AFTER THE EDUCATIONAL REFORM: AN ANALYSIS OF GEOMETRY CONTENT IN THE TURKISH MATHEMATICS TEXTBOOKS

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Abstract

This paper aimed to present the changes in the upper elementary school (grades 6 through 8) mathematics textbooks by focusing on the geometry content after the reform movement in Turkey. The methodology included two steps towards to aim: Design and presentation, and geometry content. According to the results of the study, the new textbooks included more pages and examples, and had more modern style of presentation. Moreover, the new textbooks generally included more irrelevant illustrations, and for most geometry topics, the number of pages in the textbooks was positively correlated with the number of examples.

Keywords: Mathematics textbook; Geometry Education; Reform Movement in Turkey;

Özet

Bu makale, Turkiye'deki reform hareketinden sonra ilköğretimin ikinci kademesindeki (6. sınıftan 8. sınıfa kadar) matematik kitaplarının geometri içeriği bakımından uğradığı değişiklikleri sunmayı amaçlamıştır. Araştırmanın metodu, amaca yönelik iki adım içermektedir: Tasarım ve sunum, ve geometri içeriği. Araştırmanın sonuçlarına göre, yeni kitaplar daha fazla sayfa ve alıştırma içermektedir ve daha modern bir sunuma sahiptir. Ayrıca, yeni kitaplar genellikle daha fazla sayıda içerikle bağdaşmayan gösterimler barındırmaktadır, ve çoğu geometri konusu için, kitaplardaki sayfa sayısı alıştırma sayısı ile pozitif korelasyon göstermektedir. .

Anahtar Kelimeler: Matematik kitabı; Geometri eğitimi, Türkiye'deki reform hareketi.

INTRODUCTION

The relationships among teacher, textbook and implemented curriculum appear to be complex (Remillard, 2000). Tornroos (2005) used the term "potentially implemented curriculum" (p. 2) to describe the role of textbooks and other curriculum materials in the mathematics classroom, this role being an intermediate stage between the intended curriculum and the implemented curriculum. Given the importance of published curriculum materials in mathematics teaching and learning, mainly in the form of textbooks, the establishment of an effective method of evaluation of these materials by their potential users is an important goal.

Many methods for evaluation of mathematics textbooks have been proposed over the years. Such methods often include criteria involving syllabus content coverage, numbers of exercises, layout, use of color, historical content, and so on. The State of California even has a criterion of weight for a textbook, the allowable maximum weight increasing with the age of the target students. While these features are of some importance, many evaluations have not focused at all on the essence of the mathematical ideas and the ways the ideas are developed for students.

In recent years, a number of studies have focused on a more in-depth approach to the evaluation of mathematics textbooks by developing systematic strategies that relate the content of the published materials to the mathematical content and pedagogical practices required by various authorities. Shield (1998) explored the underlying "messages" about the nature of mathematics and its teaching and learning conveyed by textbook presentations. Project 2061 (Kulm, Morris & Grier, 2000) involved the development of a method to evaluate middle-grades mathematics textbooks with a focus on "their effectiveness in helping students to achieve important mathematical learning goals for which there is broad national consensus" (p. 1). The learning goals and criteria for evaluation of Project 2061 were derived from significant documents including the NCTM *Standards* (NCTM, 1989) and the *Benchmarks for Science Literacy* (AAAS, 1994). The evaluation criteria were set out in a number of categories including: building on student ideas about mathematics, engaging students in mathematics, developing mathematical ideas, and promoting student thinking about mathematics.

As a critical part of the education system, textbooks were also investigated to improve the quality and efficiency of the education. Dede (2006) investigated the values in middle school (6^{th} and 7^{th} grades) mathematics textbooks in Turkey. The study reported that, in the 6^{th} and 7^{th} grade mathematics textbooks, the values of rationalism, control and openness were emphasized more than objectism, progress, and mystery. In 2008, under the supervision of the Ministry of National Education in Turkey (MoNE), a committee consisting of academicians, specialists, superintendents, principals, teachers, parents, students, and civic society organizations evaluated the new elementary school (grades1-8) curriculum and textbooks in the subjects of Turkish, mathematics, social studies, science and technology, English, visual arts, music, and physical education. The committee's criteria for evaluating the new curriculum included content, teaching and learning processes, and measurement-assessment. The textbooks were also analyzed by considering motivation, efficiency, examples, information, scientific mistakes, relations to real life, integration to other subjects, chapters, terminology and language, and visual design. Among the findings of the commission were: the mathematics textbooks, while found appropriate for the new curriculum, should be improved as far as their design, their content, and quality of examples were concerned; in the textbooks, the presentation of knowledge should be more indirect and students should be allowed to acquire knowledge by themselves (constructivism) (MEB, 2008).

In 2007, the MoNE supervised a study named "Ilkogretim Ogrencilerinin Basarilarinin Belirlenmesi"(OBBS) (determination of achievement of elementary school students) (MEB, 2007). The purpose of the study was to determine the quality of mandatory education in Turkey, to classify the factors relating the quality of mandatory education, and to decide what could be done to achieve the expected quality of mandatory education (MEB, 2007). The study concluded that teaching methods for the contents "numbers" and "geometry" needed to be completeley changed since most students experienced difficulty in comprehending these topics (p.60).

Considerable research has shown that Turkish students have great difficulty in geometry (Olkun & Aydoğdu, 2003). In TIMSS 1999 and TIMSS 2007, as was the case with other four content areas (fractions and number sense, measurement, data representation, analysis and probability, and algebra) Turkish 8th grade students showed low performance in geometry (Mullis et al., 2000; Mullis et al., 2008). In TIMSS 1999 and TIMSS 2007, Turkish 8th-grade students ranked as 34th out of 38 countries in 1999 (Mullis et al., 2000) and 30th out of 49 countries in 2007 (Mullis et al., 2008). In the light of this trend, the purpose of this study was to investigate how the geometry content in the upper elementary school (grades 6, 7, 8) mathematics textbooks in Turkey has developed after the reform movement in 2004. To achieve this purpose, the study sought to answer the following research question:

To what extent have content, design and presentation of the geometry learning area in the mathematics textbooks changed since the educational reform in Turkey?

Methodology

The content of the textbooks for the core curriculum mandated by MoNE is covered in most classrooms. Since teachers are required to follow the material in these textbooks, it can be assumed that the emphasis on a topic in the textbook indicates the emphasis given in most classrooms. The extent to which the goals of Turkish mathematics education actually are fulfilled in the textbooks can be evaluated by careful review.

Two Turkish textbook series, published and approved by MoNE, were selected for analysis at the 6th, 7th, and 8th grade levels. (See Appendix A for the list of textbooks analyzed in the study.) The publication dates represent textbooks published before and after the 2004 reform. In 2005, MoNE declared that the reformatted mathematic education program, including curriculum and textbooks, for upper elementary schools would become effective in steps. The new program for the 6^{th} grades would be in use in 2005-2006, for the 7^{th} grades in 2006-2007, and for the 8^{th} grades in 2007-2008. Therefore, the mathematics textbooks published before 2005 and in 2008 were compared to clearly represent the new and old Turkish geometry education. The rationale for focusing on elementary grades was the importance of a strong mathematical foundation for later school success. The textbooks were investigated in the language in which they were written. This study utilized content analysis method to evaluate textbooks into two major stages through the descriptive statistics:

Stage 1: The design and presentation for each textbook was elucidated.

Stage 2: The geometry content in each textbook was examined.

The first step, "design and presentation," looked at the physical qualities of the textbooks, which included their dimensions and weight, the number of pages, the accuracy and relevance of the graphics and illustrations, and the methodology adopted by them. An illustration was considered irrelevant if it did not contribute in some mathematical way to the understanding of the accompanying text. For example, a table including the names of eighteen soccer players is considered a relevant illustration when an accompanying problem asks for the probability of having a player in the starting team of eleven players, whose name starts with a vowel; on the other hand, a picture of a soccer field is considered as irrelevant for the same problem. Counting the number of relevant and irrelevant illustrations was also used by Mayer, Sims and Tajika (1995) in comparison of how textbooks teach mathematical problem solving in Japan and the United States.

The second step, "geometry content," counted the number of allocated pages and examples in each geometry unit and compared the proportions of each unit to one another. Examples include textbook contents under the headings of "example," "activity" and "problems and their solutions" because these were recommended to teachers as a way to support student understanding. This approach to text analysis is adapted from Flanders (1987) and also used by Jones (2004) and Kwon (2006).

Geometry Content in the Mathematics Textbooks during the Pre-reform Period

Textbooks that complied with the pre-reform period curriculum were implemented for the academic years 2002-2005, 2002-2006 and 2002-2007 at the 6th, 7th and 8th grades respectively. The National Education Printing House published all upper elementary school mathematics textbooks analyzed in this study.

Design and Presentation

All textbooks were paperback containing 236 pages, 197 pages and 204 pages for the 6th, 7th and 8th grades respectively. The mathematics textbook for 6th graders had dimensions 27 by 19 by 1.5 cm dimensions and weighed 0.53 kilos. The 7th grade textbook had dimensions 27 by 19 by 1.3 cm and weighed 0.44 kilos. The eight grade textbook was 27 by 19 by 1.3 cm with a weight of 0.46 kilos.

The textbooks appeared to provide students with a sufficient number of pictures, graphs, and diagrams. The number of irrelevant illustrations in the mathematics textbooks of the upper elementary schools is included in Appendix B. The percent coverage of irrelevant illustrations for each learning area (defined in the curriculum) at each grade level was calculated by dividing the number of irrelevant illustrations in each area by the total number of irrelevant illustrations in the same grade mathematics textbooks.

In the 6th grade mathematics textbooks, the learning area of "numbers" included the largest percentage of the irrelevant illustrations: 58%. It was followed by "measurement" with 20%. "Algebra" offered the smallest portion of irrelevant illustrations: 8%. Percentage coverage of the "geometry" learning area in terms of irrelevant illustrations was 14, distributed among the units of "point, line, plane, space, line segment, and ray" and "angle, triangles, and classification of triangles" at 11% and 3% of respectively. The 7th grade mathematics textbook had no irrelevant illustration, whereas the mathematics textbook for 8th graders included only one irrelevant illustration, in the area of "probability and statistics."

The textbooks were rather traditional in their presentation. All terminology, rules, theorems, and some proofs were meticulously introduced. The textbooks included large numbers of examples, approximately 1.2 and 1.6 and 1.8 per page at the 6th 7th and 8th grades respectively. The examples were carefully chosen to cover all the necessary skills introduced in the sections. The ratio of examples to exercises was high throughout the textbooks, sometimes reaching a ratio of 5:12 (at the 6th grade level). A large majority of the exercises were drill-oriented, some extremely long and cumbersome. A majority of the exercises did not require generalization skills. There was minimal spiraling and review in the exercises. The textbooks included no open-ended questions. The textbooks did not integrate technology.

Each textbook adopted a traditional methodology as far as its presentation technique was concerned. First, each section introduced definitions, notations and properties related to the concepts of the section and then

examples were given to support the students' understandings of the concepts. Then, exercises, most drill-oriented, were provided at the end of each section. Following word problems with their solutions, the textbooks offered multiple-choice tests (of approximately 20 questions each) for each chapter at the end. The textbooks did not provide the answers for the tests. The textbooks did not have chapter reviews or chapter summaries, but they did contain a glossary and a bibliography.

Geometry Content

Appendix C illustrates the percent coverage of pages and examples in the area of geometry in each mathematics textbook at the upper elementary school level. The percent coverage of the learning area was calculated by dividing the counted pages and examples in the area by the total number of pages and examples. For the "geometry" learning area, there was a positive correlation between numbers of pages and numbers of examples in the textbooks during the pre-reform period. In the 6th grade textbook, "point, line, plane, space, line segment, and ray" amounted to 6% of all textbook pages and 2.9% of all examples whereas "angle, triangles, and classification of triangles" occupied 9.4% of the pages and 5.5% of the examples. In the 7th grade mathematics textbook, "angles and polygons" covered 22.1% of the pages and17.3% of the examples. On the other hand, "angle, triangles, and classification of triangles" composed 10.9% of all pages and 9% of all examples. "Proportioned line segments and similar triangles" covered 34.7% of the pages and 24.4% of the examples in the mathematics textbooks for eight graders.

Geometry Content in the Mathematics Textbooks during the Post-reform Period

This part of the study includes an analysis (as defined in the methodology section) of the upper elementary school mathematics textbooks which were implemented for the academic years from 2008 to the present time. These textbooks were also published by the National Education Printing House. (See Appendix A for the list of the textbooks analyzed in the study.)

Design and Presentation

During the post-reform period, mathematics textbooks included in this study were also paperback containing 242 pages with dimensions of 27 by 20 by 1.8 cm, 238 pages with dimensions of 27 by 20 by 1.8 cm and 224 pages with 27 by 20 by 1.7 cm for the 6th, 7th and 8th grades respectively. The mathematics textbook for 6th graders weighed 0.55 kilos; the 7th grade textbook weighed 0.50 kilos, and the 8th grade textbook weighed 0.49 kilos.

One of the results of the study showed that the textbooks were very colorful. Every chapter employed different colors on the edges of the pages and in the markings, potentially helping readers to navigate between chapters. The textbooks appeared to provide students with a sufficient number of pictures, graphs and diagrams. Appendix B presents the number of irrelevant illustrations in the mathematics textbooks throughout upper elementary schools during the post-reform period. At a grade level, the percent coverage of irrelevant illustrations in each area was calculated by dividing number of irrelevant illustrations in each area by the total number of irrelevant illustrations.

In the 6th grade mathematics textbook, the learning area of "numbers" included the largest portion of the irrelevant illustrations: 53%. It was followed by "probability and statistics" with 29%. "Measurement" and "algebra" shared the third place with 7% of all irrelevant illustrations. "Geometry" covered the least portion with 4%. In the 7th grade mathematics textbook, "probability and statistics" offered the largest percentage of irrelevant illustrations, 30%, followed by "numbers" and "algebra" with percentages of 25%, and 21% respectively. "Measurement" had the fourth largest percentage of all irrelevant illustrations with 13%. "Geometry" had the least with a percentage of 11. At the 8th grade level, unlike the situations in the other textbooks studied for the post-reform period, "measurement" contained the greatest proportion of irrelevant illustrations with 36% and was followed by "probability and statistics" with 31%. "Geometry" and "numbers" had the same percentages of 12 each. "Algebra" included the least portion of irrelevant illustrations with a percentage of 9.

Appropriate terminology, rules, theorems, and some proofs were introduced. As was case in the mathematics textbooks of the pre-reform period, the new textbooks emphasized construction, paper-scissor activities and geometry board applications at the expense of more rigorous proofs. The textbooks included large numbers of examples, approximately 1.3 and 1.0 and 0.9 per pages at the 6th 7th and 8th grades respectively. The examples appeared to be carefully chosen to cover all the necessary skills introduced in the sections. The ratio of examples to the exercises was almost 1:2 in the 6th grade mathematics textbook and was more than 1:2 in the 7th and 8th grade textbooks. A large majority of the exercises were applications to real life situations and most of them required generalization, explanation and justification skills. The end of each topic included exercises under the title "application," which included real life applications, spiraling and a review. The integration of technology into the classrooms included only the uses of scientific calculators.

Each textbook adopted a more modern (constructivist) methodology as far as its presentation technique was concerned. Although every unit included topics from at least two different learning areas (sometimes the number was four) and the names of the most units evoked an association between learning areas, the connections between the subjects were few in number. For example, in the 6th grade textbook, although the name of unit IV was "reflections from numbers to probability," the unit did not include any connecting activities between "numbers" and "probability" or applications from one to the other. At the beginning of each unit, an open ended question was included to motivate students and to provide a glimpse of the contents of the unit. Typically, students were introduced to definitions, notations and properties related to the concepts of the section and then examples were given to support the students' understandings of the concepts. An enormous number of activities, some 1.2 per page and most of them requiring group work, were included in each topic to support meaningful learning. A problem solving activity with the solution was the last step before putting students through exercises. Then, applications composed of review and real life connections were provided at the end of each section. The textbooks offered "unit assessments" (of approximately 17 questions) at the end of each unit. These assessments included a few multiple choice items but were mostly exercises requiring higher level thinking skills such as analyzing, justifying and explaining. The textbooks did not provide the answers for the tests. The textbooks did not include chapter reviews or chapter summaries, but they did contain a glossary and a bibliography.

Geometry Content

The percent coverage of pages and examples in the area of geometry in each mathematics textbook at the upper elementary school level is presented in Appendix C. In the 6th grade mathematics textbook, "polygons" was the most covered geometry sub-learning area in terms of pages and was followed in a decreasing order by "geometric objects," "line, line segment, ray," "angles," "patterns and tessellations," and "congruency and similarity." "Geometry of transformations" was the least covered sub-learning area in terms of pages. In terms of coverage of examples, "angles" had the largest coverage" and was followed by "polygons," "geometric objects," "line, line segment, ray," and "patterns and tessellations." "Geometry of transformations" and "congruency and similarity" were the least covered topics in terms of examples in the 6th grade mathematics textbook during the post-reform period.

In the 7th grade mathematics textbook, as far as the percent coverage of pages was concerned, "lines and segments" and "circle and disc" had the most coverage. The second most covered topic was "geometric objects." The third place was shared by "polygons," "congruency and similarity" and "geometry of transformations." "Patterns and tessellations" was the fourth most covered geometry sub-learning area. In terms of examples, "lines and segments" was the most covered geometry topic and was followed by "circle and disc," "geometry of transformations," and "polygons." "Patterns and tessellations" and "geometric objects" was the fifth most covered topic and was followed by "congruency and similarity." Although it was not included in the upper elementary school mathematics curriculum, "sketching the Turkish flag" included 1% of all pages and 1% of all examples and was the least covered geometry topic in terms of both pages and examples.

In the 8th grade mathematics textbook, "triangles," which covered almost half of the geometry units, had the greatest percentages of pages and examples, and it was followed by "geometric objects" and "geometry of transformations." In terms of pages, "geometric projection" was the fourth most covered geometry topic, and "patterns and tessellations" was the least; on the other hand, "patterns and tessellations" was the fourth most covered geometry topic and was followed by "geometric projection" in terms of examples.

CONCLUSIONS

New mathematics textbooks of the post-reform period were smaller in terms of total number of pages but bigger in terms of volumes and weight than the ones of the pre-reform period. In terms of illustration and design, the new textbooks were more colorful, attractive, and easy to use. As far as the number of irrelevant illustrations was concerned, the recent textbooks had more than previous ones, which can be explained the fact that the curriculum of the post-reform period required motivating students towards learning mathematics by means of improving educational tools, and implementing colorful textbooks with lots of pictures was among the ways of fulfilling it. Although both series had same number of irrelevant illustrations per page at the 6th grade, the mathematics textbook series of the post-reform period presented many more unnecessary illustrations at the later grades of the upper elementary school.

In the area of geometry, the number of irrelevant illustration in the 6th grade textbooks was fewer during the post reform period than the pre-reform period; however, geometry sections of the new series included more irrelevant illustrations than the old series at the 7th and 8th grade levels.

Under the influence of constructivist ideas, new textbooks offered a more modern style of presentation. Consistent with the curricular objective of "association" (MEB, 2005), the new series included two to four different learning areas in every unit whereas the mathematics units in the old series consisted of single learning area. However, the number of associated activities and problems was very few, and as opposed to the statements in the official curriculum, associations were not interdisciplinary. Unlike the previous mathematics textbook series, the new textbooks employed open ended questions and a large numbers of activities (1.2 per page) in an attempt to be consistent with the reform principle of "students as active learners" (MEB, 2005). The number of activities was probably too large: One for each learning goals/behaviors defined in the curriculum. Both textbook series included problem solving activities but the new series differed from the old ones by putting Polya's problem solving strategies into practice. Although the new mathematics curriculum strongly emphasized problem solving as an integral part of students' learning (MEB, 2005), compared to the number of examples and exercises, the new textbook series covered only a few problem solving activities: one for each sub-topic. Even though the new mathematics curriculum polished the ideas of mathematics for all and of taking consideration of individual differences (MEB, 2005), the qualities of examples and problem solving activities were not enough to fulfill such goals. Being consistent with the curricular goals of the post-reform period, the new series included lots of real life connections and applications. Unlike the previous series, the assessment parts of the new series included few multiple choice items and many exercises requiring higher level thinking skills such as analyzing, justifying and explaining.

During the post reform period, upper elementary school mathematics textbooks included fewer examples, except at the 6th grade level. The examples appeared to be carefully chosen to cover all the necessary skills introduced in the sections. The ratio of examples to the exercises was high throughout the textbooks during the both periods. But, the exercises in the new textbook series required a higher level of thinking skills and emphasized applications to daily life rather than being drill-oriented, and some exercises were extremely long and cumbersome. The new series, as was the case for the old one, used technology at a minimal level in contrast to what was outlined in the official curriculum.

In the learning area of "geometry," the percentages of pages increased at the 6th grade level but decreased at the other levels of upper elementary education, reflecting the fact that the total geometry hours in the mathematics curriculum showed a similar tendency (an increase at the 6th grade and decreases at the 7th and 8th grades) during the post-reform period. On the other hand, the percentage of geometry examples increased at all levels of upper elementary education. For most geometry topics, the number of pages in the textbooks was positively correlated with the number of examples during both periods; however, during the post-reform period, the percent coverage of the geometry sub-learning areas decreased in terms of pages and examples since the new geometry curriculum, with the same total number of geometry hours, included new topics such as "geometry of transformations" and "patterns and tessellations."

At the 6th grade level, contrary to the fact that "geometry" coverage in the new 6th grade textbook had increased, "point, line, plane, space, line segment, and ray" and "angles, triangles, and classification of triangles" were de-emphasized during the post-reform period based on their percent coverage of pages and examples. This can be explained by the fact that the "polygons," "congruency and similarity," "geometry of transformations,"

"patterns and tessellations" and "geometric objects" were first time introduced in the new series at the 6th grade level and that they composed much (around 60%) of the geometry learning area in terms of pages and examples.

In the new 7th grade mathematics textbook, "geometry" increased in terms of examples but decreased in terms of pages. "Polygons," "lines and segments," "geometry of transformations," and "patterns and tessellations" were the new topics placed in the 7th grade mathematics textbooks after the reform of 2004. Although "triangles," "circle and disc," and "geometric objects" occupied fewer pages, they covered more examples in the new series.

After the reform movement, in the 8th grade mathematics textbook, the percent coverage of pages in "geometry" showed a slight decrease (of 1%) whereas the percent coverage of examples increased noticeably (of 10%). "Triangles," which covered almost half of the geometry units, represented fewer pages but more examples in the mathematics textbook after the reform. "Geometric projection," "patterns and tessellations," "geometric objects," and "geometry of transformations" were the new topics included in the mathematics textbook at the 8th grade level whereas "line formula" and "inequalities with two variables" were not covered under the learning area of "geometry" any longer.

Implications

This study analyzed changes in the geometry content of upper elementary school mathematics textbooks in Turkey after 2004. This study can serve as a useful source about upper elementary school geometry education and mathematics textbooks in Turkey for those who are interested in comparative education as well as a valuable reference for educational policy makers in determining future reform in mathematics education.

A limitation of is this study is that it is unable to account for the amount of congruency that exists between the intended curriculum (as present in textbooks and official documents) and enacted curriculum. The presence of an activity or example in a textbook does not guarantee that the activity will be implemented in the classroom. Conversely, the absence of activities and examples does not imply that students did not have the opportunity to learn concepts during the year. Additional analysis of existing workbooks and activity books used in classrooms as a supplementary aid to textbooks would benefit as well.

This study may be used as a reference for the Turkish government in making changes to policy concerning upper elementary school geometry education. Additional topics in textbooks may increase students' burden of studying geometry. Finally, in improving the upper elementary school mathematics curriculum, this study recommends a continual study of mathematics education in Turkey. Association within a learning area and between learning areas, for example, is highly recommended providing students with meaningful learning. As shown in this study, however, such a goal has not been carried out textbooks do not provide enough opportunities for making associations.

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APPENDICES

Appendix A

List of the Textbooks Used in the Study

Pre-reform Period

Sehnaz, B., Ekmen, H., & Gursoy, N. (2004). *Ilkogertim Matematik 6* (Mathematics 6). Ankara: Milli Egitim Yayinlari.

Tortumlu, F., Kilic, A., & Sahin, H. (2004). *Ilkogertim Matematik 7* (Mathematics 7). Ankara: Milli Egitim Yayinlari.

Polatoglu, M., Camli, A., & Calikoglu, I. (2004). *Ilkogertim Matematik 8* (Mathematics 8). Ankara: Milli Egitim Yayinlari.

Post-reform Period

Aktas, S., Atalay, A., Aygun, S. C., Aynur, N., Bilge, O., Celik, M., Cuha, S. S., Karaman, U., Ocal, I., Oncu, F., Ozcelik, U., Ulubay, M., & Unsal, N. (2007). *Ilkogertim Matematik 6* (Mathematics 6). Ankara: Milli Egitim Yayinlari.

Aynur, N., Cuha, S. S., Ozcelik, U., Aygun, S. C., Ulubay, M., Karaman, U., & Unsal N. (2007). *Ilkogertim Matematik 7* (Mathematics 7). Ankara: Milli Egitim Yayinlari.

Aygun, S. C., Aynur, N., Coskunturk, N., Cuha, S. S., Karaman, U., Ozcelik, U., Ulubay, M., & Unsal, N. (2008). *Ilkogertim Matematik 8* (Mathematics 8). Ankara: Milli Egitim Yayinlari.

Appendix B

Number of Irrelevant Illustrations in the Textbooks Used in the Study

Table 1
Distribution of Irrelevant Illustrations in the 6th Grade Mathematics Textbook (Pre-reform Period)

Learning Area	Units	# 0f Irr. Illus.	Proportion to the Number of Pages	Proportion to All (%)
Numbers	Sets	11	0.39	14
	Natural Numbers	15	0.44	19
	Prime Numbers and Prime Factorization	6	0.38	8
	Fractions	7	0.18	9
	Converting Fractions to Decimals	6	0.21	8
Geometry	Point, Line, Plane, Space, Line Segment, and Ray	9	0.64	11
	Angle, Triangles, and Classification of Triangles	2	0.09	3
Measurement	Measurements	16	0.40	20
Algebra	Proportion and Ratio	6	0.43	8
	Total	78	0.33	100

Table 2
Distribution of Irrelevant Illustrations in the 7th Grade Mathematics Textbook (Pre-reform Period)

Learning Area	Units	# 0f Irr. Illus.	Proportion to the Number of Pages	Proportion to All (%)
Numbers	Integers	0	0	0
	Rational Numbers	0	0	0
Algebra	Equations and Line Graphics	0	0	0
	Ratio Proportion and Percents	0	0	0
Geometry	Angles and Polygons	0	0	0
	Circle, Disc, and Cylinder	0	0	0
Prob. & Stat.	Statistics and Graphics	0	0	0
	Total	0	0	0

Table 3
Distribution of Irrelevant Illustrations in the 8th Grade Mathematics Textbook (Pre-reform Period)

Learning Areas	Units	# 0f Irr. Illus.	Proportion to the Number of Pages	Proportion to All (%)
Numbers	Reel Numbers	0	0	0
Algebra	Expressions and Equations	0	0	0
Geometry	Proportioned Line Segments and Similar Triangles	0	0	0
Prob. & Stat.	Permutation and Probability	1	0.0625	100
Measurement	Measurements of Surface and Volume	0	0	0
Algebra	Mathematics Systems	0	0	0
	Total	1	0.0049	100

Table 4
Distribution of Irrelevant Illustrations in the 6th Grade Mathematics Textbook (Post-reform Period)

Learning Area	# 0f Irr. Illus.	Proportion to the Number of Pages	Proportion to All (%)
Numbers	38	0.4	53
Geometry	3	0.1	4
Measurement	5	0.2	7
Probability and Statistics	21	1.1	29
Algebra	5	0.4	7
Total	72	0.3	100

Table 5
Distribution of Irrelevant Illustrations in the 7th Grade Mathematics Textbook (Post-reform Period)

Learning Area	# 0f Irr. Illus.	Proportion to the Number of Pages	Proportion to All (%)
Numbers	12	0.2	25
Geometry	5	0.1	11
Measurement	6	0.3	13

Probability and Statistics	14	0.5	30
Algebra	10	0.3	21
Total	47	0.2	100

Table 6
Distribution of Irrelevant Illustrations in the 8th Grade Mathematics Textbook (Post-reform Period)

Learning Area	# 0f Irr. Illus.	Proportion to the Number of Pages	Proportion to All (%)
Numbers	5	0.2	12
Geometry	5	0.1	12
Measurement	15	0.5	36
Probability and Statistics	13	0.7	31
Algebra	4	0.1	9
Total	42	0.2	100

Appendix C

Number of Pages and Examples in the Area of Geometry in the Textbooks Used in the Study

Table 7
Percent Coverage of Pages and Examples for Geometry in Mathematics 6 (Pre-reform Period)

Units	Topics	Pages	Examples
Point, Line, Plane, Space, Line Segment, and Ray	Point, Line, Plane and Space	1.7	1.8
	Line Segment and Ray	0.9	0.7
	Relationships among Point, Line, and Space	1.7	0.4
	Chapter Test	1.7	0.0
Angle, Triangles, and Classification of Triangles	Angles and Classification of Angles	2.6	2.6
	Supplementary and Complementary Angles	2.1	1.1
	Regions Separated by Triangles	1.3	1.1
	Classification of Triangles	1.7	0.7
	Chapter test	1.7	0.0
	Total	15.4	8.4

Table 8
Percent Coverage of Pages and Examples for Geometry in Mathematics 7 (Pre-reform Period)

Units	Topics	Pages	Examples
Angles and Polygons	Congruent Angles	3.6	2.5
	Basic Drawings	2.1	2.8
	Basic Components of Triangles	1.0	1.0
	Relationships between Sides and angles of a Triangle	4.6	4.4
	Polygons	0.5	0.0
	Quadrilaterals and Relationships among Components of Quadrilaterals	3.6	1.6
	Circumferences of Parallelogram, Rhombus, Square, Trapezoid, Deltoid	0.5	1.6
	Areas of Parallelogram, Rhombus, Square, Trapezoid, Deltoid	2.6	3.1
	Sketching Turkish Flag	1.0	0.3
	Chapter Test	2.6	0.0
Circle, Disc, and Cylinder	Circle and Disc	1.0	0.6
	Positions of a Line According to a Circle	1.0	0.3
	Arcs and Angles in a Circle	2.6	3.1
	Area and Circumference of a Disc	2.6	3.1
	Right Cylinder and Its Properties	0.5	0.0
	Area and Volume of Right Cylinder	1.6	1.9
	Chapter Test	1.6	0.0
	Total	33.0	26.3

Table 9
Percent Coverage of Pages and Examples for Geometry in Mathematics 8 (Pre-reform Period)

Units	Topics	Pages	Examples
Proportioned Line Segments and Similar Triangles	Ratio and Proportion between Line Segments	2.0	2.7
	Congruent Triangles	3.5	1.4
	Similar Triangles	3.0	1.6
	Problems Related to Similarity	2.5	0.6
	Drawing Triangles	2.5	2.2
	Pythagorean and Euclidean Theorems in Right Triangles	3.9	2.7
	Trigonometric Ratios in Right Triangles	4.9	5.1
	Problems Related to Trigonometric Ratios	1.5	0.8
	Line Formula	3.9	3.5
	Tangent of a Line	2.0	1.9
	Inequalities with Two Variables	2.5	1.9
	Chapter test	2.5	0.0
	Total	34.7	24.4

Table 10
Percent Coverage of Pages and Examples for Geometry in Mathematics 6 (Post-reform Period)

Sub-Learning Area	Pages	Examples
Line, Line Segment, Ray	3.9	3.9
Angles	3.5	6.3
Polygons	4.4	4.6
Congruency and Similarity	1.8	1.6
Geometry of Transformation	1.7	1.6
Patterns and Tessellations	3.1	2.0
Geometric Objects	3.9	4.3
Total	22.3	24.3

Table 11
Percent Coverage of Pages and Examples for Geometry in Mathematics 7 (Post-reform Period)

Sub-Learning Area	Pages	Examples
Lines and Segments	5.9	9.3
Polygons	2.7	3.1
Congruency and Similarity	2.7	2.2
Circle and Disc	5.9	6.2
Geometric Objects	3.1	2.7
Geometry of Transformation	2.7	4.5
Patterns and Tessellations	1.8	2.7
Uncovered	0.9	0.4
Total	25.7	31.1

Table 12
Percent Coverage of Pages and Examples for Geometry in Mathematics 8 (Post-reform Period)

Sub-Learning Area	Pages	Examples
Triangles	15.9	15.5
Geometric Objects	7.2	7.7
Patterns and Tessellations	1.5	2.6
Geometry of Transformation	6.7	6.7
Geometric Projection	2.4	2.0
Total	33.7	34.5