Journal of Computer and Education Research
October 2025 Volume 13 Issue 26
http://dergipark.org.tr/jcer
(ISSN:2148-2896)

Research Article

Children Literature and Mathematics: Analyzing the Educational Potential of Math-Themed Books

Rüveyda KARAMAN DÜNDAR [1,*]

[1] *Bartın University, Bartın, Türkiye, rdundar@bartin.edu.tr*

[*] *Corresponding Author: rdundar@bartin.edu.tr*

Article Info

Received: *13 February 2025*
Accepted: *02 June 2025*

Keywords: Children's literature, math-themed children's books, student

10.18009/jcer.1639207

Publication Language: English

Abstract

Effective mathematical communication plays a key role in students' understanding and success in mathematics, and studies emphasize the value of children's literature, which weaves in mathematical concepts, as it helps learners connect tangible experiences with abstract ideas. This study explores two such books— *How Many Lives Does Mathematics Have?* and *The Number Devil*—through the lens of established Evaluation Standards for Children's Mathematical Books and Counting Book Typology found in academic literature. The results show that *How Many Lives Does Mathematics Have?* aligns well with middle school curricula and introduces mathematical ideas through real-world contexts and notable historical figures. On the other hand, *The Number Devil* uses an imaginative storyline and mythical character. Its structure makes it appealing to both middle and high school audiences. Both books use narrative and illustrations to present mathematical ideas in accessible ways. This study emphasizes the potential of children's literature regarding mathematical communication and conceptual understanding and offers guidance for educators seeking engaging, content-rich children's books for classroom use.

To cite this article: Karaman-Dündar, R. (2025). Children literature and mathematics: Analyzing the educational potential of math-themed books. *Journal of Computer and Education Research, 13* (26), 654-677. https://doi.org/10.18009/jcer.1639207

Introduction

Effective communication is an important competence that must be developed in mathematics education. The National Council of Teachers of Mathematics (NCTM, 2000) emphasizes the importance of fostering communication skills to help learners bridge their informal experiences with the abstract symbolism of mathematics. In alignment with this, Ministry of National Education (MoNE, 2024) curriculum standards also identify mathematical communication as a central objective of learning mathematics. Schiro (1997) emphasized that the ability to communicate mathematically is critical for students' conceptual understanding.

Communication in mathematics is closely linked to language skills, including reading, writing, listening, and speaking. Reading, in particular, is more than a decoding process—it is an active, cognitive engagement with texts (Draper, 2002). These literacy skills are intertwined in a rich classroom environment, and their integration becomes essential for learning (Buehl, 2023). Mathematics classrooms require students to interpret written materials and articulate mathematical ideas clearly (MoNE, 2018). Hence, developing mathematical literacy entails cultivating higher-order thinking abilities to apply mathematics in everyday contexts (Colwell & Enderson, 2016).

Given the importance of integrating literacy and mathematics, children's literature has the potential to foster mathematical understanding, mainly when it reflects children's lived experiences. Shatzer (2008) highlights the importance of selecting literature that makes meaningful connections to students' lives, while studies show that early exposure to math-rich texts contributes significantly to concept development, even from preschool years (Casey et al., 2004; Van Elsen et al., 2024).

In their study, Op't Eynde et al. (2023) state that shared picture book reading—where an adult reads a children's book aloud and allows children to interact with it—is an effective activity for supporting children's mathematical development. Children's books with mathematical concepts and engaging contexts foster skill development and enrich students' ability to express mathematical ideas (Whitin & Whitin, 1996; Sianturi & Hurit, 2024). Storylines and illustrations enhance problem-solving, support mathematical modeling (Gaston, 2008), and encourage learning through natural interactions with everyday experiences (Moyer, 2000).

Literature also strengthens mathematical and linguistic skills by encouraging students to read, write, talk, and think about mathematics. Visual representations in picture books are compelling, helping young learners grasp complex ideas (Hellwig et al., 2000). Research on early literacy confirms that illustrations contribute significantly to meaning-making in texts (Kress & van Leeuwen, 1996; Lewis, 2001). When integrated well, visuals and narratives can promote mathematical dialogue and sustain students' interest (Nesmith & Cooper, 2010).

Constructivist theory posits that students build understanding through interaction and active engagement (Dewey, 1997). Given that children's books in mathematics education are also grounded in constructivist theory. This perspective supports the integration of

narrative into mathematics instruction to foster meaningful learning experiences (Draper, 2002). From this point of view, it is important to evaluate how mathematical ideas in children's literature are internalized and presented.

Criteria for Book Evaluation

Various evaluation frameworks have been developed to ensure that children's books effectively support learning. Monroe et al. (2018) argue that not all books are suitable for instructional use, as low-quality materials can diminish teacher motivation and student outcomes (Can & Durmaz, 2023; Hunsader, 2004). For instance, inaccuracies or superficial treatment of mathematical concepts may lead to misconceptions, while poor integration between mathematics content and narrative can disrupt comprehension. Poor grammar, inappropriate vocabulary, or mismatched visuals can hinder learning, making it imperative to evaluate books holistically (Hunsader, 2004). Livy et al. (2023) highlight the importance of teacher training in helping educators develop the pedagogical knowledge necessary to use children's literature to support students' mathematical development.

High-quality books are those that accurately present mathematical ideas, provide conceptual depth, and engage students at their cognitive level (Hellwig et al., 2000; Nurnberger-Haag et al., 2021). Language, narrative coherence, and visual design are also critical considerations. According to Schiro (1997), evaluating a book's mathematical and literary quality includes analyzing accuracy, completeness, and the alignment of text and illustrations.

Schiro (1997) and Hellwig et al. (2000) have proposed standards and rubrics for evaluating books based on literary and mathematical criteria. According to the standards developed by Schiro (1997), the accuracy and completeness of the mathematical information presented in its content are paramount for a mathematics book to be academically and pedagogically valuable. In this regard, potential errors in the illustrations should be carefully examined if any appear in the text, calculations, scale, terminology, and graphics.

The visibility and effective presentation of mathematical content depend on how the author and illustrator integrate the mathematics with the narrative text and visuals. Furthermore, the cognitive and developmental level of the intended audience must be considered; a book designed for a specific grade level should align with the curriculum for that level and present mathematical content that is understandable within the students' cognitive capacities.

Moreover, the book should encourage the reader's active participation in mathematics, supporting the use of mathematical concepts and their transfer to different contexts. The relationship between mathematics and the narrative is also a critical evaluation criterion; mathematics should enhance the story, and integrating mathematics into the narrative should create a more holistic structure (Hunsader, 2004).

Building upon the standards developed by Schiro (1997), Hunsader (2004) established the following criteria:

- Is the book's plot well-developed and satisfying in terms of imagination and continuity?
- Are the characters (if present) well-developed?
- Does the book possess a lively and engaging writing style that actively involves the child in the process?
- Are the book's visuals and graphics consistent with the text, engaging, and appropriate from a child's perspective?
- Is the book's readability and level of interest appropriate for the targeted age group?
- Do the book's plot, writing style, and graphics/illustrations complement each other?
- Do all the components combine to create a cohesive product for children to enjoy reading?
- Does the book present appropriate positive ethical and cultural values to the reader?

In addition to such rubrics, more straightforward classifications, like those developed by Nurnberger-Haag and colleagues (2021), exist. Nurnberger-Haag et al. (2021) elaborated on counting sequences, rationality, and clarity in children's books, examining how numbers are presented and their impact on mathematical learning. Regarding counting sequences, the study explored how books present skip counting (e.g., counting by tens), how they contribute to children's number sense by using different starting points and scales, and how they aid in developing this sense. Some books provide flexibility by teaching counting with variable skip values, relating it to real-world contexts such as counting money or time. Regarding rationality, a distinction was made between rote counting (RC) and rational counting sequences (RCS), emphasizing that books listing only digits help children develop basic memory skills.

In contrast, those providing visuals and contextual support assist in understanding number relationships and patterns within sequences. Regarding clarity, the study highlighted how clearly the counting process is expressed in books; some books directly explain counting, while others use indirect expressions. Nurnberger-Haag et al. (2021) emphasized that books offering explicit guidance can help children recognize that skip counting is valid. These books help students become familiar with mathematical terms and foster positive attitudes toward mathematics (English & Watters, 2004; Moyer, 2000). In addition to contributing to language development, children's books facilitate the achievement of targeted learning outcomes in mathematics, make activities more enjoyable, and ease student comprehension (Flevares & Schiff, 2014). Specifically, from a communication perspective, children's books support a sociocultural learning approach by promoting mathematical discussions in the classroom and at home (Anderson et al., 2004). Additionally, studies indicate that book-based interventions improve children's vocabulary, achievement, and engagement (Doig, 1989; Welchman-Tischler, 1992). A study by Jennings et al. (1992) found that children who received book-based instruction performed better on vocabulary tests and achievement indices than those in the control group.

Representation is closely linked to mathematical communication and relies on the natural connection between words and visuals. Van Oers (2013) highlights the potential of children's books, especially through visuals, to promote discourses that support mathematical ideas. Van den Heuvel-Panhuizen et al. (2009) suggest that the combination of text and visuals can facilitate mathematical thinking processes by providing cognitive connections for young learners. However, it should be noted that not every book is equally compelling; some books, while intentionally including mathematical content, may be insufficient in terms of representation.

Connections help students relate mathematical concepts to their in-school and out-of-school experiences (Moyer, 2000; NCTM, 1989) when authentic and relevant to their experiences (Nesmith & Cooper, 2010). Researchers like Anderson et al. (2004) and Shatzer (2008) emphasize that books can guide students in making sense of mathematical concepts and relating them to their daily lives. Storytelling and narratives engage students' interest and support mathematical thinking processes, reducing anxiety (Zazkis & Liljedahl, 2009; Casey et al., 2004). Specifically, story characters can assist students in understanding problem situations (Casey et al., 2004). Picture books are beneficial for presenting modeling

problems within authentic contexts (English, 2010; Flevares & Schiff, 2013). Although reasoning and proof are less commonly addressed in children's literature, specific texts show potential for supporting these skills through discussion and multiple perspectives (Marston et al., 2013).

Purpose of the Study

Given the increasing use of children's literature in mathematics classrooms, this study aims to analyze the content of two books— *How Many Lives Does Mathematics Have?* and *The Number Devil*—to explore how they support the development of mathematical communication and conceptual understanding. Specifically, the study examines the books in terms of mathematical accuracy, conceptual coherence, narrative integration, pedagogical appropriateness, and the effectiveness of visual supports.

The research question for this study is as follows:

To what extent do the children's books *How Many Lives Does Mathematics Have?* and *The Number Devil* align with established literary and mathematical criteria?

Method

This study is a document analysis based on a qualitative research design. The content analysis method has been used to evaluate how *How Many Lives Does Mathematics Have?* and *The Number Devil* address mathematical concepts and their pedagogical potential (Merriam, 2009). In this context, the study examines how the books are structured within the framework of mathematics education and how they may contribute to students' conceptual development. During the analysis process, the mathematical content presentations of the books were classified based on a subject-specific typology (Nurnberger-Haag et al., 2021); additionally, an evaluation was conducted following the methods proposed by Hunsader (2004) for assessing the content quality of children's literature books with mathematical content. This way, the study deeply investigates how the books support teaching mathematical concepts, creating connections between concepts, and helping students make sense of mathematics.

Data Collection and Tools

The books that were examined in this study were selected based on an analysis of 17 national and international children's books that contain mathematical content and have been referenced in the academic literature. The analysis process involved various perspectives,

including their suitability for the middle school level, integration of mathematical concepts, coverage of diverse mathematical topics, compelling storytelling, appropriate visuals, educational value, and potential for discussion.

The 17 children's literature books with mathematical content analyzed in this study were selected based on specific criteria developed with reference to the works of Schiro (1997), Hellwig et al. (2000), and Hunsader (2004). The selection process took the following criteria into account:

1. Suitability for Middle School Level: The content and narrative style of the books must be appropriate for middle school students cognitive development and mathematical competencies.
2. Integration of Mathematical Concepts: The potential of the books to present mathematical concepts in a natural context and supporting students' conceptual understanding were considered.
3. Coverage of Diverse Mathematical Topics: Books that include topics from various mathematical fields (e.g., numbers, algebra, geometry, probability, problem-solving) were prioritized.
4. Compelling Storytelling: Books that has potental to capture students interst and effectively integrate mathematical content with engaging and fluent storytelling were selected.
5. Use of Appropriate Visuals: Preference was given to books that provide meaningful visuals that support mathematical concepts and facilitate the learning process for students.
6. Educational Value: The pedagogical structure of the books were considered. Books that have potnetail for contributing to the learning process and offering valuable learning opportunities were selected.
7. Potential for Discussion: The ability of the books to stimulate mathematical thinking, questioning, and the development of critical thinking skills during classroom or individual reading was considered.

This framework provided a comprehensive basis for selecting the books analyzed in this study. Based on the framework, two mathematics teachers and the author of this study carefully examined a list of 17 children's books. As a result of these evaluations, *How Many*

Lives Does Mathematics Have? and *The Number Devil* were selected for an in-depth analysis within this study.

The data collection process used a systematic and well-defined book selection process. A list of 17 books was created based on their presence in the academic literature and incorporating mathematical content. The abovementioned selection criteria, such as integration of mathematical concepts, coverage of diverse mathematical topics, storytelling quality, and educational value, were grounded in established pedagogical and curricular considerations to ensure the validity of the data collection process in this study. The selection process was carried out collaboratively by two mathematics teachers and the author of the study to strengthen reliability. Each book was independently evaluated based on a consistent evaluation framework. The framework helped ensure inter-rater reliability and reduced subjectivity during the selection process. The discrepancies were discussed and resolved through consensus. This collaborative approach and the dual focus on mathematical depth and literary quality contribute to constructing the study's validity. Thus, the selected books—*How Many Lives Does Mathematics Have?* and *The Number Devil*—were chosen for their mathematical content and potential to engage students and stimulate mathematical thinking.

Data Analysis

Hunsader (2004) considered the Evaluation Standards for Children's Mathematical Books developed by Schiro (1997) and outlined how these standards can be applied to assess children's literature related to mathematics. The evaluation of mathematical books is based on several criteria. First, the mathematical content of the book—including text, computation, scale, vocabulary, and visuals—should be accurate and consistent, with illustrations correctly reflecting mathematical details. Second, the mathematical content should be effectively and visibly presented through the narrative and illustrations. Third, the content should be appropriate for the target age group. Fourth, the book should engage readers in mathematical problem-solving and encourage applying mathematical concepts in various contexts. Fifth, the integration of mathematics and storytelling should enhance the overall narrative. In this study, based on these standards two selected children's books were analyzed.

Additionally, the *Counting Book Typology* developed by Nurnberger-Haag et al. (2021) was utilized in the data analysis to assess the mathematical content of children's books. This typology categorizes counting sequences into three groups: singular sequences (whole

number sequences, skip counting, ordered sequences), multiple sequences (restart and continuation sequences), and continuous sequences (with or without a narrative). In singular sequences, a single counting sequence is present. In multiple sequences, different sequences appear within the same book and are further divided into subcategories. Counting progresses without interruption in continuous sequences and is classified into two subcategories: with and without a narrative.

Nurnberger-Haag et al. (2021) also evaluated how much a book explicitly conveys whether the reader is expected to engage in counting. This aspect, termed *explicitness*, is categorized into three levels: Explicit Scalar (ES), Explicit Counting (EC), and Implicit Counting (IC). In Explicit Scalar, the text clearly states that counting is taking place and specifies the type of scalar used. In Explicit Counting, counting is explicitly mentioned, but no scalar information is provided. The book presents numbers without directly indicating counting or scalar details in Implicit Counting.

Rationality refers to the extent to which a book's illustrations and visuals effectively reflect changes within a counting sequence (Nurnberger-Haag et al., 2021). Rationality is classified into three subcategories: Rational Counting Sequence (RS), Rational Counting Terms (RT), and Rote Counting (RC). In Rational Counting Sequence (RS), sequences are presented by adding to or removing from previous visual content, ensuring a logical and structured progression. In Rational Counting Terms (RT), images are presented independently, and the counting process is explained through these terms. In Rote Counting (RC), numbers or numerals are provided without accompanying illustrations, requiring the reader to comprehend the counting process solely through numerical values.

Finding

Literary Characteristics of the Books

This section presents the narrative, visual elements, and historical context findings about the books *How Many Lives Does Mathematics Have?* and *The Number Devil.* Both books embed mathematical concepts within rich storylines featuring young protagonists who engage with mathematics through imaginative journeys and problem-solving scenarios. A detailed analysis of each book is presented below.

The book *How Many Lives Does Mathematics Have?* is printed on soft, off-white paper. The cover page features illustrations of the main character, Can, a young boy, along with other figures and events in the story.

Figure 1. Cover image of *how many lives does mathematics have?* by Merve Uygun.

As observed in the book's cover image, the title explicitly includes the term *mathematics*, and the cover itself features numbers, mathematical symbols, and notations. This visual presentation of the cover image suggests that the book contains mathematical content. The book consists of 198 pages, 22 of which include illustrated visuals. Most of these illustrations are directly related to the events depicted in the story. In addition to these images, the text incorporates mathematical representations embedded within the narrative.

The narrative structure in *How Many Lives Does Mathematics Have?* includes sequentially progressing events within their respective contexts. The story's first character is a young boy named Can, who embarks on various adventures involving mathematical problems he must solve while traveling across different time periods. The plot of the book is structured accurately with logically flowıng events. As an example, Can experiences time-traveling adventures in which he encounters and solves mathematical problems. These adventures with mathematical problems in the storyline further enhance the narrative's credibility.

The language of the book is appropriate for middle school students whose ages can range from 10 to 14. The narrative aligns with the everyday experience of this age group. The book has accurate grammar and vocabulary structure supporting a valuable reading experience. Also, the mathematical concepts presented in the book are suitable for the cognitive development level of the target audience.

The narration in the book follows a third-person perspective, which allows readers to follow and observe the first character's (Can) adventures. There are also notable historical mathematicians presented as secondary characters in the book. Some famous characters in the narrative are Omar Khayyam, Pythagoras, and Leonardo Fibonacci. Alongside these

renowned figures, supporting characters such as Can's family, school friends, and animals like rabbits and dinosaurs play roles in the adventures.

During Can's adventures with these characters, the book introduces various mathematical concepts such as variable and exponential.

The design of the books is attractive and captures readers' attention. During the reading experience, the narrative actively encourages participation in the problem-solving process. The solutions to these problems are embedded within the storyline. Thus, readers are engaged with carefully crafted mathematical challenges as Can encounters and resolves the problems throughout his adventures.

The illustrations in the book are both explanatory and complement the text effectively. As an example, in one of his adventures with Leonardo Fibonacci, Can is tasked with calculating the number of rabbits on a farm. The situation on the farm was described as rabbits giving birth every month. At the end of each month, the offspring grow and start giving birth. Thus, the population of rabbits increases exponentially. That information requires Can to carefully perform various calculations to find the total number of rabbits on the farm. Moreover, by performing those calculations, Can discovers Fibonacci numbers. These calculations lead Can to discover Fibonacci numbers. Page 99 of the book presents the results of these calculations in a table format (Figure 2).

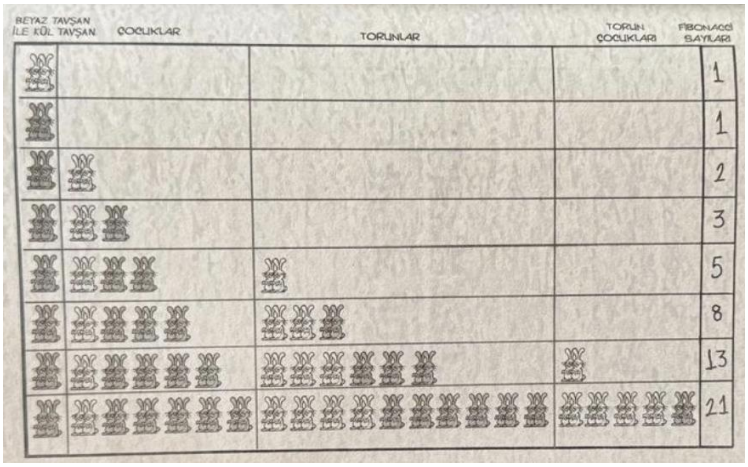

Figure 2. The table used to calculate Fibonacci numbers in the rabbit story from *How Many Lives Does Mathematics Have?* (p. 99).

The cover of *The Number Devil* features a vibrant and colorful image that reflects the imaginative and playful tone of the book. It depicts the story's main characters, Robert and the Number Devil, along with elements such as a rabbit, referencing mathematical concepts mentioned in the book. The book is printed on colored paper.

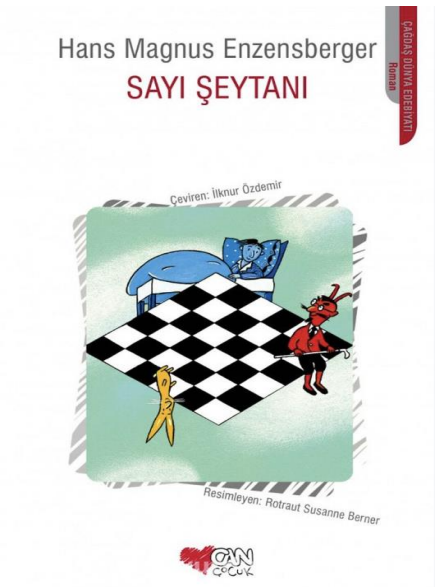

Figure 3. The cover image of *the Number Devil* by Hans Magnus Enzensberger.

The main character of *The Number Devil* is Robert, a child who struggles with mathematics. The events of the book unfold around Robert's encounters with the Number Devil in his dreams. He encounters the Number Devil in his dreams and learns mathematics through this interaction. The book is divided into 12 chapters, each representing a night in which Robert encounters the Number Devil in his dreams. Each chapter focuses on a different mathematical concept, explored through the stories and games that the Number Devil uses to explain the topic to Robert. With the help of the Number Devil, Robert learns mathematical concepts in a fun and discovery-oriented way. During his dreams, the Number Devil teaches Robert various mathematical topics ranging from basic arithmetic to more complex concepts such as prime numbers and infinity. The visuals within the narrative play a crucial role in making mathematics entertaining and comprehensible.

The book consists of 221 pages in total. Numerous illustrations complement the text and visually explain mathematical concepts in the book. On average, about one-third of the pages are filled with visual representations seamlessly integrated into the text. These visual representations include images, mathematical representations, symbols, drawings, and shapes, which help clarify the mathematical ideas presented in the text.

Furthermore, famous mathematicians such as Euler and Gauss are also featured in the book to enrich the mathematical content and provide information about the history and development of mathematics. The events are presented from a third-person perspective, allowing for an external view of Robert's journey through his mathematical exploration.

The style of *The Number Devil* presents mathematical concepts through an entertaining and instructive narrative. The book uses humor to make mathematics engaging, and the character of the Number Devil explains mathematical topics in a fun and accessible way. The language in the text is simple, making the complex topics understandable. The vivid and colorful illustrations in the text facilitate the comprehension of mathematical concepts mentioned in the text. Moreover, the book's discovery-oriented approach makes learning mathematics enjoyable. The language of *The Number Devil* is appropriate for both middle and high school students. The language of the book presents mathematical ideas in a way that children can grasp easily. The book explains complex mathematical terms using straightforward and comprehensible language.

The illustrations in the book are supportive and explanatory. For example, in the section where Robert and the Number Devil explore the numbers in Pascal's Triangle, illustrations of Pascal's Triangle are used, with examples provided for each pattern to be discovered. The Pascal's Triangle on page 118 is presented in Figure 4.

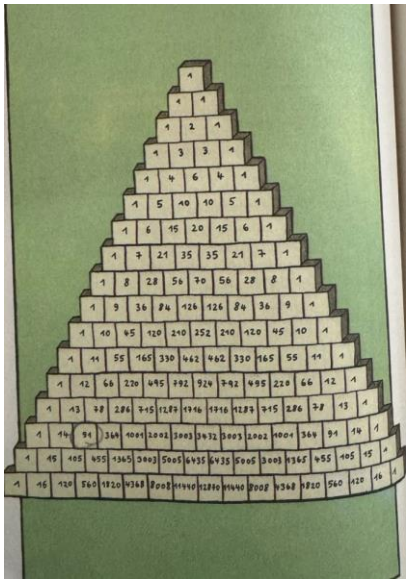

Figure 4. Pascal's triangle from *The Number Devil* (p. 118).

Mathematical Features of the Books

The information presented in *How Many Lives Does Mathematics Have?* is mathematically accurate and aligns with the objectives and mathematical skills outlined in the Ministry of National Education's (2024) middle school mathematics curriculum at various grade levels. The mathematical content of the book generally corresponds to the themes covered in the Ministry of National Education's (2024) middle school curriculum for grades 5, 6, and 7, specifically in the areas of Numbers and Quantities, Algebraic Thinking with Operations, Changes, and Geometric Quantities. The problems featured in Can's adventures involve operations, variables, and some algebraic concepts. In these problems, the 'x' expression is introduced as a placeholder for an unknown value, referred to as 'thing.' Through his adventure with Omar Khayyam, Can realizes that the 'x' expression represents the unknown value. The following dialogue illustrates this realization (p. 35).

> *Grocery Salesman (Omar Khayyam): Well, we have found the Sultan's "x," or "thing." Now it's your turn. What did your mother ask of you?*
>
> *Can: The Sultan's thing was the shooting speed and distance, right?*
>
> *Grocery Salesman (Omar Khayyam): Yes, my child. "x" is the unknown, the value that is sought. I referred to it as a "thing." Over time, it became "x." This is how values began to be determined.*

The information presented in the *Number Devil* book aligns with the objectives and mathematical problem-solving skills outlined in the Ministry of National Education's (2024) middle school and mathematics curriculum, specifically in the learning domain of numbers and quantities at various grade levels. Some of the mathematical topics addressed in the book include basic arithmetic, prime numbers, exponents and square roots, decimal notation, irrational numbers, number systems, the concept of infinity, Fibonacci sequence, Pascal's triangle, permutations, and combinations. These topics are covered in both the middle school (grades 5-8) and high school mathematics curricula. The book presents these and similar mathematical concepts in a fun, story-based manner. In the section where square root two is discussed, the Number Devil plays a game with Robert to help him discover the square root of two, asking various questions throughout the game to encourage Robert's self-discovery. This discovery involves the use of two related squares (Figure 5).

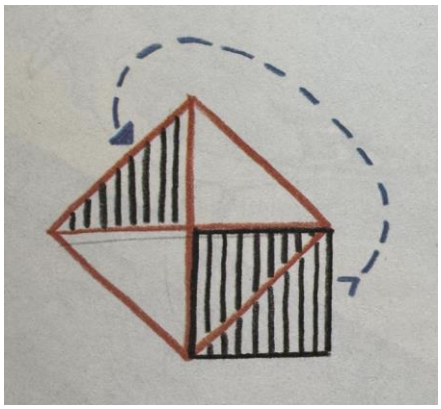

Figure 5. Squares used in the exploration of the square root of 2 (The Number Devil, p. 71)

The book *How Many Lives Does Mathematics Have?* is categorized under Skip Counting (SC). On page 150 of the book, a problem involving the sequence "9, 18, 27, 36, 45, 54, 63, 72, 81, 90" is presented. Additionally, on page 88, the Fibonacci sequence calculates the number of rabbits and is given as "5, 8, 13, 21, 34, 55, 89, 144, 233." However, since this is not an arithmetic sequence and does not belong to the content-specific typology, it should be categorized differently. Counting with Multiple Scalars in a Scenario (MWS) refers to a counting method with multiple sequences. Still, instead of starting over, counting continues with different scalars within a real-life scenario or context. On page 53 of the book, the child protagonist calculates half of his height, 1 meter 54 cm, by first calculating half of 1 meter, which he expresses as 50 cm, and then calculating half of 54 cm. This method fits within the *Counting with Multiple Scalars* category. The book falls under the category of explicit counting. On page 81, Can is imprisoned on a rabbit farm, and the White Rabbit asks Can to calculate the total number of rabbits on the farm. The sequence "9, 18, 27, ..." is organized by grouping each term in the visual presented on page 152 of the book *How Many Lives Does Mathematics Have?*. Thus, the book fits the Rational Counting Sequence (RCS) category.

The book *The Number Devil* is categorized under Multiple Different Scalars (MDS). On page 151 of the book, sequences related to counting numbers and odd numbers are presented. Therefore, a new sequence is included in the book using a different scalar. Two sequences with different scalars end with different values. The book also includes sequences such as noble numbers and Fibonacci numbers, but these sequences do not belong to the content-specific typology. *The Number Devil* fits within the category of Implicit Counting (IC). On page 151, a sequence "1, 2, 3, 4, 5..." is presented, but these quantities are discussed without using the term 'counting.' *The Number Devil* fits within the Rational Counting Terms

(RCS) category. For instance, in the visual presented on page 155, different sequences such as counting numbers, odd numbers, and Fibonacci numbers are listed in a table. This table includes the numbers in the sequences' terms, but the sequences' scalar patterns are not specified.

The book *How Many Lives Does Mathematics Have?* is aligned with the objectives and mathematical skills outlined in the Ministry of National Education (2024) mathematics curriculum for 5th, 6th, and 7th grades. The book addresses various mathematical objectives of the MoNE mathematics curriculum through the mathematical problems encountered by the child protagonist, Can, during his journeys through different time periods. The problems require students to use natural numbers and operations, time, length, and the conversions of these measurements. The book introduces the concept of 'x' as an unknown in algebra and presents some algebraic operations. The book emphasizes the use of reasoning and critical thinking skills to solve problems. The mathematical skills covered in the book are diverse. In Can's adventures, famous mathematicians appear as secondary characters, and information about these mathematicians is woven into the story.

Additionally, the book focuses on skills to develop problem-solving abilities and mathematical literacy. The stories included problems that are presented aesthetically pleasing in terms of literary quality. Although calculations are often emphasized in solving these problems, there are also instances where reasoning and prediction skills are required.

At the beginning of the book, the child character, Can, represents a mathematically struggling individual. However, it is observed that throughout his adventures, he develops a positive attitude toward mathematics through the problems he solves. Furthermore, the problems in the book involve real-life scenarios, encouraging students to develop mathematical modeling skills.

The concepts of prime numbers, exponents, irrational and complex numbers, infinity, logic, and proof addressed in *The Number Devil* appeal to many readers, from middle school to high school and university students. The book presents mathematics in an enjoyable and accessible way, not limited to the concepts in the middle school mathematics curriculum. Various mathematical problems and concepts are comprehensively explored, making it a suitable resource for young readers and adults interested in mathematics. The mathematical topics in *The Number Devil* focus more on abstract and theoretical concepts than everyday arithmetic operations. The book supports various skills, encouraging students to think

critically and analytically through various mathematical problems. Fundamental mathematical concepts (e.g., numbers, geometry) are presented in a clear and enjoyable manner, ensuring that students can learn these concepts effectively—fun and engaging stories related to mathematics boost students' motivation to learn. The book encourages creative exploration of mathematical concepts and helps students develop their imagination and creative thinking skills.

Additionally, the problems in the book contribute to the development of self-regulation and patience skills, as solving specific problems requires time and effort. Overall, *The Number Devil* narrates the educational and adventurous guidance of the Number Devil, which helps Robert overcome his challenges with mathematics and understand mathematical concepts. In each chapter, the Number Devil explains various mathematical topics (e.g., prime numbers, infinity, the Fibonacci sequence) entertaining and thought-provokingly. These explanations enjoyably teach mathematics and develop critical thinking skills in the readers.

The book *How Many Lives Does Mathematics Have?* aligns with the criteria for evaluating mathematics books. The text tells a well-developed narrative filled with creative elements; the story focuses on the adventures of the main character, Can, who travels through time and meets famous mathematicians such as Omar Khayyam, Leonardo Fibonacci, and Pythagoras. As the plot progresses logically and convincingly, including historical figures and mathematical problems creates an engaging and educational environment. Through his interactions with these famous mathematicians, the character of Can makes mathematical concepts more understandable and engaging for middle school students. In contrast, other characters enrich the narrative by adding details to the story. The writing style is captivating, integrating mathematical problems seamlessly into the story and actively involving the reader. The visuals are related to the text and help visualize mathematical concepts, such as representing the Fibonacci sequence through the rabbit problem, making complex mathematical ideas more accessible to young readers. While the book uses appropriate language and presentation for middle school students, the off-white color of the paper may cause eye strain during prolonged reading sessions. The text demonstrates strong coherence between the plot, writing style, and visuals; the integration of mathematical problems into the story and the visuals make the book engaging. The book reflects positive educational values by incorporating historical mathematicians and

encouraging curiosity and problem-solving. The book promotes a positive attitude toward mathematics, encouraging readers to view mathematics as not a task but an adventure.

The book *The Number Devil* aligns with the criteria for evaluating mathematics books. The plot, developed through imagination, revolves around the young boy Robert, who experiences visits from the Number Devil in his dreams due to his fear of mathematics. In each chapter, new mathematical concepts are introduced in an entertaining manner, maintaining the continuity of the story. The Number Devil guides Robert through a series of adventures, making abstract concepts accessible and engaging, which makes the book both educational and enjoyable. Robert's development from a student who avoids mathematics to one who becomes interested in numbers illustrates character development, with the Number Devil acting as a mentor who guides him on his mathematical journey. The book's writing style is lively and compelling, capturing readers' attention with humorous and imaginative scenarios. The visuals complement the text and help reinforce mathematical concepts by visualizing abstract ideas. While the language used is appropriate for middle school students, the book also contains content suitable for more advanced readers, providing an accessible and intellectually enriching reading experience. With its subject matter, writing style, and visuals, the book strikes a harmonious balance, offering children an engaging and educational experience in mathematics. Moreover, it encourages curiosity, critical thinking, and the development of positive attitudes toward mathematics.

Discussion

The contents of *How Many Lives Does Mathematics Have?* and *The Number Devil* provide valuable findings for mathematics education. The cover of *How Many Lives Does Mathematics Have?* features mathematical symbols and numbers, while the book links mathematical content to real-life scenarios. In contrast, *The Number Devil*'s cover includes fantastical elements and mathematical concepts are introduced through dreams and a mythological character. *How Many Lives Does Mathematics Have?* is written from a third-person perspective, integrating mathematical problems into the narrative to engage the reader, using language appropriate for the middle school age group. On the other hand, The Number Devil presents mathematical concepts in a fun and humorous manner; its narrative style is more fantastical and playful. It is also written from a third-person perspective.

The two books' page count and visual representations differ: *How Many Lives Does Mathematics Have?* consists of 198 pages, with 22 pages dedicated to illustrations, while *The Number Devil* has 221 pages, with approximately one-third containing visual representations. *How Many Lives Does Mathematics Have?* focuses more on mathematical topics aligned with the middle school curriculum and incorporates historical figures. At the same time, *The Number Devil* covers a broader range of topics, from basic arithmetic to prime numbers and the concept of infinity, making it suitable for both middle school and high school curricula.

Additionally, the off-white paper in *How Many Lives Does Mathematics Have?* may cause eye strain during prolonged reading sessions. In contrast, the paper quality and colored visuals in *The Number Devil* offer a more favorable reading experience. The mathematical content in *How Many Lives Does Mathematics Have?* aligns with the Ministry of National Education's (2024) middle school curriculum, covering topics such as Numbers and Quantities, Algebraic Thinking with Operations, and Geometric Quantities for grades 5, 6, and 7. The book includes problems involving the four basic arithmetic operations, variables, and algebra. The expression 'x' is introduced as a symbol representing an unknown value, a concept explained during Can's adventure with Omar Khayyam.

On the other hand, the information presented in *The Number Devil* aligns with the Ministry of National Education's (2024) middle school and high school curricula, incorporating topics from grades 5 to 8. The book introduces basic arithmetic, prime numbers, powers and square roots, decimal notation, irrational numbers, number systems, infinity, the Fibonacci sequence, Pascal's triangle, and permutations and combinations in a fun, story-based manner. For instance, the concept of square roots is taught through a game played by the Number Devil and Robert.

Both books present mathematical concepts through storytelling; however, *How Many Lives Does Mathematics Have?* adopts a curriculum-focused approach aimed at middle school students, while *The Number Devil* uses a more creative and entertaining method that appeals to a broader audience. *How Many Lives Does Mathematics Have?* teaches mathematics through real-life scenarios and historical figures. *The Number Devil* explores mathematical concepts under the guidance of a fantastical character, the Number Devil. These different approaches provide readers with various opportunities to learn and understand mathematics.

These findings are also consistent with the literature on the role of children's literature in mathematics instruction. The findings highlight the potential of integrating

narrative and storytelling techniques into mathematics education to enhance student engagement and understanding as they support students' mathematical communication (NCTM, 2000; Schiro, 1997). Both *How Many Lives Does Mathematics Have?* and *The Number Devil* demonstrate that mathematical concepts, whether elementary or more advanced, can be effectively taught through creative, context-driven approaches (Van Elsen et al., 2024). This approach can be generalized to various educational settings, showing that mathematics education should not be confined to traditional, abstract methods (Sianturi & Hurit, 2024). Specifically, children's books can make mathematical concepts fun and understandable, enhancing students' mathematical thinking skills and motivation (Casey et al., 2004; Shatzer, 2008). By embedding mathematical ideas within stories, whether through real-life scenarios, historical figures, or fantastical elements, educators can make mathematics more relatable, engaging, and memorable for students (Sianturi & Hurit, 2024).

These findings underscore the importance of combining different educational methods—such as storytelling, problem-solving, and visual aids—to support diverse learning styles (Can & Durmaz, 2023). In a broader context, this approach aligns with constructivist educational theories, suggesting that learners benefit from active, inquiry-driven experiences that allow them to connect new concepts to their prior knowledge (Dewey, 1997). Children's books provide students various opportunities to learn and apply mathematical concepts through interacting with literature, highlighting the importance of constructivist approaches and literary standards in this context (Dewey, 1997; Schiro, 1997). Consequently, the generalizability of these findings supports the idea that integrating narrative-based strategies into the curriculum can enrich the overall learning experience and foster a more positive attitude toward mathematics across various age groups and educational levels.

Beyond the analysis of *How Many Lives Does Mathematics Have?* and *The Number Devil*, the study underscores the broader value of using narrative-based approaches in mathematics education. These findings suggest that traditionally viewed as abstract or challenging mathematical concepts can be made more accessible and engaging by integrating storytelling and creative contexts (Sianturi & Hurit, 2024). This approach supports the comprehension of mathematical ideas and enhances student motivation and interest by placing mathematics in real-life or imaginative scenarios (Van Elsen et al., 2024).

Conclusion

This study aimed to explore the extent to which the children's books *The Number Devil* and *How Many Lives Does Mathematics Have?* align with established literary and mathematical criteria. The findings reveal that both books integrate mathematical concepts effectively, yet through distinctly different narrative strategies and pedagogical orientations.

How Many Lives Does Mathematics Have? aligns closely with the middle school curriculum defined by the Ministry of National Education (2024), both in content and in integrating real-life contexts and historical figures. The book *How Many Lives Does Mathematics Have?* has a narrative structure that embeds mathematical problems within engaging scenarios, supporting a conceptual understanding of mathematics. *The Number Devil* introduces a broader range of mathematical topics using elements of dreams and fantasy. The content of the book is suitable for middle and high school levels. It contains an imaginative narrative and supports curiosity and enthusiasm in mathematics by emphasizing creativity and abstract exploration.

In addressing the research question, the analysis shows that both books satisfy key literary standards—such as character development, narrative coherence, and age-appropriate language—and incorporate visual elements that aid comprehension. From a mathematical standpoint, they both present accurate content. *How Many Lives Does Mathematics Have?* offers a curriculum-based, problem-oriented structure, and *The Number Devil* embraces a discovery-based, story-driven model.

This study confirms that children's literature can be a powerful tool for mathematics instruction since they could meet educational criteria while offering engaging, interdisciplinary learning experiences. The alignment with literary and mathematical criteria suggests that these books are suitable for classroom use, and they can reshape students' perceptions of mathematics from a rigid subject to a creative and meaningful discipline.

Suggestions

The current study suggests that future studies may explore the potential of integrating children's literature into the mathematics curriculum at all educational levels fr, from elementary to higher education. Stories give students a broader context for the concepts they are learning, enhancing their understanding and ability to apply mathematical knowledge. Additionally, the books focused on this study contained specific mathematical concepts, so future studies could explore children's books that include mathematical topics

such as statistics and probability, which were not covered in the current study. This study also suggests the importance of children's literature interdisciplinary approaches in mathematics education with a richer learning environment because children's literature encourages integrating mathematics with other subjects like history or literature. Furthermore, future studies could explore the potential of interactive technologies and problem-solving games on narrative techniques. To sum, children's literature has a crucial role in fostering creativity and curiosity, emphasizing that mathematics is not just about right or wrong answers but about exploration and discovery.

Acknowledgement

Due to the scope and method of the study, ethics committee permission was not required.

Author Contribution Statement

Rüveyda KARAMAN DÜNDAR: *Conceptualization, literature review, data curation, methodology, implementation, data analysis, original draft, language editing, organization, and writing.*

References

Anderson, A., Anderson, J., & Shapiro, J. (2004). Mathematical discourse in shared storybook reading. *Journal for Research in Mathematics Education. 35*(1), 5–33.

Buehl, D. (2023). *Classroom strategies for interactive learning*. Routledge.

Can, D., & Durmaz, B. (2023). An analysis of teachers' beliefs about the integration of children's literature into the mathematics education. *International Journal of Science and Mathematics Education*, *21*(2), 489–512.

Casey, B., Kersh, J. E., & Mercer Young, J. (2004). Storytelling sagas: An effective medium for teaching early childhood mathematics. *Early Childhood Research Quarterly, 19*, 167–172.

Colwell, J., & Enderson, M. C. (2016). "When I hear literacy": Using pre-service teachers' perceptions of mathematical literacy to inform program changes in teacher education. *Teaching and Teacher Education*, *53*, 63–74. doi:

Cotti, R., & Schiro, M. (2004). Connecting teacher beliefs to the use of children's literature in the teaching of mathematics. *Journal of Mathematics Teacher Education*, *7*, 329–356.

Dewey, J. (1997). *Experience and education*. Touchstone.

Doig, B. (1989). *Links: A guide to maths in children's literature*. Nelson.

Draper, R. J. (2002). School mathematics reform, constructivism, and literacy: A case for literacy instruction in the reform-oriented math classroom. *Journal of Adolescent & Adult Literacy*, *45*(6), 520–529.

English, L. D. (2010). Young children's early modeling with data. *Mathematics Education Research Journal. 22*(2), 24–47.

English, L. D., & Watters, J. J. (2004). Mathematical modelling with young children. *International Group for the Psychology of Mathematics Education*, *2*, 335–342.

Enzensberger, H. M. (1999). *Sayı Şeytanı* (İ. Özdemir, Çeviren). Can Sanat Yayınları.

Flevares, L. M., & Schiff, J. R. (2013). Engaging young learners in integration through mathematical modeling: asking big questions, finding answers, and doing big thinking. *Advance in Early Education and Day Care, 17*, 33–56.

Flevares, L. M., & Schiff, J. R. (2014). Learning mathematics in two dimensions: A review and look ahead at teaching and learning early childhood mathematics with children's literature. *Frontiers in Psychology, 5*(459). http://doi.org/10.3389/fpsyg.2014.00459

Gaston, J. L. (2008). A review and an update on using children's literature to teach mathematics. https://files.eric.ed.gov/fulltext/ED503766.pdf

Hellwig, S. J., Monroe, E. E., & Jacobs, J. S. (2000). Making informed choices: Selecting children's trade books for mathematics instruction. *Teaching Children Mathematics, 7*(3), 138–143. https://doi.org/10.5951/TCM.7.3.0138

Hunsader, P. D. (2004). Mathematics trade books: Establishing their value and assessing their quality. *The Reading Teacher*, *57*(7), 618–629.

Jennings, C. M., Jennings, J. E., Richey, J., & Dixon-Krauss, L. (1992). Increasing interest and achievement in mathematics through children's literature. *Early Childhood Research Quarterly, 7*(2), 263–276.

Kress, G., & Van Leeuwin, T. (1996). *Reading images: The grammar of visual design*. Routledge.

Lewis, D. (2001). *Reading contemporary picture books: Picturing text*. Routledge Falmer.

Livy, S., Muir, T., Trakulphadetkrai, N. V., & Larkin, K. (2023). Australian primary school teachers' perceived barriers to and enablers for the integration of children's literature in mathematics teaching and learning. *Journal of Mathematics Teacher Education, 26*(1), 5-26. https://doi.org/10.1007/s10857-021-09517-0

Marston, J. (2010). Developing a framework for the selection of picture books to promote early mathematical development. In *Mathematics Education Research Group of Australasia*, (pp. 383–390).

Marston, J., Muir, T., & Livy, S. (2013). Can we really count on Frank? *Teaching Children Mathematics, 19*(7), 440–448.

Merriam, S. B. (2009). *Qualitative research: A guide to design and implementation. Revised and expanded from qualitative research and case study applications in education.* A Wiley Imprint.

Ministry of National Education [MoNE] (2024). *Mathematics teaching program (Middle School 5, 6, 7, ve 8. Grades).*

Monroe, E. E., Young, T. A., Fuentes, D. S., & Dial, O. H. (2018). *Deepening student's mathematical understanding with children's literature*. National Council of Teachers of Mathematics.

Moyer, P. S. (2000). Communicating mathematically: Children's literature as a natural connection. *The Reading Teacher*, *54*(3), 246–255.

National Council of Teachers of Mathematics [NCTM]. (2000). *Principles and standards for school mathematics.* National Council of Teachers of Mathematics.

Nesmith, S. M., & Cooper, S. (2010). Trade books in the mathematics classroom: The impact of many, varied perspectives on determinations of quality. *Journal of Research in Childhood Education, 24*(4), 279–297. https://doi.org/10.1080/02568543.2010.510086

Nurnberger-Haag, J., Alexander, A. N., & Powell, S. R. (2021). What counts in number books? A content-domain specific typology to evaluate children's books for mathematics. *Mathematical Thinking and Learning, 23*(2), 145–169. https://doi.org/10.1080/10986065.2020.1777365

Op't Eynde, E., Depaepe, F., Verschaffel, L., & Torbeyns, J. (2023). Shared picture book reading in early mathematics: A systematic literature review. *Journal Für Mathematik-Didaktik (Internet), 44*(2), 505–531. https://doi.org/10.1007/s13138-022-00217-7

Schiro, M. (1997). *Integrating children's literature and mathematics in the classroom: Children as meaning makers, problem solvers, and literary critics*. Teachers College Press

Shatzer, J. (2008). Picture book power: Connecting children's literature and mathematics. *Reading Teacher, 61*, 649–653.

Sianturi, M., & Hurit, A. A. (2024). 'I want to read this book again!' decolonizing children's literature to support indigenous children in reading and mathematics learning. *Journal of Intercultural Studies*, *45*(2), 338–362.

Uygun, M. (2022). *Matematiğin kaç canı var?* Cezve Çocuk Yayınları.

Vaughan, J. L., & Estes, T. H. (1986). *Reading and reasoning beyond the primary grades.* Allyn & Bacon.

Van den Heuvel-Panhuizen, M., Van den Boogaard, S., & Doig, B. (2009). Picture books stimulate the learning of mathematics. *Australasian Journal of Early Childhood*, *34*(3), 30–39.

Van Elsen, J., Catrysse, L., & De Maeyer, S. (2024). The effect of interactive picturebook reading on problem-solving skills in preschool: A quasi-experiment. *Early Childhood Education Journal*, *52*(7), 1471–1485.

Van Oers, B. (2013). "Communicating about number: Fostering young children's mathematical orientation in the world," in *Reconceptualizing Early Mathematics Learning*, eds L. D. English and J. T. Mulligan (Springer).

Welchman-Tischler, R. W. (1992). *How to use children's literature to teach mathematics*. National Council of Teachers of Mathematics.

Whitin, D. J., & Whitin, P. E. (1996). Fostering metaphorical thinking through children's literature. In P.C. Elliott (Ed.), *Communication in mathematics: K-12 and beyond, 1996 yearbook of the National Council of Teachers of Mathematics* (pp. 60-65). National Council of Teachers of Mathematics.

Zazkis, R., & Liljedahl, P. (2009). *Teaching mathematics as storytelling*. Sense Publishers.