An Investigation into the Content Designs of the third Grade Mathematics and Turkish Textbooks

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The design of textbooks used in teaching and learning processes is of great importance to each level of education from pre-primary through to higher education. Textbooks, especially at primary level, include lots of visual images. It is, therefore, of crucial importance to resort to effective and proper ways of using visual design elements in textbooks. This study was to examine Grade Three Primary Mathematics and Turkish Textbooks published by Republic of Türkiye Ministry of National Education Publishing in 2018-2019 Academic Year in Türkiye in terms of visual-text design and typography. The data draws on the evaluation of content design of textbooks respecting typographic style, visual design principles and suitability of visual images. This study, based on qualitative research model, is a multi-case study for which the data were collected through semi-structured interviews. Following the evaluation of the field experts, there was a total of 18 open-ended questions. We recruited eleven field experts to collect qualitative data through semi-structured interviews. During the interviews, the participants provided data on typographic style, visual design principles and suitability of visual images. Based on the content analysis results, we found that there are some typographic errors in the content design of textbooks. Further, no original visual images seemed to be included in the textbooks examined. We can conclude that the related textbooks do not comply with the Gestalt Principle of Continuity. Other visual design elements such as the use of visual hierarchy, two-pages spread design, and the emphasis effect and alike are not satisfied since there is no consistency in the drawings of the content design of textbooks. We argue that it is of vital importance to recruit professional textbook designers in the design process of textbooks and to pay more attention to the visual evaluation criteria prepared by the relevant Board of Education.

Introduction

Textbooks are indispensable part of teaching and learning processes since they provide a syllabus for the course, ensure security for the students, support teachers with extra

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materials etc. (Graves, 2000). In education and training processes, textbooks can be seen as a source of information for students and as a roadmap for teachers. For this reason, textbooks are among the important tools for educational environments (Küçükahmet, 2011). Textbooks that facilitate education and training processes in extracurricular learning processes (Kılıç, 2006) also play a critical role in instilling a love of reading and reading habits in students (Erdal, 2008). Therefore, a proper adaptation of textbook in terms of content design, visual design and typography is as important as textbooks' existence. From this point of view, we argue that well designed and prepared textbooks in terms of content and design will also contribute to the aesthetic perceptions of primary school students.

Turkish, Mathematics and other textbooks should be seen as a whole in terms of issues such as constitution, content, acquisition, language and expression, visual and learning-teaching. Features that should be in a qualified textbook; being compatible with the content and achievements of the course; meeting course objectives; compliance with visual design principles; have interesting jokes, puzzles and visuals that support learning processes; It can be expressed as including different educational structures such as reading texts, practice and experiment examples belonging to experts in the field (Çoruh & Erarslan, 2017; Hayta et al., 2003).

Turkish language skills primarily reflect students' ability to understand and explain. A written text is a more complex process than an oral narrative. Namely, before the written texts, the text and the knots in the texts should be resolved and the contexts should be understood. For this reason, great importance is attached to reading and explaining a written text in schools. The rapid development of visual and auditory tools and their gaining an active role in our daily life also allow us to understand by listening and knowing listening (Küçükahmet, 2011).

The Mathematics Curriculum includes values such as aesthetics, flexibility, justice, equality and sharing, along with a student-centered approach that emphasizes the importance of conceptual understanding. In this regard, it highlights the association with the eight basic competencies determined in the Turkish Qualifications Framework (Ministry of National Education [MoNE], 2018).

In the textbooks to be used in the teaching-learning process, the subjects can be made more interesting and instructive by including educational and instructive elements such as pictures, graphics, figures, guiding, explanatory and complementary visuals. In this respect, it is very important to pay enough attention and care to visual design during the preparation and design of the textbook (Tertemiz, Ercan, & Kayabaşı, 2011).

Images are more memorable than words, and thus they can be remembered more easily (Paivio, 1983). The visual perceived by the person is first placed in the memory as an image and then as a verbal label given to this image. This situation is called dual coding (Miller & Burton, 1994). The fact that the image has two layers in the memory provides an advantage for later recall. Due to this nature of human memory, it has become a must to provide visual support in addition to the message when it is desired to be given on any subject (Pettersson, 2010).

Visual design is an important issue for textbooks to be more effective (Kılıç & Seven, 2008). Basic design principles are listed as follows: balance, emphasis, unity, contrast, proportion, rhythm, repetition, conformity and dominance (Evergreen & Metzner, 2013; Malamed, 2009; Schlatter & Levinson, 2013). For an effective textbook design, first of all, these design elements should be chosen correctly and then they should be arranged in accordance with the design principles. Basic design elements can be listed as line, size, color, texture, shape and space. These elements should be chosen according to the purpose of the textbook and

curriculum. In addition, these elements prepare the environment for the design principles to fulfill their duties (Kılıç & Seven, 2008). During the implementation of these principles, careful action should be taken and exaggerated use should be avoided.

While designing the textbook, care should be taken to ensure that the design elements and design principles are compatible with each other. If this harmony is not achieved, the textbooks will not attract the attention of the users as they will disturb the eyes. For this reason, textbooks will also lose their functionality. In addition, one of the important elements of preparing an effective textbook is to pay attention to basic teaching principles. The most important of these principles are the principle of relativity for the student, moving from the close to the distant, moving from the known to the unknown, clarity, from the concrete to the abstract, and economy (Küçükahmet, 2011).

Text design process in textbooks should be arranged according to human vision and learning theories. In this context, the first thing to do is to act in accordance with the interests, expectations and perceptions of the target student group. This is possible by recognizing the characteristics of the target audience (Alpan, 2008). In that case, it can be stated that it is important to consider the characteristics of the target audience who will use the textbook during the text design process in textbooks. The visuals used in the textbooks are designed based on the text. Illustrations should correspond directly with the text and have aesthetic values that can attract the attention of the child. Illustrations and content should not have negative connotations on children. In visual perception, noticing the whole picture or the details of the picture is a matter of perspective. Visual perspective is also related to the size of the picture in the visual field. While seeing the whole or the details of the picture does not dominate each other, it is possible for the individual to pay attention to the details of the image somewhere between these two elements (Fleming & Levie 1993). In an experiment by Pettersson (1989), the following conclusions were drawn: (a) How a visual image is understood is a relative thing and is open to personal interpretation, (b) the perceived message is different from the intended theme or subject, (c) even simple pictures may lead to different perceptions, (d) complex messages can be formed through simple elements, (e) small changes lead to big changes in the meanings of visuals, (f) content is more important than practice and form, (g) legibility of pictures is determined by aesthetic and usability, (h) captions must be carefully addressed since they affect how we perceive pictures, (i) readers mostly see what they are expected to see in pictures, (j) there is no meaningful difference in the interpretation of pictures in terms of gender, (k) students have low level of drawing skills, and (l) it is important for us to learn how to read a picture.

Typography is not only arrangements of letters, words, lines, or pages but also design attitude and problem (Tschichold, 1995). Therefore, each element of the text should depend on each other element in the established values and emphasis, and the design should be considered as a whole. This approach will ensure clearly visible and functionality in design with type weight and width, use of color, line layout, photography, picture and other elements (Sarıkavak, 2004).

Various problematic issues have been identified in many studies on the content, text and design of textbooks (Alpan, 2004; Baş & İnan Yıldız, 2014; Cımbız, 2017; Eşgi, 2005; Gülersoy, 2013; İşcan & Karadağ, 2021; Kaptan & Kaptan, 2005; Kılıç & Seven 2008; Şahin, 2014; Uçar & Özerbaş, 2017; Yaşar, 2015). There are still visual mistakes in the textbooks approved by the Board of Education after certain stages. The Board of Education has determined the criteria that will be the basis for the review of the draft book (MoNE, 2021). However, it has been observed that these criteria are not fully taken into account in the approved books. On the other hand, it is seen that the studies carried out in the literature to

examine book contents in terms of design are not aimed at examining current textbooks. In this context, examining the current textbooks in terms of visual-text and typography can make new contributions to the existing literature. In this direction, it is expected that this research will contribute to filling this gap in the literature.

In this study, we examined grade three primary mathematics and turkish textbooks that are still used in schools in terms of visual-text design and typography. Based on this, the main research question is "How suitable are Grade three Mathematics And Turkish Textbooks in terms of visual-text design and typography?" The more specific research questions that guided this research were as follows:

(1) How suitable is the typographic design of content design of textbooks for the level of the student?
(2) How suitable is the content design of textbooks with visual design principles for the level of the student?
(3) How suitable are the visual images used in the content design of textbooks for the level of the student?

Method

Research Model

This study, based on qualitative research model, was designed as a multi-case study in which Grade three Primary Mathematics and Turkish Textbooks published by Ministry of National Education Publishing in 2018-2019 academic year were examined in terms of visual-text design and typography of them. Case study is defined as a qualitative research design through which the researcher investigates contemporary, limited situation or multiple situations over time in a real-life context in a detailed, in-depth way thanks to multiple sources of data, including observations, interviews, audio-visual materials, documents, and reports. Creswell and Poth (2018) note that the research phenomena can be designed as a case study or multi-case study.

Participants

In this study, we interviewed eleven participants and asked them if there are any problematic issues in Mathematics and Turkish textbooks in terms of visual-text design and typography. In this sense, the experts working on visual design were recruited through purposeful sampling method. The number of qualitative interviews was defined according to data saturation. Participants took part in this research voluntarily and were informed about the problem situation, the purpose of the interview and the research in general. Table 1 summarizes the participants' demographic information.

Table 1. Demographic Information

		n	%
Gender	Female	5	45,4
	Male	6	54,5
	Total	11	100
Academic Title	Professor	2	18,1
	Associate Professor	3	27,2
	Assistant Professor	3	27,2
	Doctor	2	18,1
	Expert	1	9
Work Experience	0-5 years	-	-
	6-10 years	3	27,2
	11-15 years	6	54,5
	16 years and above	2	18,1

As shown in Table 1, there are five female participants in this study. All these participants were selected since they have already had experiences and academic studies on textbooks. The participants in this study have more than five years of experience in visual design. Further, we examined Grade Three Primary Mathematics and Turkish Textbooks published by Ministry of National Education Publishing in 2018-2019 academic year. The reason for including these two books in the scope of the research is that they are recommended by the Ministry of National Education and are among the books to be read on the eba.gov.tr website. In addition, these selected courses are among the compulsory courses taught in the primary school curriculum.

Grade Three Primary Mathematics Textbook included in this research consists of 288 pages and has 6 units. Based on the national mathematics curriculum, the textbooks include six units as follows: "Unit 1-Natural Numbers", "Unit 2-Addition of Natural Numbers", "Unit 3-Multiplication of Natural Numbers", "Unit 4-Fractions", "Unit 5-Geometric Objects and Shapes" and "Unit 6-Measurement". Grade Three Primary Mathematics Textbook includes illustrations and schematic figures. Grade Three Primary Mathematics Textbook included in this research, on the other hand, consists of 280 pages and has 8 themes. Based on the national mathematics curriculum, the textbooks include six units as follows: "Theme 1-Individual and Society", "Theme 2-The National Struggle and Atatürk", "Theme 3-Virtues", "Theme 4-Our National Culture", "Theme 5-Communication", "Theme 6-Science and Technology", "Theme 7- Children's World" and "Theme 8-Health and Sport". Illustrations and schematic figures are extensively used in Grade Three Primary Mathematics Textbook.

Data Collection Tools

To evaluate the textbooks examined in this study in terms of typography and visual design principles, qualitative interview questions were prepared based on the literature and expert opinions. The semi-structured qualitative interview form consisting of 12 questions was examined by Turkish language experts, three measurement and evaluation experts, and seven visual design field experts, and the number of questions was increased to 18 questions. An expert was interviewed for the pilot application of the prepared interview form. After these stages, the data collection process was started. The data in this study were obtained through qualitative interviews. Due to the Covid-19 pandemic, the interviews were held with online video conferencing methods such as Google Meet and Zoom. The interviews were recorded with the permission of the participants. Since these programs have both video and audio recording features, the interview recordings were watched repeatedly during the data analysis. Participants independently evaluated the textbooks according to the questions in the

interview form. Probe questions were added to create a rich data set by obtaining in-depth data during the interviews. Interview times varied between 120-150 minutes. On average, interviews lasted 135 minutes.

Data Analysis

In this study, before the data analysis was carried out, the qualitative data set was prepared for analysis. First, the audio records were transcribed and were converted into text. To ensure participant confidentiality by providing anonymity due to ethical considerations, the participants were assigned codes starting from "Participant 1(P1) to (Participant 2 (P11)". The qualitative data obtained from the interviews were re-read by the researchers. Qualitative data analysis was carried out by comparing the answers of each participant within themselves and with the answers of other participants. In this process, the qualitative data obtained from the participants were abstracted and conceptualized. During this conceptualization, qualitative data obtained from participant responses were evaluated together with the textbooks included in the analysis. The concepts that emerged following the analysis of the data obtained from the interviews with the participants were confirmed by examining the books. Obtained concepts were classified according to their properties by comparing them with other concepts. The concepts obtained for this purpose were named according to the answers of the participants and grouped under themes. The findings obtained through content analysis were presented with tables, and where necessary, the participants' own statements and the relevant book chapters were included in detail to ensure validity and reliability.

In this study, trustworthiness strategies suggested by Lincoln and Guba (1985) were used in terms of validity and reliability. Four general criteria including credibility, transferability, dependability, and confirmability were addressed. In this context, the first issue is that the researcher has experience with the relevant research problem. The researcher worked as a visual design specialist for twelve years in a publishing house that prepares textbooks. He still gives lectures on visual design in a higher education institution. In addition, the data obtained through the interviews were evaluated together with the relevant textbooks, and the answers of each participant were compared with the books to ensure data diversity. Each concept obtained following the analyzes is explained in detail in its own context by specifying its features. These concepts were also supported by quotations from the participants' own statements. In addition, the research process was reported in a transparent and detailed manner. In the presentation of the findings obtained in the research, the differences of opinion of the participants were also emphasized, reflecting the different views. Finally, since this research was carried out within the scope of the doctoral thesis, the entire research process was carried out under the supervision of the thesis advisor and the thesis monitoring committee.

Findings

1. Findings Regarding the Typographic Style of Content Design of Textbooks

Table 2 displays research findings on the typographic style of content design of third Grade Mathematics Textbook.

Table 2. Findings on the Typographic Style of Content Design of Third Grade Mathematics Textbook

Theme	Code	f
Typography	The suitability of the font size for the level of the student	8

The suitability of the font for the level of the student	8	
Legibility	8	
Functionality of text organizers	8	

Based on the analysis, it was found that the fonts without serif were used in the typography arrangement in the content design of the Mathematics Textbook, but it was above the student level due to the dense and small font throughout the page. Here is a sample excerpt from the participant's own statements:

> …The sans serif script is dominant throughout the book, but the font size is small. The legibility of the typefaces was too small for a third-year student, and type weights on some pages are very heavy. There are no spaces between the text and the page numbers. The line lengths of the texts are generally well organized, but due to the density of the scripts, the lines are narrowed on some pages. I'd say they are above the level of third graders… (P1)

Another finding obtained in the research is related to the appropriateness of the font size to the level in typography arrangement in content design. Participants stated that throughout the book, the font size was small compared to the level of the students. Here is a sample excerpt from the participant's own statements:

> …In general, the scripts in this book are small according to the students' level. The smallest font size that can be used at third grade level should be 14 pt. This is because I see it as a problem. Further, the proper font sizes are written in the guide by MoNE. The scripts are heavily used on pages, but this is due to mathematics. However, I think there are a lot of texts according to the students' level... (P9)

In the findings regarding the legibility of the text throughout the book, it was stated that the legibility was ensured despite the small font size used throughout the book. Here is a sample excerpt from the participant's own statements:

> …In typographic arrangements, legibility is improved by using plain and sans serif fonts. It is designed in a way that can be read even though its dimensions are reduced due to lack of space in some subjects. Another problem is that the spaces between the lines are too narrow. For example, on pages 71, 154, 155 etc. The lines are too close, the page is too dense and crowded... (P5)

Based on the qualitative analyzes, different views on the use of contents, titles, dictionary, and bibliography, which are among the text organizers about typography arrangement in content design, were determined. Accordingly, some experts can read the font of the table contents. While they found the change of colors according to the units distinctive, some emphasized that the contents section was prepared in a uniform manner. Although it was suitable for the purpose, most of the participants stated that the titles were prepared as attention-grabbing, but the line space left when switching to another letter in the dictionary section was insufficient. Here is a sample excerpt from the participant's own statements:

> …Although the table of contents is in line with the purpose, it is prepared uniformly, and the titles have been prepared in a way that supports the visual hierarchy, and the transition between the units is remarkable. While the topics in the unit are provided, contrast should be used better and be remarkable. Boxes and balloons of different shapes and colors are used to prevent the texts from getting cramped... (P3)

Table 3. Findings on the Typographic Style of Content Design of Third Grade Turkish Textbook

Theme	Code	f
	The suitability of the font for the level of the student	8
	Legibility	8
Typography	Functionality of text organizers	8
	The suitability of the font size for the level of the student	4
	Achieving contrast between text and background	4

As shown in Table 3, the participants stated that the typefaces in the typography arrangement in the content design of the Turkish Textbook were generally suitable for the level. On the other hand, they stated that the script typeface in the box under the preparatory work area throughout the book is not suitable for the level of the student. Here is a sample excerpt from the participant's own statements:

> …The font throughout the book seems appropriate. However, script fonts are used in the box under the preparatory worksheets throughout the book. Even though it is not the right choice for this age level, italic fonts should be preferred when necessary. Further, the colors preferred in script fonts do not provide contrast with the color boxes opened under the text, which is against the color hierarchy rule. (e.g.: p.12, 18, 31, 38, 51, 66, 76 and so on) … (P5)

Based on the qualitative analysis, regarding the legibility of the text throughout the book regarding the typography arrangement in the content design, the participants stated that the texts throughout the book were legible except for a few pages. Here is a sample excerpt from the participant's own statements:

> …In general, the legibility of the pages is not bad, but some pages have serious problems. For example, the legibility of the text on Page 27 is fairly difficult. The design, which has reduced the legibility of both the image and the text, is intertwined. There is a background and text relationship, the "from me" part on the bottom line is not legible. Does it say Alpha at the top? or Does it say mummy or mommy? for example, it is not legible. The writing on the blue is a serious problem. It's the designer's fault. Again, the legibility of the 174 and 175 cartoon pages is not appropriate at all. The scripts are too small. On page 249, a page-shaped image has been placed for the text space, but the text has not been fitted into this space... (P7)

The participants emphasized that the contents of the book were created in a functional way regarding the use of contents, titles, dictionary, and bibliography, which are among the text organizers related to typography arrangement in content design. In addition, they stated that the titles were emphasized in an order that would create the visual hierarchy, except for pages 12 and 262, and the glossary and bibliography sections were distinguishable and . Here is a sample excerpt from the participant's own statements:

> …It is clear that the table of contents has been functionally designed, the titles are designed in a way that supports the visual hierarchy, the subject titles between the units are eye catching, and boxes of different shapes and colors are used to prevent the texts from getting cramped. The glossary and bibliography sections are also distinguishable and ... (P8)

Another finding related to typography arrangement in content design is related to the suitability of the font size to the students' level. Participants stated that throughout the book, the font size was appropriate for the level, but on pages 174 and 175, the font size was not taken into account in the cartoon drawings. Here is a sample excerpt from the participant's own statements:

> …Throughout the book, the student level has been addressed in the font sizes. But 174 and 175 cartoon pages are not suitable for legibility at all. Scripts are too small… (P11)

The participants stated that the required contrast between the background and the text was not provided regarding the typography arrangement in the content design. Accordingly, the participants emphasized that the ground-writing relationship was neglected in the texts on page 27 and in the boxes under the preparatory work of the book, as stated in terms of legibility. Here is a sample excerpt from the participant's own statements:

> …However, it is seen that script fonts are included in the box under the preparatory worksheets throughout the book. The colors preferred in script fonts do not provide contrast with the color boxes located under the text, which is against the color hierarchy rule. (Ex: p.12, 18, 31, 38, 51, 66, 76 and so on) … (P5)

2. Findings Regarding the Suitability of Content Design of Textbooks with Visual Design Principles

Table 4 displays research findings on the suitability of content design of third grade mathematics textbook with visual design principles.

Table 4. Findings on the Suitability of Content Design of Textbooks with Visual Design Principles

Theme	Code	f
	The Gestalt Principle of Continuity	9
Visual Design Principles	Use of visual hierarchy	8
	Two-pages spread design	7
	Emphasis effect	5

Based on the qualitative analyzes, the use of the principle of unity and continuity is among the important findings regarding the suitability of the content design of the mathematics textbook with the visual design principles. Participants expressed different views on this principle. Accordingly, The first pages of each unit of the mathematics textbook, the dialogues and icons of Emre and Ezgi in the "let's remember" section partially ensured unity and continuity in the design of the textbook. In the content design of the mathematics textbook, some images were too small but some were large. This resulted in the loss of unity principle. Visual hierarchy is not often considered in the mathematics textbook. Due care has not been taken to design the two-pages spread design in general. Here is a sample excerpt from the participant's own statements:

> …In the 'Let's remember!' section, which appears on many pages in the book, there are dialogues between Emre and Ezgi (Pages 103, 114, 126, 184…). There is unity and continuity between the images used in the frames used in Let's learn! Let's work!, icons, transitions between topics. Peanuts almonds and hazelnuts given on pages 196 and 197 are very small in one and large in the other. There is an inconsistency, as well… (P7)

Another issue expressed by the participants in this research is that the use of the hierarchy principle is not paid attention to, and therefore the sizes of the images are smaller than the icon symbol on some pages and the images are placed in the remaining sections of the articles. Here is a sample excerpt from the participant's own statements:

> …There is a problem with visual hierarchy. There are mostly other design principles, and the designer knows that they are not in the visual hierarchy, so they have been located in boxes. That's why it's colorful. Since visual hierarchy has not been considered in the visual design, the designer has attempted to correct each of them by enclosing them in boxes. For example, on page 233, lots of schemas have been used. In the fourth question, the character "Cin Ali" has been used in teaching of angles. It is strange that there have been lots of schemas, but a very simple drawing has been used here. If I am asked to tell what the most absurd thing in this book is, I would say it is that. A more appropriate schema could have been used here… (P3)

Different views on the design of the two-pages spread regarding the compliance of content design with visual design principles have been identified. Most of the participants stated that attention was paid to the design of the facing page design as a whole and the continuity of the pages, but others stated that this was not paid attention to. Here is a sample excerpt from the participant's own statements:

> …Most pages have been designed as a whole in themselves, and successive pages have been tried to be designed as a whole. Such pages as 22-23, 26-27, 84 -85, 88-89 etc. can be shown as examples of this situation. When compared to other books, its design has been intended to form a unity across the book. For example, the arrow drawings used on pages 188 and 189 were also

intended to be unified. In general, the pages in the book are not disconnected from each other… (P1)

Participants also drew attention to the principle of emphasis regarding the compliance of content design with visual design principles. Accordingly, they evaluated the design of the answer section allocated to the students as a checkered page, as a positive practice for the student to write easily and to provide the atmosphere of the mathematics lesson. However, they also stated that the emphasis was missing in some places. Here is a sample excerpt from the participant's own statements:

> …Designing the answer sections allocated to the student throughout the book as checkered pages allows student to write easily and provides them with the atmosphere of a Math class. By doing so, the space where the student will write was highlighted. In some places, on the other hand, the emphasis is missing. For example, in the scene about the ball rolling from the hill on page 22, the snow from the hill is in the foreground instead of the ball, and the ball lags behind. There is a similar situation on page 13 that Metehan and İrem's books are difficult to understand… (P4)

Table 5. Findings on the Suitability of Content Design of third Grade Turkish Textbook with Visual Design Principles

Theme	Code	f
	The Gestalt principle of continuity	9
Visual Design Principles	Two-pages spread design	8
	Emphasis effect	7

Table 5 shows the findings regarding the compliance of the content design of the Primary School Third Grade Turkish Textbook with the principles of visual design. Attention was drawn to the principle of unity and continuity regarding the compliance of the content design of the Turkish Textbook with the principles of visual design. There are different points of view among the participants. Some participants stated that the unity and continuity among the visual elements were considered, especially within each unit and in the whole book in general, however, some of the images were positioned contrary to the composition in their placement, and that the photograph and illustration should not be overlapped on some pages. Others claimed that this principle was not addressed because there was no unity between the drawings. Here is a sample excerpt from the participant's own statements:

> …In the repeated sections such as themes and preparatory studies, unity was achieved and similar elements were repeated, but in general, I do not reckon that there is unity and continuity between the visuals. For example, the illustration on page 27 seems that it is a hand-drawn with dry paint, but the illustration used in the event on page 29 was drawn in a completely different style, and it came later here (page 32) and a photograph was used here. There is no unity between the images, and it is clear that there is no unity between the drawings… (P4)

There is evidence regarding the compliance of content design with visual design principles. Participants stated that two-pages spread designs have been too limited. Here is a sample excerpt from the participant's own statements:

> …When I examine on page 90, I suddenly come across an Ottoman Edict with a yellow background that has never been used before in the book. Next to it, the design drawn on the board after 1960 and used in education is presented as a writing space for students. Both images are given side by side. So, did the subject of the lesson change in activity 8 or activity 9? Did the course content change? Of course, no. The subject of the course and the content of the course continue in the same direction… (P4)

Another view regarding the compliance of content design with visual design principles is the principle of emphasis. Most of the participants claimed that emphasizing throughout the book did not serve the purpose and that the empty places on the page were filled for movement and

the page designs were placed in a scattered manner. Here is a sample excerpt from the participant's own statements:

> …For example, on page 191, the highlight effect is used, but it does not serve the purpose. When I look at the highlighted part in this section, it is not fully understood why the emphasis is made. I can make a comment about why those images are needed on this page: There are too many different concepts here, and when images of each concept were used, the page would have looked complicated, and a chaotic image would have formed. When no images were used, the left and right sides of the page would look very plain. They may have used this highlighting effect here for this purpose in order to animate this empty space. In such processes, the void is like a design element. This rule does not change, even if it is a book for 9-year-olds... (P8)

3. Findings Regarding the Suitability of Visual Elements Used in the Content Designs of Textbooks

Table 6 displays research findings on the suitability of visual elements used in the content designs of third grade mathematics textbook.

Table 6. Findings Regarding the Suitability of Visual Elements Used in the Content Designs of Textbooks

Theme	Code	f
	Effective use of volumes	9
	Reflecting cultural values	9
	The suitability for the level of the student	9
	Consistency between color and layout	9
Visual Elements	Interpreting visual text and facilitating learning process	9
	Proximity in visual design	9
	Original visual design for textbook	9
	Technical consistency	8
	Compliance with the reality principle	6

One of the findings related to the suitability of the visual elements used in the content design of the Mathematics Textbook is related to the effective use of the dimensions of the visuals. Most of the participants stated that the size of the visuals throughout the book was small compared to the level. Here is a sample excerpt from the participant's own statements:

> …The effectiveness of visual elements seems low due to the large amount of text in the design. The sizes of the images used in general are appropriate. For example, the small size of the numbers in the treasure chest image on page 16 reduces the legibility levels. In addition, it is not fully understood which object is in the third Box in the activity number seven given on the same page. It is not clear whether there is a tree or something else. For example, in another example Egyptian numerals and Sumerian cuneiform numerals were used. Sumerian cuneiform numerals seem appropriate, but Egyptian numerals are not sufficient for legibility. It would be better if these numbers were not used at all. Either the larger size could be preferred or not used at all. The reason for this is that there are too many elements in the image. What is meant to be conveyed by these elements is not entirely appropriate for the purpose. In my opinion, half of the page should have been devoted to this image and the dimensions should have been larger… (P3)

Regarding the suitability of the visual elements used in content design, it has been stated that there are some cultural elements in the book and that there are no images contrary to our culture among them. Here is a sample excerpt from the participant's own statements:

> …It is possible to see cultural elements in some parts of the book. For example, the Maiden's Tower on page 44, the images of Karagöz and Hacivat and Nasreddin Hodja on page 181, the images of students holding the Turkish Flag on page 157, and the pre-hospitality behaviors in Turkish culture on page 183. visuals, our currencies unit starting on page 188 and the Turkey Map on page 226 can be given as examples of these cultural elements… (P1)

Based on the qualitative analyzes, it was stated that the visual elements used in the content design were suitable for the student level, that the illustrations were drawn in simple forms, that they were cartoonish figures, and that it was desired to draw attention to the child by attributing anthropomorphic features to inanimate objects and animals. Here is a sample excerpt from the participant's own statements:

> …The pictures used in the book are generally suitable for the level of the student. Colors and gestures are used in accordance with their purpose. When evaluated from this point of view, it does not seem to affect the students negatively. For example, the images on page 29 were drawn in simple forms suitable for the level of the student, and cartoons were used. Similarly, simple illustrations are used on pages 52 and 75. In other words, they are used at a level that children can understand, there is no problem in this respect… (P9)

Based on the analyzes, findings related to the suitability of the visual elements used in the content design and the color and form harmony were obtained. Accordingly, it has been stated that the colors throughout the book are vivid and bright in accordance with the level. It is also among the findings that the character forms were designed in an easy-to-understand way, taking into account the principle of simplicity, as in the other book, and therefore they were drawn in accordance with the age group. Here is a sample excerpt from the participant's own statements:

> …The color and form used in the character illustration stages are suitable for the level of the students. Vivid and bright colors are preferred. For example, the colors and format of the character used on pages 128 and 140 were designed considering the level of the student. On page 140, too, the simply drawn lines and bright colors seem fit for purpose. It was used at a level that students could perceive, but the dimensions could have been better. In terms of form, the illustrations are detached and uncomplicated... (P2)

Among the findings about the suitability of the visual elements used in the content design, there are also the fact that it makes sense of the verbal text and supports learning and that it affects the perceptions of the students. Accordingly, some participants stated that the visual elements were designed to help make sense of the text due to the nature of the mathematics course. Others claimed that this situation was not taken into consideration in the book, and that the effects and shapes used were distracting and inadequate. Here is a sample excerpt from the participant's own statements:

> The visuals used in the book are used in a way that supports the interpretation of the texts due to the structure and content of the mathematics course. In this respect, the visuals in this book contributed to making sense of the verbal text and supporting learning. For example, on pages 122 and 140, images associated with the text are used. On page 122, the concept of unity digits in mathematics was supported with fingers. In question five on page 140, images related to the text were used and "How many roosters are in the farm? How many chickens and roosters?" questions such as images are linked to each other. Since the number of people in the elevator is not written in the content of question seven on page 153, there is a family of 4 people in the image, and it helps to make sense of the question with subtitles. (P5)

Another finding related to the suitability of the visual elements used in content design is the ordering of the visuals according to the principle of near-to-far. Accordingly, the participants stated that the visuals that children are generally familiar with are used in the textbook. However, it was also stated that it was enriched with examples from the distant environment. Here is a sample excerpt from the participant's own statements:

> …There are examples from the near and far circles of the students. Explaining the "straight line" subject with the ornament applied to the edge of the notebook on page 234, giving examples of number symbols that people needed numbers in ancient times on page 46, and the Roman numbers and the equivalents of these numbers used today in the second activity on page 48 are examples of this situation… (P4)

Another finding obtained in this research is related to the fact that the images used were obtained from certain stock photography sites instead of being original. Accordingly, it was stated that the images were taken from Shutterstock and Dreamstimeand they were not original drawings for the book. Here is a sample excerpt from the participant's own statements:

> …When the bibliography of the images is examined, there is no visual of the designer. Images are sourced from stock photography sites such as Shutterstock and Dreamstime. There are no original images in this book. In general, similar drawings were produced… (P6)

In terms of the suitability of the visual elements used in the content design, it has been determined that the technical consistency continues consistently throughout the book in the illustration in the Let's Remember section, but technical unity is not achieved in the other sections. Here is a sample excerpt from the participant's own statements:

> …A single image was used in the illustrations in the Let's Remember section and it continues in the same way throughout the book. However, it can be said that technical unity is not achieved in other departments. Drawings are caricatured on some pages, schematic on some pages, and realistic on others. For example, while using a detailed image on page 200, a simple drawing is used on page 201. There are many pages like this… (P9)

According to the findings obtained regarding the reality principle in terms of the suitability of the visual elements used in content design, some participants said that this principle was taken into account in the design processes, while others claimed that the reality principle was not followed. Here are sample excerpts from the participants' own statements:

> …In general, the drawings meet the qualifications in the reality principle. Frankly, I did not pay much attention to the reality principle here, since it is a mathematics book, and the use of schematics is preferred in drawings… (P4)

> …Most of the drawings do not comply with the reality principle. The proportions and proportions of the objects and figures were not taken into consideration in the images. Examples such as the absence of writing on the vehicles on page 16, the style of the writing on the blackboard on page 75, and the fact that the image named cookie on page 147 does not match the real cookie supports this determination. In addition, the name of "börek" is mentioned on page 160, but it is not similar to the visual "börek". Since the washing machine on page 195 is small compared to other objects, it is very difficult to distinguish the coin images used on page 193. In the question, it is required to find the amount of money and write it in the space in the table, but it is very difficult for the student to perceive the money. So, there is a problem here. It is absolutely inconsistent with the reality principle. It is incomprehensible in this form... (P7)

Table 7. Findings Regarding the Suitability of Visual Elements Used in the Content Designs of third Grade Turkish Textbook

Theme	Code	f
	Effective use of volumes	9
	Reflecting cultural values	9
	The suitability for the level of the student	9
	Consistency between color and layout	9
Visual Elements	Interpreting visual text and facilitating learning process	9
	Proximity in visual design	9
	Original visual design for textbook	9
	Technical consistency	8
	Compliance with the reality principle, anatomy and design	6

Table 7 shows the findings regarding the suitability of the visual elements used in the content design of the Primary School Third Grade Turkish Textbook. Accordingly, one of the findings regarding the suitability of the visual elements used in the content design of the Turkish Textbook is the effective use of the dimensions of the visuals. While some

participants stated that the dimensions of the images were used correctly and clearly according to the level throughout the book, some others stated that the sizes of the images were not correct and appropriate. Here is a sample excerpt from the participant's own statements:

> …There are problems with the size of the images in this book. Image sizes are not appropriate. On some pages, large images are used to attract attention with images, but they create problems in terms of perception. For example, let's examine the image on page 93. Large, medium, and small. We need to be able to see the relationship between the lead actor, the supporting role and the extra with this perception. I see the photo below. The first photo stands out. But other photos do not have the same effect. Considering the size of the page, I can say that too many images are used. There is also a similarity in terms of the type of paintings. Students immediately eliminate similar pictures. In the second and third photos, there are photos of disabled cats and dogs. Walkers were made for these animals. However, if a picture was placed and its size was large, the child would be able to perceive the emotion in the gaze of that cat or dog more clearly. Photos are randomly placed. There is already a difficulty in perception, which creates an extra difficulty. If there was a moving image next to three uniformly arranged images, it would have come to the fore more… (P8)

Being in harmony with cultural elements is among the findings related to the suitability of visual elements used in content design. According to this, most of the participants included in the book, the National Struggle and Atatürk, the unit of our National Culture and the "goodness, help, etc." throughout the book. He said that the visual elements used in the pages where the subjects are covered are associated with our cultural elements. One participant claimed that to create a sense of belonging in students, they should have school-specific uniforms in the visuals drawn in the classroom environment. Here is a sample excerpt from the participant's own statements:

> …The National Struggle and Atatürk in the book, the unit of our National Culture and the "goodness, help, etc." throughout the book. It can be said that the visual elements used in the pages where the topics are covered are compatible with our cultural values. In addition, the image describing our folk dance culture on page 61, helping our neighbors on page 101, "Çayda Çıra" folk dance image on page 117, horse javelin competition images on page 126, Karagöz and Hacivat photos on page 162, April 23 National Sovereignty and Children's Day celebrations on page 208 can be given as examples of this situation... (P7)

Based on the qualitative analysis, another finding related to the suitability of the students' level and the suitability of the visual elements used in the content design. Most of the participants generally describe the illustrations as "sad, happy, confused, thoughtful, etc." They said that their emotional state was transferred. Here is a sample excerpt from the participant's own statements:

> …It can be noted that the images used in the book reflect emotional states such as "being sad", "being happy", "confused", "being thoughtful". In addition, images of people "flying a balloon", "reading a book", "writing", "singing", "playing a game", "painting", "coughing or sneezing" also reflect the body language in these situations… (P2)

Another finding about the suitability of the visual elements used in content design is about color and form harmony. Some participants stated that throughout the book, the colors are lively, and the character forms are designed in a cute and affectionate way. Others stated that the lack of controlled use of color is an important shortcoming. Here is a sample excerpt from the participant's own statements:

> …For example, on this page, on the activity pages, the use of colors should have been less than the other areas, whichever area was wanted to be highlighted hierarchically on the activity pages. There is a similar color issue in the character designs that are limited above. I would like to emphasize again that the most basic criticism I can make to this 3rd grade textbook is that the use of colors is not made in a controlled manner. When the student looks at those characters for too long, they will be distracted and therefore will be distracted from the context during the stages of

understanding the instructions for the actual learning, the details of the activity and the reinforcement work. Again, as can be seen in the image on the left, color usage preferences for a child's textbook at this age seem problematic in terms of reading and learning and then keeping them in mind. Too many colors are used... (P10)

There are different opinions in terms of visual elements used in content design to make sense of the verbal text and to support learning. Here is a sample excerpt from the participant's own statements:

…In this part, for example, there is the case of not being related to each other, that is, not having a context. For example, on page 31, I want to establish a relationship between the game and these images, but above there are images of children playing, and the sea image is used as a photograph. A park image could have been used. Since the title is "Children Living in Cities Also Want to Play Games", a park image between buildings in cities would be better instead of this photo. Instead, a romantic photo of Istanbul was preferred. From this point of view, it is very difficult to establish a relationship between the content and the images used. From here, we can deduce the following: When visual texts are read, they do not make it easier to understand plain text… (P9)

Another finding regarding the suitability of the visual elements used in content design is related to the ordering of the visuals according to the principle of close to far. Most of the participants stated that to contribute to learning, it is aimed to create the visuals by following a close and distant path, either temporally or spatially, by adding the unknown to the known, and these principles were taken into consideration in the unit covers of the book and in the ordering of the subjects. Here is a sample excerpt from the participant's own statements:

…For example, on page 164, visuals that students are accustomed to from their immediate surroundings and that they have seen before are used. For example, the case of the father figure being shaved. Usually, fathers get up in the morning and shave. For example, a bird in a cage. A visual that students can see in their immediate surroundings. It is a similar situation when grandparents tell stories. There seems to be a reading activity here. Here, too, the principle of near-far has been adhered to. In another example on page 181, plastic was mentioned, but a Lego photo was used instead of plastic. Here, a visual that the students are used to, for example a toy image, would be more appropriate. A toy image made of plastic both explains that the toy has a plastic structure and can be considered as the principle of near to far… (P7)

Another finding about the suitability of the visual elements used in the content design is the drawing of the visuals unique to the book. Regarding the visual bibliography of the book, most of the participants stated that most of the images in the book were used from ready-made images, but a few images were drawn by the designers. Here is a sample excerpt from the participant's own statements:

…The visual illustrations in the book were taken from various clip-art sites, that is, they were obtained from internet sources, therefore they are not original. This is the case in many book designs. On the other hand, the images on pages 40, 84, 85, 101, 107, 110, 160, 184, 193, 247 and 258 were drawn by the designer. Other images in the book were obtained from stock photography sites... (P8)

Another finding obtained in the research is related to the fact that technical consistency between the visual elements used in the content design could not be achieved throughout the book. Participants said that in the illustration technique, it is difficult to talk about a general harmony created by different illustrators because the images were taken from stock sites. Here is a sample excerpt from the participant's own statements:

…For example, in the design of this book, there are too many images, illustrations and drawings that are not related to each other, and they are not consistent with each other. For example, on page 28, a real image was preferred for the flowerpot, but a flowerpot image was preferred as a drawing just below. On the other hand, the other drawing does not have the same design as the previous drawing. The person who drew the picture of the pot is different, the person who took the picture of the pot is different. This photo was downloaded from the internet. In fact, there is such a problem throughout the book… (P8)

Another finding related to the suitability of the visual elements used in content design is related to the principle of anatomy, pattern, and reality. Most of the participants stated that the logical size and proportion-proportion were not paid attention to in the drawings. Here is a sample excerpt from the participant's own statements:

> …The reality principle has been partially addressed. On the other hand, the boy over there on page 85 seems problematic in terms of ratio and proportion. He looks tall and has almost the same height with his grandfather. I don't know if it makes that much difference in terms of perspective, but it seems strange to me in that page. It also looks like a logical error within the same page. One of the students in the lesson may ask the teacher why the child has shrunk here. We also come across these kind of situations... (P3)

Discussion

This study has sought to examine Grade Three Primary Mathematics and Turkish Textbooks published by Ministry of National Education Publishing in 2018-2019 academic year in terms of visual-text design and typography. There is evidence that in the Turkish Textbook, the font and size are suitable for the grade level, but the script fonts of the texts in the box given under the preparatory work in all parts of the book are not suitable for the level. In the mathematics textbook, although the font used for the texts is suitable for the student's level, the font size is small compared to the student's level. In a study by Yaşar (2015), the author examined the English Language Textbook, entitled "Fun With Teddy" and concluded that the font type and font sizes of the English textbook are at a sufficiently legible level. A review of literature has revealed other studies in which similar results have been obtained (Bağcı, 2007; Eşgi, 2005; Uluışık, 2008).

Another conclusion drawn from this current study is that the content section of the mathematics textbook, seen as the text organizer, has been designed in a uniform manner. The texts of the sixth unit in the table of contents are not legible due to the color preferred. In the dictionary section, on the other hand, the space between the lines is insufficiently used in the transitions to other letters. The titles of the mathematics textbook are designed to attract the attention of students. The text organizers of the Turkish Textbook were used functionally. Keser (2004) and Şahin (2012) corroborated with these findings.

In the findings obtained regarding the suitability of the content design of the textbooks with the visual design principles, we found that the visual design principles were not sufficiently addressed in both textbooks. The first pages of each unit of the mathematics textbook, the dialogues and icons of Emre and Ezgi in the "let's remember" section partially ensured unity and continuity in the design of the textbook. In the content design of the mathematics textbook, some images were too small but some were large. This resulted in the loss of unity principle. Visual hierarchy is not often considered in the mathematics textbook. Due care has not been taken to design the two-pages spread design in general. Unity and continuity between the drawings could not be achieved in the Turkish textbook. In this textbook, due care was not given to the design of the two-spread pages in general, and the principle of emphasis was not addressed. Keser (2004), similarly, concluded that such principles as unity, simplicity, emphasis, balance and two-pages spread were not addressed in textbooks. Şahin (2014) also lends support to findings of us, noting that visual design principles are mostly ignored. Based on these, we can note that in content designs, it would be better to prepare visual design applications professionally together with a visual design expert.

When the findings regarding the suitability of the visual elements used in the content design of the textbooks are examined, most of the visuals for the two books are generally designed to support the verbal text and learning. In addition, the colors used in the images are vivid and bright in accordance with the level of the student. There are studies in the literature that do not

overlap with this finding. For example, İşcan and Karadağ (2021) found that the level of pictures in narrative and informative texts that allowed students to guess the text was below the medium level. Keser (2004) also concluded that visual elements do not contribute to convey the message. In the studies conducted by İşcan and Karadağ (2021), Cımbız (2017), and Baş and İnan Yıldız (2014), it was found that the colors used in the paintings were highly vivid and striking. In the research conducted by Cımbız (2017), it was found that the visuals in the textbook were partially sufficient for the students to predict the content of the text. On the other hand, Baş and İnan Yıldız (2015) concluded that the pictures used in the textbook were designed in such a way as to allow students to guess the majority of the text. In another study supporting the findings of this research, it was concluded that the pictures used in the Turkish textbook were sufficient in terms of predicting the text and improving the guessing skills of the students (Baş & İnan Yıldız, 2014). In the Turkish and Mathematics textbook, it was found that the dimensions of the visuals were not used effectively and appropriately. Similarly, according to the research conducted by Şahin (2014), the dimensions of the visuals in the textbook were used very little effectively. There is no visual contrary to national culture in the Mathematics and Turkish textbooks examined in this study. On the other hand, there are no original drawings in either book. Images used in the book are taken from www.shutterstock.com and www.dreamstime.com. For this reason, technical consistency and unity could not be achieved in the drawings.

Conclusion

In conclusion, typeface, legibility and function of text organizers in Grade Three Primary Mathematics and Turkish Textbooks were found to be suitable with the level of the students. The visual images used in the textbooks reflect cultural values and mostly support the verbal text and learning. However, the size of the Mathematics textbook is not satisfactory in terms of the level of students. Visual design principles were not addressed in the textbooks. The effectiveness of the size of the images used in the textbooks is low. No original drawings were found in the textbooks.

Limitations and Recommendations for Future Research

This study has been subjected to some limitations, as well. First, this study is intented to examine primary level textbooks. Future researchers can delve into different levels of textbooks so that comparisons can be made. No study was found in the literature examined within the scope of this study on originality in textbooks and technical unity in drawings. Therefore, future inquiries can be made to fill this gap in the literature. Another limitations in this study is that this current research is about Grade Three Primary Mathematics and Turkish Textbooks. Future research can be performed to examine different courses at different grade levels. Some recommendations to practitioners can be made as follows: Publishing houses that prepare educational textbooks and the Ministry of National Education Publications, the visual evaluation criteria prepared by the Board of Education and Discipline should take into account the findings of the research in a more rigorous manner. Visual criteria should be evaluated more rigorously in the visual examination of textbooks. In this regard, it may be beneficial to give the necessary training to the commissions that prepare the textbooks. The content design of the textbooks should be supported by original drawings. For this, an archive can be created by working with national and international illustrators. The visuals used in the textbooks should be designed in a way that does not restrict the creativity of the students.

Acknowledgment

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