de leer la explicación sobre la división se anexa un link que permita al docente y estudiante a acceder, de manera virtual, a dicha información; dando mayor claridad al tema.
*Video de youtube: La división/Videos educativos Aula 360.
* Video: Aprendiendo a dividir. La división/Videos educativos para niños/Happy Learning

Note. Translation—"After reading the explanation about the division a link is attached that allows the teacher and student to access, virtually to said information; giving greater clarity to the topic.
* YouTube Video: La división/videos educativos Aula 365.
* Video: Aprendiendo a dividir. La división/videos educativos para niños/Happy Learning."

The teacher mentioned that the videos expanded explanations but should have commented on other criteria she considered when selecting them. Burgos et al. (2020) suggest reviewing the adequacy of these virtual educational resources to be consistent with the learning objectives. Furthermore, resources taken from YouTube do not provide a more active role to students than any other resources since students only listen and do not have any other type of interaction with the resource. This research does not intend to delve deeper into this issue since the study aims to account for the teacher's implicit criteria to assess the didactic suitability of the textbook.

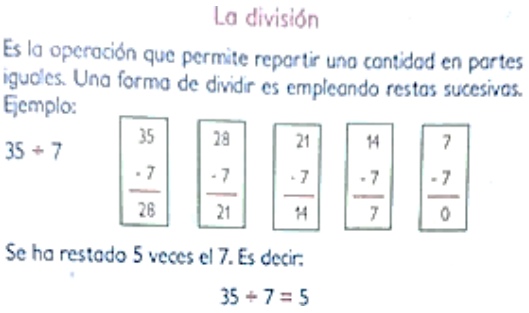
Figure 3. Sheet Proposed by Ana: Division Table



Note. Translation—"Division "table: A table numbered from 1 to 10 is made both vertically and horizontally. Then the number of beads that indicates the dividend is placed, distributed in the rows."

The teacher explains that the "chaquiras" must be distributed, one for each square, in the rows numbered from one to four. This is because the operation $20 \div 4$ suggests distributing the twenty "chaquiras" in four rows. The distribution is carried out equitably, with one "chaquira" added for each row. It is important to note that this task, which involves equitably distributing several objects, is not necessarily solved through "successive subtractions," a procedure presented in the book. "Successive subtractions" involve subtracting the same number repeatedly until the dividend is zero. Figure 4 shows the "successive subtraction" procedure proposed by the textbook to carry out divisions.

Figure 4. Proposed Definition and Procedure for Teaching Division



Note. Translation—"The division Is the operation that allows an amount to be distributed in equal parts. One way to divide is using successive subtraction. Example: ... The 7 has been subtracted 5 times. Meaning:"

The YouTube videos and worksheets that the teacher includes in class planning to complement the textbook align to adapt the material. Ana's assessment section expands on the criteria she uses to make these adjustments. The decision to supplement the textbook content stems from the need for innovation in teaching based on the teacher's reflective practice. This decision falls under the innovations component, which corresponds to the ecological facet (Castillo et al., 2021; Godino,

2021), as she expands upon the textbook's content rather than merely replicating it.

Initially, the teacher participated in two interview sessions. The first interview inquired about how she prepares for class and, in this process, the role she gives to the textbook; however, more than inquiring about class preparation, it is necessary to ask about the role given to the textbook during class sessions. For this reason, a second interview was carried out to inquire how to implement the class. Both interviews aim to recognize the role that the teacher gives to the textbook in preparing and implementing mathematics classes.

The teacher mentions three moments she guides the class: prior knowledge, practice activities, and evaluation activities. Each of these moments is described below. It is worth noting that the research considers the information provided by the teacher in extra-class sessions and did not participate in the classroom to verify or contrast such information.

The teacher states, "We start with the questions about prior knowledge to continue contrasting their prior knowledge with the real theory" (Ana, personal communication, May 2, 2022). The first section of the textbook deals with basic activities that, according to Cadavid (2019), aim to investigate students' prior knowledge. However, it is not enough for the teacher to declare the investigation of previous knowledge to conclude that her class organization is in correspondence with the textbook. For this reason, the other two moments mentioned are investigated.

Godino, Bencomo et al. (2006) and Godino, Contreras et al. (2006) consider that the cognitive facet of didactic knowledge aims to investigate the level of proximity between the student's meanings and what the teacher intends to teach, based on the teachers' mathematical reference meaning. In this case, the reference meaning is provided by the textbook selected by the teacher. The personal meaning, as expressed in the teacher's statement, is rooted in the student's prior knowledge, which must be contrasted with the "real theory"—the institutional meanings accepted by the teacher. The textbook proposes a sequence of tasks to achieve this contrast. The contrast the teacher proposes is understood in the cognitive facet of mathematical didactic knowledge as the proximity between meanings. Furthermore, this facet incorporates the component of prior knowledge, which the teacher has mentioned.

"Then, come the practice activities, which is where they demonstrate what they learned in class" (Ana, personal communication, May 2, 2022), which also coincides with the textbook proposal. In the textbook, the teacher explains a component of cognitive suitability that she uses in class; according to Godino (2021), the personal meaning lets us verify that the students learn the intended knowledge. In addition, Gómez (2010) affirms that textbooks designed for the Escuela Nueva include instructions that allow the teacher to verify student learning.

The textbook proposes family work. The teacher mentions that carrying out tasks with family accompaniment constitutes a difficulty for the classes that she implements, given that:

> I always notice that there are shortcomings and absence of the family, and that is seen in the children's results, absence [of the family] in carrying out their duties, in accompanying the meetings, in accompanying the processes, and knowing how the student is doing. (Ana, personal communication, May 2, 2022)

In this regard, Castro et al. (2020) affirm that the link between family and school is recognized as one of the challenges facing mathematics education in Latin America.

The teacher ends the class session by inquiring about the student's learning based on strategies that promote student reflection about their learning process. She claims, "Finally, the class is evaluated through questions or a conversation, where they will answer what they learned that day" (Ana, personal communication, May 2, 2022). Also, in this episode, the teacher values the meanings achieved by the students.

Given its structure, the textbook allows us to recognize a correspondence between the proposed class model and what the teacher considers a good guide.

It has been reported that mathematics teachers use textbooks as a source of reference both to prepare and implement class sessions (Castillo et al., 2022; Font & Godino, 2006; González & Sierra, 2004; Jamieson-Proctor & Byrne, 2008; Monterrubio & Ortega, 2011), which is evident in Ana's speech. In this regard, the teacher describes her ways of preparing and implementing class, which allow her to recognize the textbook as a fundamental material for her teaching practice.

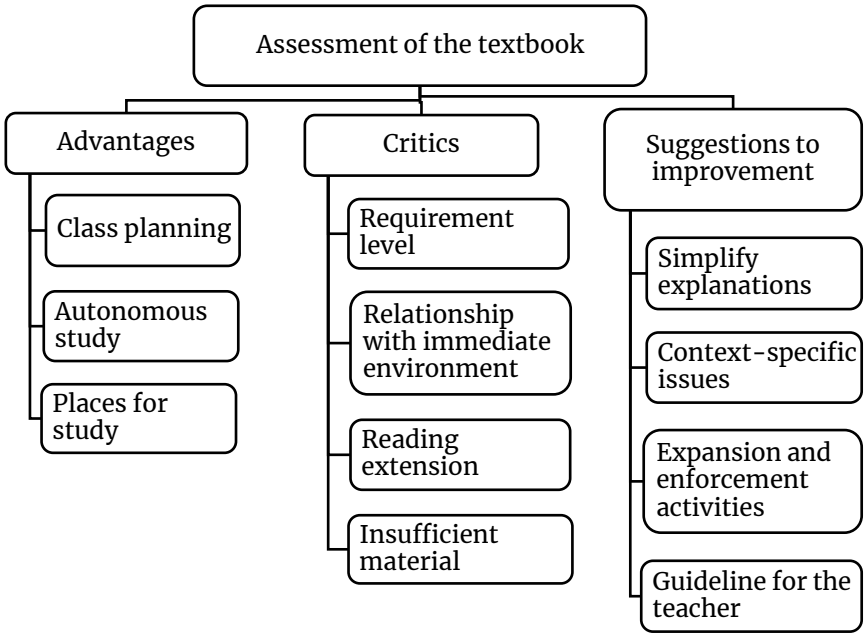
In Figure 5 are the textbook teacher's assessments, based on three aspects: the advantages of using the selected book, criticism of the material, and proposals to improve it. Figure 5 illustrates the features.

The teacher would preserve the structure presented in the textbook. She states that she would maintain:

The way, as they propose, to develop activities in class, which is in three stages: where we start with the student's prior knowledge; then, we continue with the practice; to finish with the evaluative part, what they have learned. So, this sequence, and the activities proposed in this way, allow the student to be able, from the onset, to contribute to the learning work. (Ana, personal communication, May 24, 2022)

Furthermore, the teacher recognizes that her textbooks "contribute to planning and what we look for in the class" (Ana, personal communication, May 24, 2022). For both class planning and implementation, the teachers appreciate ecological suitability, which refers to the degree of adaptation of the study process to both the curricular guidelines and the social environment (Godino, Bencomo et al., 2006).

Figure 5. Textbook Assessment by Ana



Additionally, the teacher highlights responsibilities that the student assumes, such as autonomy and teamwork, based on using the textbook in the classroom. She says: "autonomous ability, teamwork ability, students become very independent in their work" (Ana, personal communication, May 2, 2022). However, the teacher recognizes that the students achieve partial autonomy and mentions that the teacher's accompaniment is essential in the study process. Godino et al. (2021) state that independence is related to the relationship the student establishes with the knowledge.

The teacher states that the textbook "supports this process of teamwork and the development of activities, both inside and outside the classroom." The teacher assumes that the textbook favors the student's understanding by promoting its use both in the classroom and beyond. For instance, the teacher assigns tasks from the book for students to complete at home. Learning outside the classroom is not separate from working with the textbook, as it encourages the development of certain activities beyond the school setting. Additionally, using the school surroundings to conduct lessons is significant, as it complements the work with the textbook. Ecological suitability promotes the use of the context, while mediational suitability refers to the availability of resources and how they can be used.

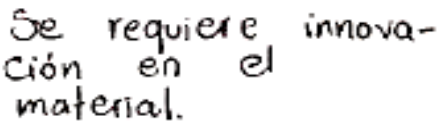
The teacher states, "I emphasize that the guides propose activities that invite students to go out, outside the classroom, and that must also be highlighted because it is a very, let us put it that way, very conscious way of learning" (Ana, personal communication, May 24, 2022).

The teacher identifies textbooks' advantages, such as promoting class planning, allowing students autonomous study, and promoting the development of topics in places she considers relevant. However, she criticizes the content, as set out below.

Ana affirms that the proposed tasks "are inappropriate for students' ages" (Ana, personal communication, May 2, 2022). This statement constitutes an assessment of the level of demand for the proposed tasks, which are seen as inadequate due to their high complexity, given that she states that the students still need to be taught how to solve them. Based on the textbook, the teacher assesses the potential cognitive conflicts in the study process when she recognizes that the student's prior knowledge is insufficient to learn the topics proposed in the text. This assessment refers to the cognitive aspect, in that the teacher recognizes a conflict that the students eventually present (Castillo et al., 2021; Godino, 2021).

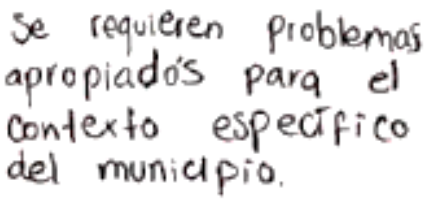
Furthermore, Ana criticizes the material for being outdated and lacking situations relevant to the students' rural context. Figures 6 and 7 show the statements in which these teacher disagreements are observed.

Figure 6. Ana Requires Including Innovations in the Material



Note. Translation—"Innovation in material is required."

Figure 7. Ana Requests Situations Consistent with the Context of the Municipality



Note. Translation—"Appropriate problems are required for the specific context of the municipality."

Ana clarifies that although the book has a new version, it does not relate to the context of the Antioquia province. Although the edition she uses —an older version— is more appropriate, it still requires adaptations. This assessment is located in the ecological aspect because the professor links the object of knowledge with activities specific to the region (Castillo et al., 2021; Godino, 2021).

Ana also criticizes that the textbook contains very extensive readings, which bore students, stating that "they are guides made with much text and become boring for children" (Ana, personal communication, May 2, 2022), and she reiterates, "the current guides are too text-heavy; a lot of written information, and, for children, you have to be realistic, that bores them" (Ana, personal communication, May 24, 2022). In both episodes, it is evident that the length of the readings is related to both the ecological facet—which corresponds, in this case, to the context of the textbook—and the affective facet, given that the students' boredom is linked

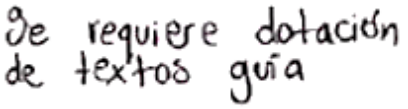
to their willingness to take on such readings. This relationship between components of didactic suitability highlights the potential of this theoretical construct to connect components and facets, enabling the researcher to conduct an integrated and systemic analysis. Godino (2013) noted that the facets of didactic suitability are interrelated, promoting a complex view of the teaching process. This assessment by the teacher allows us to assume, according to Barwell et al. (2016) and Lerner (2001), that the school has the challenge of engaging students with reading and writing, starting from a reconceptualization of the teaching object and constructing it, taking as a reference socially relevant language practices so that students find meaning in the readings they perform.

The crucial role of reading comprehension in academic performance cannot be overstated. Celis et al. (2013) assert that it is a prerequisite for solving mathematical tasks. Montero and Mahecha (2020) further elaborate on this, stating that students' proficiency in mathematical procedures is often hindered by their difficulties in understanding mathematical statements, leading to challenges in problem-solving across various contexts, including standardized tests. This intricate relationship between reading comprehension and mathematical problem-solving, as evidenced by these studies, presents a compelling area for further research.

Both Canales (2018) and Reyes and Pérez (2019) found a significant and positive relationship between reading comprehension and mathematical problem-solving.

Additionally, the teacher acknowledges the importance of having enough materials for the mathematics class, as seen in Figure 8; however, she notes that she lacks the necessary resources to conduct her class as she intends.

Figure 8. Ana Requires Sufficient Materials to Implement Class Sessions



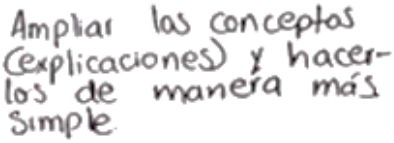
Note. Translation—"Provision of guide texts is required."

The teacher criticizes the difficulty level of the proposed tasks, the outdated and inappropriate information for the students' cultural context, and the lack of sufficient resources. Figure 8 shows the assessment of the availability of sufficient materials as a criterion that the teacher considers when preparing class lessons, which corresponds to both the mediational and ecological facets when assessing resource availability in the teacher's rural school. After this, she offers proposals for improving the textbook content presented in Figure 9.

The teacher suggests that the explanations be presented more simply. Although Godino (2021) states that the prior knowledge component aims to help acquire the necessary background for studying, Son and Kim (2015) state that teachers should be careful when designing tasks with a lower level of cognitive demand since there is a possibility that the value of the mathematical object to be studied

will be lost. In another sense, Lester and Cai (2016) claim that tasks with different cognitive demands promote various kinds of learning because they combine students' attention to particular aspects of content and offer different ways of processing information.

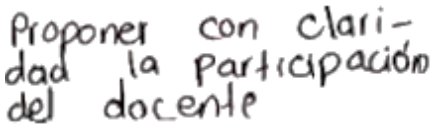
Figure 9. Expansion of Explanations



Note. Translation— "Expand the concepts (explanations) and make them simpler."

In Figure 10, the teacher suggests that the textbook contain guidelines for the teacher's participation so that these are more explicit and understood. Godino et al. (2021) mention that it is necessary to specify roles in task management and types of interactions. This statement suggests that the textbook specifically promotes the teacher's participation in teaching the object of study, located in the interactional facet (Castillo et al., 2021; Godino, 2021).

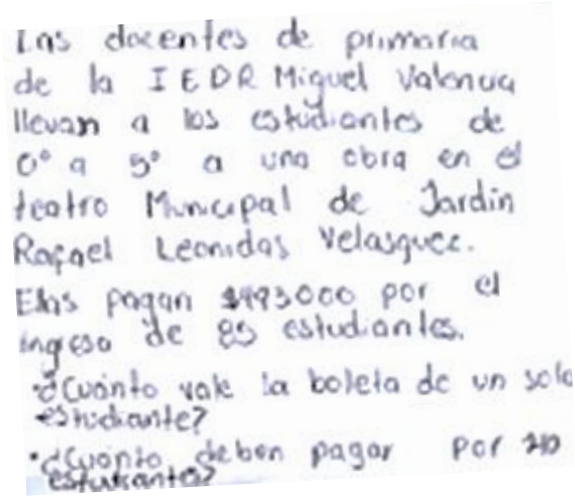
Figure 10. Teacher's Participation



Note. Translation—"Propose clearly the teacher's participation."

The teacher proposes incorporating problems appropriate to the municipality's specific context. Godino and Burgos (2020) highlight the importance of adjusting the study process to the student's social context. For this reason, after these written suggestions were given by the teacher participating in the research, she met with her colleagues from her rural school to discuss their assessments. She proposed mathematical tasks involving places in the municipality. Figure 11 shows one of the tasks designed by the group. It is worth mentioning that the place referred to in the tasks exists, the number of students enrolled in primary school between preschool and fifth grade is approximately the amount of money presented in the task, and the price for each person's income is consistent with the range of rates that the theater currently offers.

Figure 11. Problem Designed by the Teacher's Group



Note. Translation— "The primary teachers of the I. E. D. R. Miguel Valencia take the students from 0° to 5° to a play at the municipal theater of Jardín Rafael Leonidas Velasquez. They pay $493,000 for the admission of 85 students. How much does a single student ticket cost? How much should they pay for 40 students?"

The teacher refers to additional expansion and reinforcement activities in the textbook, such as YouTube videos and explanatory sheets—Figures 2 and 3—. The expansion and reinforcement component of the cognitive facet proposes this type of activity to verify the progress in the student's learning (Godino, 2021). Although criteria have been reported to discuss the suitability of online educational videos for teaching mathematics (Santos & Acuña, 2017), the researcher did not continue investigating this matter.

Son and Kim (2015) reviewed research on how teachers use textbooks in the classroom, the content included in textbooks, and the alignment between textbooks and instruction. These authors found that teachers usually modify tasks or activities proposed by textbooks and that such modifications depend on the cognitive demands involved. Also, they report that teachers tend to lower the cognitive demand of the task during instruction—specifically, the conceptual level of demand—and often opt for memorization tasks, that is, those that require the student to repeat what you previously learned or those that lack a specific context––apart from the context of mathematics––. In line with these findings, teacher Ana recommends lowering the cognitive demand so that the proposed tasks are at the student's skill levels.

The thorough assessment of each component of didactic suitability and the possible relationships between facets of didactic suitability allows us to propose adjustments to the school text, which constitutes an opportunity to provide relevant teaching. It is worth remembering that this article emphasizes a teacher's perceptions about the textbook she uses in the mathematics classroom.

The teacher concludes that the interviews allowed her to reflect on adjustments in the mathematics classroom and "motivate me towards constructing new

tools that enable better development of classes in said area. At the same time, it gives me an openness to wanting to investigate and go beyond what the texts offer as such for the development of the classes" (Ana, personal communication, August 16th, 2023).

5. Conclusion

A teacher cannot always expect the textbook to align perfectly with the student's cognitive level, cultural environment, or interests. However, the textbook constitutes a reference and the starting point for preparing and orienting the mathematics class. The textbook may not fully meet the teacher's needs due to specific contextual factors, as different locations and times may present unique challenges and demands. Nevertheless, the teacher must recognize problems relevant to the student's cultural context and adjust accordingly. The teacher values that the textbook is characterized by some components of epistemic, cognitive, affective, interactional, ecological, and mediational facets of didactical suitability, which lets her develop her mathematics class without making adjustments at all times. In another sense, although such components are included in the textbook, they require a revision to the settings, orient more pertinent classes, and agree with the content that she pretends to teach and the students with whom she interacts. In addition, she affirms that the textbook lacks innovation, problems appropriate to the social environment of the students, and sufficient materials for each student to expand the explanations and propose the participation of the teacher, which negatively affects the development of the class because students become demotivated and disengaged from learning mathematics.

Mathematics school textbooks, as has been reported in some research, remain a referent to prepare and orient classes. Teachers consider textbooks as a reference for teaching mathematics. Although it makes adaptations, the material remains a guideline to teachers, so it is necessary to analyze the content of this material. This paper proposes the analysis of didactic suitability as a tool to orient such analysis. In addition, it is suggested that this study object be included in initial formation programs for teachers who eventually will teach in rural primary schools or in continuing training programs for teachers currently working in this context.

The integration of the components and indicators of didactic suitability in this research offers a systemic vision of the didactic suitability of the school textbook, which constitutes a support material for classes guided by rural primary school teachers.

It is possible to integrate both textbook assessment by rural school teachers and didactic suitability analysis by the researcher to find improvement opportunities in mathematics textbooks for mathematics teaching.

In conclusion, we have observed that teachers often use didactic suitability implicitly. Therefore, as criteria are guidelines for reflecting on and analyzing practice, they can also be applied to textbook evaluation. This tool criticizes, selects, or assesses this material through the formation process.

A thorough analysis of a textbook's didactic suitability requires evaluating all facets and their indicators. While the teacher in this study engaged with some components, her assessment did not encompass all facets comprehensively. Although the teacher uses some implicit components of this theoretical and methodological tool, other issues, such as effective student learning, couldn't be considered, and they are relevant for the analysis of didactic suitability. For example, the researcher reports information from his interaction with the teacher but did not participate in the class sessions.

When the teacher assessed the textbook, she proposed adequations related to "increase in information, problem statement accord with the social environment of the student, inclusion of links from the internet-linked textbook with the internet." However, she didn't propose adequations for epistemic components such as process, definitions, and arguments.

Teachers' textbook assessment is linked to their practice or their ways of teaching. For this reason, when it wants research teachers to practice, it is necessary to consider how the teacher uses these references. How the teacher perceives, uses, and assesses textbooks evidences her perception about her practice and serves to evidence how she intends and implements sessions of mathematics class.

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Valoración de un Libro de Texto de Matemáticas por una Profesora de Escuela Rural Colombiana

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Este artículo presenta la evaluación de un libro de texto de matemáticas realizada por una profesora de una escuela rural colombiana. Dicha evaluación se analiza a partir de las facetas de idoneidad didáctica del enfoque ontosemiótico del conocimiento didáctico-matemático, tales como la idoneidad epistémica, cognitiva, interactiva, mediacional, afectiva y ecológica. Este marco teórico y metodológico promueve conocer, evaluar y mejorar las prácticas docentes de los profesores de matemáticas de acuerdo con el contexto social en el cual está ubicada la escuela. Se indaga el conocimiento de la evaluación realizada por una docente a partir de su interacción con el libro de texto que utiliza tanto para preparar como para impartir las clases de matemáticas. Esta investigación adopta un diseño cualitativo, cuyo objetivo es comprender un fenómeno a partir del reconocimiento del punto de vista del participante como fuente de información. El estudio incluyó un análisis de contenido utilizando el software Atlas.ti, a partir de: 1) una nube de palabras, para reconocer la importancia que la profesora concede al uso del libro de texto escolar para preparar y orientar las sesiones de enseñanza; 2) una red de códigos y citas para reconocer los componentes de la idoneidad didáctica en el libro de texto escolar; y 3) una agrupación de redes para vincular la información de las redes desarrolladas previamente y evaluar el libro de texto escolar con base en las relaciones entre las facetas de idoneidad didáctica. La participante en la investigación utiliza el libro de texto como guía para la planificación de las clases, pero lo complementa con recursos adicionales, y valora que el libro de texto pueda promover el aprendizaje autónomo en algunos segmentos de la clase. Además, considera que el libro de texto carece de innovación, de problemas adecuados al entorno social del alumno y de materiales suficientes para que cada alumno amplíe las explicaciones, y propone la intervención del profesor. Además de valorar las ventajas y desventajas del libro de texto, la profesora ofrece sugerencias para mejorar la enseñanza basada en el libro, como dar explicaciones simplificadas, incluir cuestiones específicas del contexto, proponer actividades de ampliación o refuerzo y elaborar pautas para el profesorado. Las valoraciones realizadas evidencian que la idoneidad didáctica se usa implícitamente. En general, el estudio destaca la importancia de incluir la idoneidad didáctica al analizar los libros de texto para la enseñanza de las matemáticas en las escuelas primarias rurales.