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Real-Life Contextualization in the Geometric Shapes Unit of Fifth Grade Mathematics Textbooks: An Analytical Study[1]

*** Şevval İşözen, ** Ahmet Kaçar**

Abstract. Students often perceive mathematics as a challenging subject, which can contribute to the development of negative attitudes toward the course. One reason for this negativity is that textbooks are often disconnected from students' everyday experiences. Previous studies emphasize that textbooks should not only align with the curriculum but also be organized in a way that engages students' interest. Approaches that support learning through real-life connections further highlight this necessity. However, existing research indicates that mathematics textbooks often fail to incorporate real-life contexts sufficiently. With the implementation of the Turkey Century Maarif Model in the 2024–2025 academic year, textbooks were revised to bridge the gap between theoretical knowledge and daily life. Within this framework, the present study examines the extent to which the "Geometric Shapes" unit of the fifth-grade mathematics textbook, prepared in accordance with the 2024–2025 Turkey Century Maarif Model, incorporates real-life contexts. Specifically, the study examines the degree to which concepts, problems, and activities in the unit are related to everyday life. The research employed a qualitative research design, utilizing document analysis as the primary data source, with the fifth-grade mathematics textbook published by the Ministry of National Education serving as the basis for the study. Applying Gainsburg's (2008) analytical framework, a total of 118 items were examined, of which 77 were not connected to real-life contexts, while 41 demonstrated various forms of contextualization. These connections were categorized as simple analogies, mathematical modeling, and examination of real data, classical problems, applied demonstrations, and discussions of mathematics in society. The findings reveal that the use of real-life contexts is limited, indicating that although the textbook demonstrates some alignment with the principles of life-based learning, it does not fully adhere to the intended approach.

Keywords. Mathematics education, textbook analysis, real-life context, geometric shapes, Century of Türkiye Maarif Model.

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Mathematics is generally regarded as a challenging subject, both in terms of learning and teaching. Students often describe the subject as "difficult," "boring," and "uninteresting," while teachers frequently perceive it as "difficult to teach" and "characterized by low student engagement." Numerous studies have examined the reasons behind these negative attitudes toward mathematics, highlighting it as an important area of research in mathematics education. Several factors contribute to these negative perceptions, including students' prior mathematical experiences, preconceptions, fear of failure, the teaching methods and strategies employed by instructors, and the attitudes of teachers. Additionally, mathematics textbooks play a significant role in this process (Dayak, 1998; Duman et al., 2001). In particular, the complexity and abstract nature of the language used in textbooks, along with the insufficient connection of examples to everyday life, can hinder students' ability to relate to mathematical concepts (Göze, 1999).

Recent developments in teaching and learning approaches have necessitated the revision of textbooks. Textbooks serve as a fundamental tool for conveying the learning outcomes specified in the curriculum. In addition to answering questions such as "what will be taught, how it will be taught, and how the outcomes will be assessed," textbooks also shape the roles of teachers and students within the learning environment. Therefore, mathematics textbooks should not only align with the curriculum but also be designed to engage students actively in the learning process. According to Küçükahmet (2011), mathematics textbooks should be consistent with the Ministry of National Education’s curriculum, incorporate interdisciplinary connections, and be structured using appropriate teaching methods.

In this context, contemporary theoretical approaches to mathematics education emphasize students' engagement with learning by connecting it to their everyday experiences. These approaches consider how individuals learn and the factors that influence the learning process, aiming to make mathematics learning more meaningful, lasting, and functional (Altun, 2006). One such approach, Realistic Mathematics Education (RME), emphasizes that students solve problems linked to real-life contexts based on their personal experiences and informal knowledge, while simultaneously progressing toward a formal understanding of mathematics (Tunalı, 2010). RME not only focuses on the mathematical content but also questions how this content should be presented (Van den Heuvel-Panhuizen & Wijers, 2005). This approach underpins the design of instructional materials with a pedagogical and didactic philosophy, aiming to facilitate meaningful and holistic learning experiences for students (Sezgin-Memnun, 2011). The fundamental principles of Realistic Mathematics Education (RME) find a strong correspondence particularly within the domain of

geometry. Geometry plays a significant role in integrating real-life contexts into mathematics instruction, as it is a learning area that is highly conducive to spatial reasoning, visualization, and interaction with objects in the surrounding environment. Van den Heuvel-Panhuizen (2003) emphasizes that geometric models and realistic contexts function as a bridge enabling students to access abstract mathematical concepts. Similarly, Blum et al. (2002) highlight that modelling activities and real-life–based tasks particularly in geometry education support students' conceptual understanding and problem-solving skills.

Bingölbali and Özdiner (2022) examined the relationship between activities in mathematics textbooks and real-life contexts across grades 1–8. Their study found that approximately half of the activities in primary school textbooks were related to real-life contexts, while the other half did not adequately reflect such connections. The richness of real-life experiences is thus not sufficiently conveyed through textbook activities.

The present study aims to examine the extent to which concepts, problems, and activities in primary mathematics textbooks are linked to everyday life. In this regard, the fifth-grade mathematics textbook prepared according to the Turkey Century Maarif Model, which was implemented in the 2024–2025 academic year, serves as the basis of the analysis. The study specifically focuses on the Geometric Shapes unit, which was selected because this grade level represents one of students' first systematic encounters with abstract mathematical concepts, and geometry is a learning domain that is particularly well suited to establishing connections with real-life contexts. Accordingly, the study addresses the following research question:

• To what extent do the concepts, problems, and activities in the Geometric Shapes unit of the fifth-grade mathematics textbook prepared according to the 2024–2025 Turkey Century Maarif Model incorporate real-life contexts?

Students' ability to relate mathematics to real life is closely associated with the teacher's allocation of time to such connections during lessons and the opportunities provided for students to reflect on these examples (Özgeldi & Osmanoğlu, 2017). Therefore, textbooks prepared with real-life connections are of critical importance. Such an approach not only supports meaningful learning but also ensures equitable access to learning opportunities for all students, contributing to fairness in education.

Analyzing the content of mathematics textbooks in terms of real-life contexts is essential for both aligning with contemporary teaching approaches and fostering positive attitudes toward

mathematics. Accordingly, this study examines the extent to which the content presented in textbooks enables students to make connections with real-life experiences. In doing so, it evaluates whether mathematics instruction is structured not only to achieve academic success but also to develop practical life skills. Given the critical role of textbook activities in integrating school mathematics with real-life experiences, it is important to examine the degree to which textbooks, as primary sources of information, incorporate real-life contexts (Bekiroğlu & Ütkür-Güllühan, 2023).

The concept of real life has been addressed in various ways in the literature. Le Roux (2008) associates the concept with mathematical problems embedded in real-life contexts, while Stylianides and Stylianides (2008) consider it as activities in which mathematics connects directly or indirectly with disciplines such as science, commerce, engineering, and economics. In the RME approach, the term "real" is understood as a feature that must be mentally represented by the student (van den Heuvel-Panhuizen, 2003). Studies conducted under the auspices of the International Commission on Mathematical Instruction (ICMI) further conceptualize real life not as being limited to daily experiences, but as encompassing contexts related to nature, society, culture, and various academic disciplines (Blum et al., 2002).

Many countries' mathematics curricula emphasize the importance and benefits of linking mathematical concepts to real-life applications (National Council of Teachers of Mathematics [NCTM], 2012). Similarly, in Turkey, curriculum guidelines highlight real-life situations. The transition to the Turkey Century Maarif Model further reinforced the significance of knowledge and skills that are practically applicable and transferable to real-life situations. This model promotes the integration of existing knowledge and skills with new content, enabling students to connect their prior knowledge with new learning experiences. Such activities enable students to connect their prior knowledge to new learning in real-life contexts, thereby enhancing the meaningfulness and retention of mathematical knowledge (Ministry of National Education [MoNE], 2024). The Middle School Mathematics Curriculum, within the framework of the adopted model and approach, aims to make mathematics teaching and learning engaging and interactive, increase students' interest, address individual and societal needs, and integrate mathematics into everyday life experiences. Furthermore, the curriculum emphasizes the development of higher-order skills such as critical thinking, problem-solving, and decision-making (MoNE, 2024).

Method

Research Model

Since this study is based on an analysis of a subject-specific textbook, it will be conducted within the framework of a qualitative research design using the document analysis technique. Document analysis, the primary method employed in this research, involves the systematic collection, examination, and interpretation of written materials produced by individuals, institutions, or events related to the research topic (Sak, Şahin-Sak, Öneren-Şendil, & Nas, 2021). The data source of the study consists of the fifth-grade mathematics textbook published by the Ministry of National Education, prepared in accordance with the Turkey Century Maarif Model for the 2024–2025 academic year (Albayrak et al., 2024). The analysis is limited to the textbook's first unit, titled "Geometric Shapes."

Examined Document

The data source of the study consists of the fifth-grade mathematics textbook published by the Ministry of National Education, prepared in accordance with the Turkey Century Maarif Model for the 2024–2025 academic year. The analysis is limited to the textbook's first unit, titled "Geometric Shapes." All activities and concept explanations within the Geometric Shapes unit were included in the analysis. A total of 118 items from the unit were examined.

Data Collection Tools

In this study, no pre-existing instrument was used for data collection; instead, the relevant unit of the textbook was directly examined in accordance with an analysis framework specifically developed to suit the research purpose. All problems and activities in the textbook were analyzed, and the types of real-life contextualization were identified based on the framework developed by Gainsburg (2008), which is presented in Table 1.

Table 1.

Types of Real-Life Connections and Descriptions

Types of Real-Life Connections	**Descriptions**
Simple Analogies	These are contextualizations that utilize real-life situations metaphorically to facilitate the understanding of mathematical concepts. In such examples, real life does not appear directly but serves as a tool to strengthen the mental representation of the concept.
Traditional Word Problems	These are problems that appear to be drawn from real life but typically contain fictional quantitative data adapted to the classroom context. Such problems are used to assess students' ability to apply mathematical operations.
Examination Of Real Data	These are activities that involve analyzing real data obtained from everyday life or social sources. In this process, students develop skills such as data collection, organization, interpretation, and analysis, culminating in a conclusion.
Discussion Of Mathematics İn Society	These are activities that address the role of mathematics in various areas, including social life, the economy, the environment, and technology. Such contextualizations enable students to recognize the social dimension of mathematics.
Applied Demonstrations Of Mathematical Concepts	These are activities that demonstrate mathematical concepts through concrete materials, experiments, or practical applications. The aim is to facilitate students' understanding of abstract concepts.
Mathematical Modelling Of Real Situations	These are activities that involve expressing real-life events or problems in mathematical terms, developing solution strategies, and evaluating the results. Such contextualizations help students perceive mathematics as an integral part of everyday life.

Process

During the analysis process, all activities and concept explanations within the Geometric Shapes unit were first identified. Each item was then evaluated according to Gainsburg's classifications of real-life contexts, and its corresponding type was determined.

- Activities were coded as E1, E2, …
- Concepts were coded as K1, K2, …

Moreover, transferred to an Excel spreadsheet. Instances that did not contain real-life contexts were marked as "None" in the dataset. Based on this coding table, thematic counts, percentages, charts, and tables were generated. Throughout the process, the accuracy of the analyses was supported by consulting a mathematics teacher from the Ministry of National Education and a field expert, a faculty member in mathematics education.

Sample Codings:

E4: None

Match the following geometric drawing, representation, and pronunciation correctly.

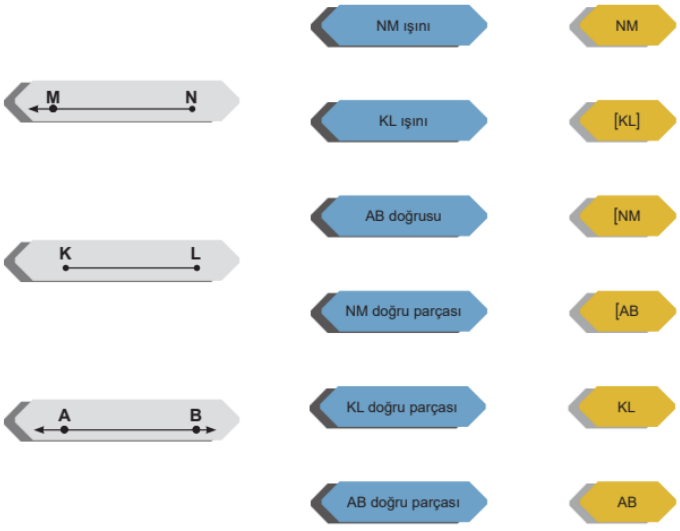

Figure 1. MoNE, 2024, s. 20.

• The given activity is the fourth activity in the relevant textbook of the study. It lacks real-life context.

E16: Examination of real data

Engineer Ms. Zeynep wants to transport the wastewater from the building's roof to the ground in the shortest possible way. Which of the numbered pipes is the most suitable for this task?

Figure 2. MoNE, 2024, s. 29.

• The given activity is the 16th activity in the relevant textbook of the study. Since it requires finding a solution to a real-life situation, it is an example of the "examination of real data" type.

E57: Applied demonstrations of mathematical concepts

Are the Sums of Interior Angles of All Triangles the Same?

• Draw a triangle of any size on a white sheet of paper, and also draw a line segment in the area outside the triangle.

• Label the vertices of your triangle.

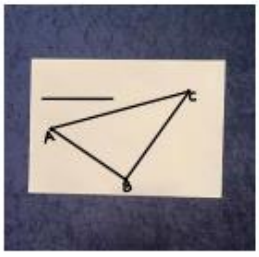

Figure 3 *Figure 4*

MoNE, 2024, s. 72

• Color your triangle and indicate its interior angles.

• Write the letters you assigned to the vertices of your triangle inside the triangle, placing them at the positions corresponding to the interior angles.

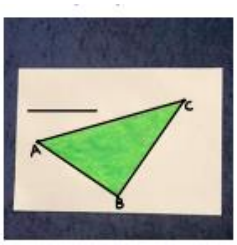

Figure 5

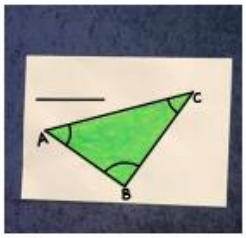

Figure 6

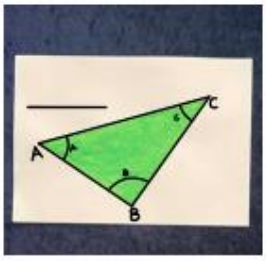

Figure 7

(MoNE, 2024, s. 72)

• Cut out the interior angles, including the letters inside the triangle, without altering the shape of the triangle.

• Place the cut-out angles onto the line segment.

Figure 8

Figure 9

Figure 10

(MoNE, 2024, s. 72)

• What is the measure of the angle formed when the three interior angles of the triangle are combined?

• The given activity is the 57th activity in the relevant textbook of the study. Since it demonstrates the sum of the interior angles of a triangle through concrete materials, experiments, or hands-on applications, it is an example of the “applied demonstration for mathematical concepts” type.

E62: Discussion of mathematics in society

Euclid’s Studies in Geometry

For thousands of years, mathematicians have explored the construction of triangles with specific properties using only a compass and an unmarked ruler. Among these mathematicians was Euclid, who lived approximately 2,300 years ago in Alexandria, Egypt, and is known as the founder of geometry. Euclid is referred to as the founder of geometry because he authored Elements, a book that contains the fundamental principles and definitions of geometry. This book begins with definitions of basic geometric shapes, including circles, equilateral triangles, isosceles triangles, and

scalene triangles. It then outlines five rules for constructing and understanding the properties of these basic geometric figures. The first three of these rules can be summarized as follows:

1. A line segment can be drawn from one point to another.
2. A line segment can be extended indefinitely from its endpoints.
3. Given a point and a line segment, a circle can be drawn with the point as the center and the line segment as the radius.

Figure 1. MoNE, 2024, s. 82.

These rules can be considered the fundamental principles of construction for geometric shapes. You know that an unmarked ruler is used to perform the first two constructions, while a compass is used for the third. Following these rules, Euclid explains how to construct an equilateral triangle with a given line segment as one of its sides.

Investigate how Euclid performed this construction. In the space below, draw a line segment using an unmarked ruler. Then, following Euclid's steps, use a compass and an unmarked ruler to construct an equilateral triangle with the drawn line segment as one of its sides.

• The given activity is the 62nd activity in the textbook analyzed in this study. Since it refers to Euclid and also touches upon the social and cultural role of the topic, it serves as an example of the "applied demonstrations for mathematical concepts" type.

E8: Simple analogies

Identify a line segment model in each of the visuals below. Name the line segment models you have identified and represent them using symbols. Measure the lengths of these line segments with a ruler and write the measurement results in centimeters below each corresponding line segment.

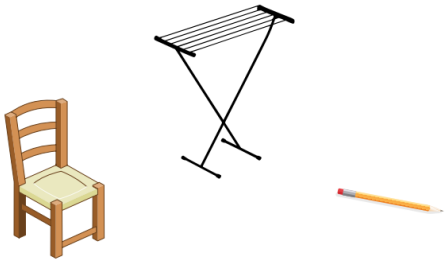

Figure 2. MoNE, 2024, s. 23.

• The given activity is the eighth activity in the relevant textbook analyzed in this study. Since the chair, clothes hanger, and pencil are used as tools to strengthen the mental representation of the concept, the activity exemplifies the "applied demonstration for mathematical concepts" type.

E44: Traditional word problems

İbrahim is designing a carpet pattern using a computer program. For the new carpet design, he has drawn lines on the rectangular area below and colored each enclosed region with a different color.

Accordingly, name all the lines and record in the table the types of polygons corresponding to each color and which line intersections form them.

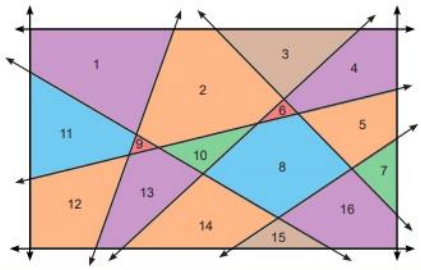

Figure 13. MoNE, 2024, s. 59.

• The given activity is the 44th activity in the textbook examined in this study. Although designing a carpet pattern may evoke real-life contexts in the mind, it is an activity adapted solely to the classroom environment and primarily aimed at assessing students' mathematical skills. Therefore, it is an example of the classical problems category.

E12: Mathematical modelling of real situations

• Teacher Canan took class 5/B on a picnic. She chose a random point, extended a measuring tape to 3 meters, and told her students, “Everyone should position themselves 3 meters away from me using this measuring tape and hold hands.” Which geometric shape do you think the teacher tried to form with the students? In the resulting shape, what do the positions of the teacher and the students represent? Write your thoughts below and discuss them with your classmates.

• Try to draw the geometric shape that Teacher Canan attempted to form with her students in the box below. To do this, place as many points as possible at an equal distance from the given point using a ruler. The more points you place, the clearer the shape will become.

• Instead of marking each point individually, can you think of a tool or method to draw this shape more accurately and efficiently? Write down your thoughts.

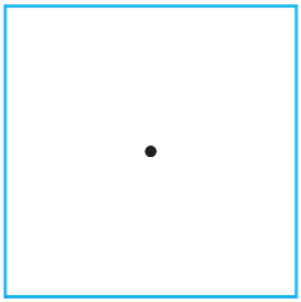

Figure 14. MoNE, 2024, s. 27.

• The given activity is the 12th activity in the relevant textbook. By having students position themselves at an equal distance from a specific point, namely the teacher, and thereby form a circle, this activity helps students perceive mathematics as part of real life. Therefore, it is an example of the “mathematical modelling of real-life situations” type.

K13: Simple analogies

All points that are at an equal distance from a line and lie in the same direction form a line. Since the distance between lines AB and KL does not change, these lines are called parallel lines. The symbol for parallelism is “//”. It is written as AB // KL and read as “Line AB is parallel to line KL." Examples of parallel lines include train tracks and electric wires.

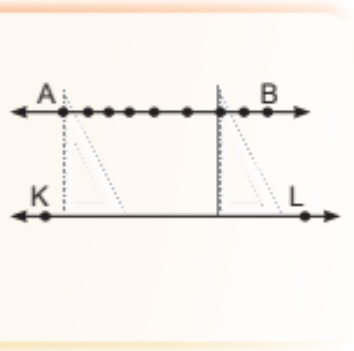

Figure 3. MoNE, 2024, s. 35.

• The given concept explanation is the 13th concept in the relevant textbook of the study. Explaining parallel lines using train tracks and electric wires reinforces the mental representation of the concept; therefore, it is an example of a simple analogy.

K14: Applied demonstrations of mathematical concepts

Figure 16. MoNE, 2024, s. 39.

How would you describe the openness of the cabinet door shown in the above image? Similarly, what can you say about how open the arms of scissors, a compass, or tweezers are? Can you measure the exact opening between the arms of these tools? Which instruments would you use to perform this measurement?

• The given concept explanation is the 14th concept in the relevant textbook analyzed in the study. Exploring and measuring the angles of everyday materials, such as a cabinet, scissors, tweezers, and a compass, helps students better understand the abstract concept of angles. Therefore, this activity is an example of the “hands-on demonstration” type for mathematical concepts.

K21: Mathematical modelling of real situations

• Ants moving along the lines at the joints of pavement stones may meet at certain points. How could the reason for the ants' meeting be expressed?

Figure 4. MoNE, 2024, s. 45.

• The given concept explanation is the 21st concept in the relevant textbook of the study. The situation of ants meeting on pavement stones is used to illustrate the concept of intersection. Since it involves evaluating an event that a student might encounter in real life, it is classified as an example of mathematical modelling of real-life events.

K31: Traditional word problems

The given concept explanation relates to reflectors with reflective surfaces, which are used to warn other drivers in case of an accident or breakdown, helping to prevent potential new accidents. Reflectors are required to be included in vehicle traffic kits. In the adjacent Figure 1.3, the sides of the triangular reflector are aligned with the given lines. Name the angles at the intersection points of these lines and answer the questions below.

Figure 5. MoNE, 2024, s. 55.

• The given concept explanation is the 31st concept in the relevant textbook. Although it appears to be taken from real life, it is used to represent the triangular shape of the reflector; therefore, it is an example of the classical problem type.

K39: Discussion of mathematics in society

The founder of the Republic of Turkey and Chief Teacher, Mustafa Kemal Atatürk, in his book Geometry, Turkified geometric terms to help students retain geometric concepts for a longer time and to make it easier for them to visualize the meaning of these terms when mentioned.

When examining Atatürk's Geometry book, it can be seen that polygons such as "triangle," "vertical quadrangle" (rectangle), "square," and "pentagon" are defined.

Figure 6. MoNE, 2024, s. 68.

• The given concept explanation is the 39th concept in the relevant textbook. By referring to Atatürk's book in the explanation of polygons, the concept is enriched, allowing students to recognize the social dimension of mathematics; therefore, it is classified as an example of "mathematics discussed in society."

K7: None

The angle, defined as the amount of rotation of a ray, can also be described as the shape formed by two rays sharing the same starting point.

The rays forming the angle are called the sides of the angle, and the common starting point of the rays is called the vertex of the angle.

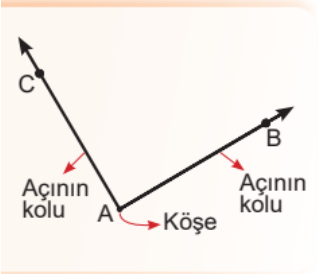

Figure 7. MoNE, 2024, s. 24.

• The given concept explanation is the 7th concept in the relevant textbook. It lacks a real-life context.

Data Analysis

Both descriptive analysis and content analysis techniques were employed in analyzing the data. First, each activity and concept was categorized and coded according to the types of real-life contexts in which they occur. Using the database created in Excel, frequency and percentage values were calculated, and distributions across categories were presented through charts and tables. The resulting findings were interpreted to reveal the extent to which real-life contexts are incorporated in the textbook. Various strategies were employed to enhance the credibility and reliability of the study:

• Expert consultation: During the coding process, a mathematics teacher working at the Ministry of National Education and a faculty member specializing in mathematics education were consulted. The coding was reviewed and revised in accordance with the recommendations of the experts.

• Consistency in coding: All data were systematically coded by the researcher alone, following the pre-established analysis framework. To ensure consistency, the same data were re-coded at different times as a verification measure.

• Detailed reporting: The data collection and analysis procedures were presented in a detailed, transparent, and replicable manner.

• Direct quotations and examples: In the findings section, excerpts from sample activities and concepts were provided to support the rationale for the classifications.

Results

In this study, a total of 118 items from the first unit of the fifth-grade mathematics textbook were analyzed based on Gainsburg's (2008) classification framework of real-life contexts. The findings indicate notable differences in both the frequency and variety of real-life contextualizations across activities and concept explanations. An examination of the overall dataset revealed that 77 of the 118 items (65.25%) did not include any real-life contextualization. In contrast, 41 items (34.75%) incorporated various types of real-life contexts. Among the items containing real-life connections, the most frequently observed type was simple analogies (n = 11), followed by applied demonstrations (n = 10), discussions of mathematics in society (n = 7), mathematical modelling of real events (n = 6), and classical problems (n = 5). Notably, examples involving the direct examination of real data were minimal, with only two instances identified. This indicates that the types and scope of real-life contextualizations in the textbook are relatively narrow.

Findings Related to Activities

The 73 activities analyzed in the study were evaluated separately in terms of their real-life contextualization. Among these, 48 activities (65.75%) did not contain any real-life connections, while 25 activities (34.25%) included various types of real-life contexts. Among the activities containing real-life contexts, simple analogies (n = 8) and applied demonstrations (n = 8) were the most common types. The predominance of these two types suggests a preference for superficial and directly structured contexts within the activities.

In contrast, contextualizations based on classical problems (n = 3), examination of real data (n = 2), and discussions of mathematics in society (n = 2) were observed only to a minimal extent. Moreover, only one activity involved the mathematical modelling of real events, indicating a very low number of activities that provide opportunities for mathematical reasoning through modelling. A detailed distribution of these findings is presented in Table 2.

Table 2.

Number of Activities About Real-Life Connections

Real-Life Connection	Number of Activities
Simple Analogies	8
Traditional Word Problems	3
Examination of Real Data	2
Discussion of Mathematics in Society	2
Applied Demonstrations of Mathematical Concepts	8
Mathematical Modelling of Real Situations	2
None	48

Findings Related to Concept Explanations

In addition, a total of 45 mathematical concepts included in the unit were analyzed as a separate dataset. Among these concept explanations, 29 (64.44%) did not incorporate any real-life contexts. The remaining 16 concepts (35.56%) included various types of contextualizations. The most frequently observed type of real-life contextualization in concept explanations was discussions of mathematics in society (n = 5), followed by applied demonstrations (n = 2), classical problems (n = 2), and simple analogies (n = 3). The presence of four examples based on the mathematical modelling of real events suggests that abstract concepts are to some extent contextualized.

However, a noteworthy finding is that no examples involving the direct examination of real data were identified in the concept explanations. This suggests that opportunities for data-based

learning are almost entirely absent in the presentation of concepts. The quantitative distribution of concept explanations is presented in Table 3.

Table 3.

Number of Concepts About Real-Life Connections

Real-Life Connection	Number of Concepts
Simple Analogies	3
Traditional Word Problems	2
Examination of Real Data	0
Discussion of Mathematics in Society	5
Applied Demonstrations of Mathematical Concepts	2
Mathematical Modelling of Real Situations	4
None	29

Overall Patterns

When comparing activities and concept explanations across the entire dataset, it was observed that the overall use of real-life contexts is similarly low in both categories; however, notable differences exist in the distribution of context types. Applied demonstrations and simple analogies were more prominent in the activities, whereas examples related to discussions of mathematics in society were more prevalent in the explanations of concepts. Additionally, examples involving the examination of real data were present only in the activities, while this type was entirely absent from the concept explanations, representing a noteworthy pattern. These distributions are presented in Figures 21.

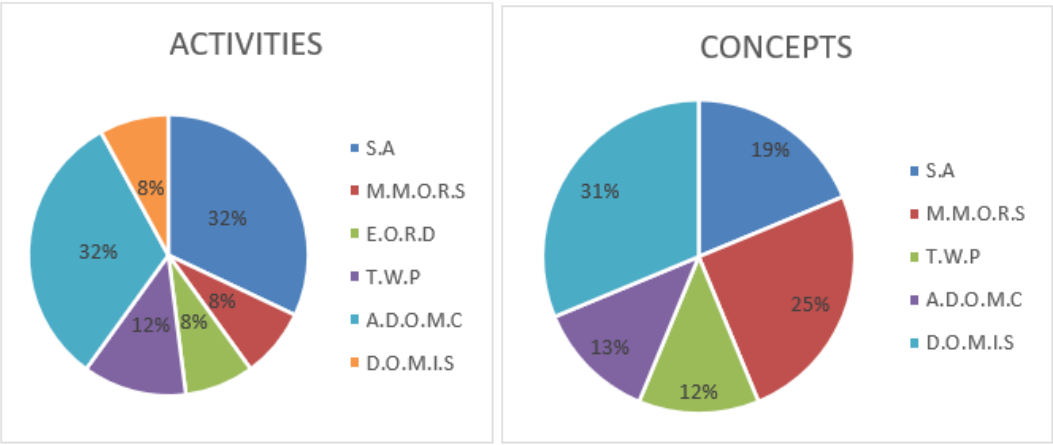

Figure 21. Activities and Concepts

Discussion and Conclusion

In this study, the Geometric Shapes theme of a fifth-grade mathematics textbook was examined in terms of the nature and diversity of real-life contexts. The analysis revealed that a considerable proportion of the activities and conceptual explanations included in this theme incorporate real-life contexts in a limited manner. This finding is noteworthy when considered in relation to the literature emphasizing the central role of real-life contexts in supporting students' meaningful learning of mathematics (Gainsburg, 2008; Blum et al., 2002; van den Heuvel-Panhuizen, 2003). However, the low frequency of such contexts in the examined textbook indicates that it is not fully aligned with the life-based learning approach envisioned by the Türkiye Yüzyılı Maarif Model.

The findings further indicate that connections involving the analysis of real data and mathematical modelling are represented to a very limited extent. Among the 118 analyzed instances, only two included the examination of real data, suggesting that the use of such contexts in textbooks has not yet reached a sufficient level. This situation implies that learning opportunities that could foster students' problem-solving, reasoning, and critical thinking skills remain limited within the textbook materials. Similarly, Bingölbali and Özdiner (2022) reported that none of the textbooks examined in their study included activities involving the mathematical modelling of real-life events, indicating that the modelling approach has been largely neglected at the primary education level, at least in the context of activities. The findings of the present study are consistent with these results.

The fact that discussions of mathematics in society appeared in seven instances and the mathematical modelling of real-life events appeared in six instances within the analyzed activities and conceptual explanations suggests a slight increase in such connections compared to previous years; however, this level remains insufficient. Likewise, Yekrek and Özgeldi (2019) found that activities related to "discussing mathematics in society" and "mathematical modelling of real-life events" were either absent or extremely limited in the introductory sections of middle school mathematics textbooks. The findings of the present study are in line with this observation.

The distribution presented in Figure 22 demonstrates that real-life contexts are limited in both diversity and depth. The predominance of simple analogy as the most frequently used type of connection indicates that students are more often guided toward superficial comparisons

rather than toward establishing deeper and more meaningful links with real-life situations. In particular, the limited presence of higher-level connections, such as discussing mathematics in social contexts and engaging in modelling activities, may hinder students' understanding of the social, cultural, and professional dimensions of mathematics. Similarly, the restricted use of real-life contexts in conceptual explanations reduces opportunities for students to relate abstract mathematical concepts to concrete experiences.

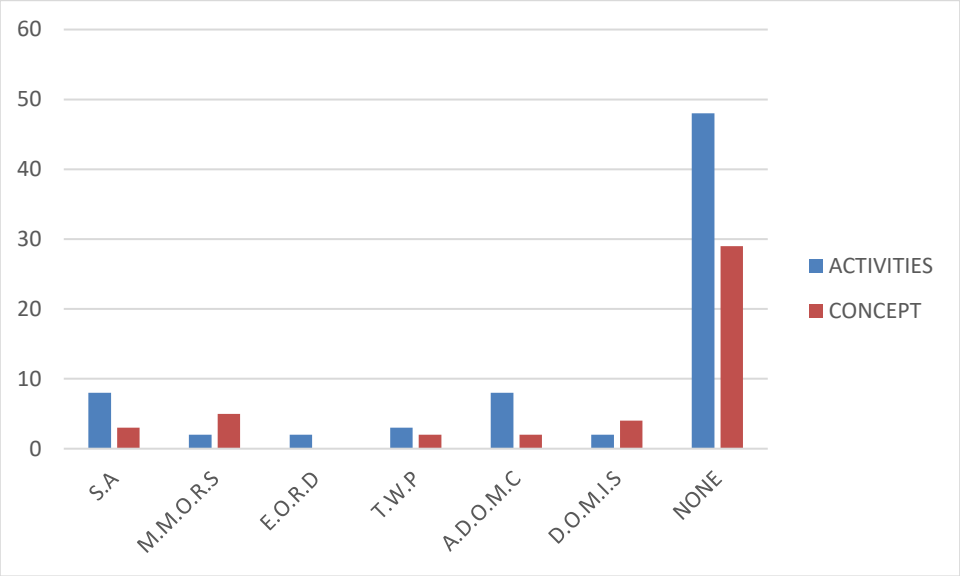

Figure 22. Real-Life Contexts

Overall, the identified patterns suggest that learning opportunities in the textbook predominantly focus on introducing basic concepts, while real-life contexts that support mathematical modelling, real data analysis, the creation of discussion environments, and higher-order reasoning processes are not sufficiently represented. Although occasional attempts to relate mathematical content to society, culture, and real-world events can be observed, these efforts indicate only an emerging tendency toward life-based learning. At present, however, this level remains insufficient to enable students to perceive mathematics not merely as an abstract discipline but as a functional tool for understanding various aspects of real life.

These findings highlight the need for richer, more diverse real-life contexts that support higher-order cognitive processes in mathematics textbooks, particularly at the primary education level, in order to promote meaningful learning. Structuring textbooks in a way that enables students to connect mathematics with both their own lives and broader societal

dynamics would ensure stronger alignment with curriculum goals and contemporary perspectives in mathematics education.

Recommendations

Based on the findings of this study, the limited inclusion of real-life contexts in the first unit of the fifth-grade mathematics textbook restricts students' opportunities to relate mathematical knowledge to real-world experiences and to develop problem-solving, interpretation, and higher-order thinking skills. Therefore, it is recommended that, during the development of textbooks, greater emphasis be placed on linking mathematical concepts with various aspects of science, nature, engineering, economics, and everyday life.

Furthermore, designing learning activities in a manner that aligns with students' personal experiences, interests, and social environments can make mathematics learning both more meaningful and enduring. Increasing the use of real data, mathematical modelling, discussion-based tasks, and interdisciplinary connections within these activities would further support students in situating mathematics within real-life contexts.

Future research is recommended to extend similar analyses across different grade levels and content units to comprehensively evaluate the extent to which the Turkey Century Maarif Model achieves its goals of life-based learning. Such studies could provide evidence-based feedback to guide textbook development processes and contribute to enhancing the quality of mathematics education.

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Conflict of Interest

İt has been reported by the authors that there is no conflict of interest.

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Ethical Standards

This study was conducted in accordance with the principles of the Helsinki Declaration. All participants voluntarily took part in the study, and informed consent was obtained.

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