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Analysis of Gender Fairness of Primary School Mathematics Textbooks in Turkey

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ABSTRACT

This study aimed to analyse whether primary school mathematics textbooks in Turkey (grades 1 to 4) are fair concerning gender. The study analysed four mathematics textbooks approved by the Ministry of National Education and published for use in the 2019-2020 school year. These books were examined in terms of the ratio of the appearances of women and men, the activities performed by each gender, the professional and family roles assigned to these individuals, and who (children/adults) and where (outdoors/indoors) people were. In addition, famous people and characters mentioned in the books were investigated regarding their genders. Firstly, content analysis was used to determine the frequencies of the categories; then a chi-square test was performed to determine whether there are significant differences in these categories regarding genders. The findings reveal some evidence of equality, including a balanced proportion of females/males appearing, and the presentation of girls and boys in all categories. However, gender inequality is still persistent in terms of the adults' activities, occupational and parental roles, locations in which they are presented and people with whom they are shown. The results show that the textbooks contribute to the reproduction of gender stereotypes by presenting images of adults shaped by a sexist view.

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Keywords:

Gender equality, gender stereotypes, mathematics textbooks

1. Introduction

Gender equality is becoming an increasingly important issue in education, as in other disciplines. Education is one of the most powerful tools for achieving gender equality, through preparing students, regardless of their gender, to be equally productive and empowered citizens. For that reason, it must be free of gender stereotypes, bias and discrimination (Bursuc, 2013). However, education is characterised by extensive gender inequalities. The most striking problem is access to education. According to a report by UNESCO (2020), there were approximately 59 million children of primary school age worldwide who were not in school in 2018. Of these, three-quarters were girls. Women still account for almost two-thirds of all illiterate adults – 515 million women lack basic reading skills. Of 86 countries monitoring gender parity in education, almost a third have not achieved equal numbers of girls and boys in primary school. Nevertheless, there has also been global progress in gender parity. The gender parity index in primary and secondary education has risen from about 90 girls enrolled for every 100 boys in 1995 to an equal number of girls and boys in 2018.

However, it is difficult to think that education systems are close to achieving gender equality unless multi-layered and multidimensional discrimination is removed from education. Therefore, the gender inequality problem in education cannot be explained just by looking at the increase in girls' schooling (Sayılan, 2012). The relationship between education and gender involves more than quantitative inequality (Tan, 2008).

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Suppose one of the factors creating gender inequality in education is the problem of access. In that case, another is how and to what extent those who can benefit from that education (Sayılan, 2012).

The education system in many countries reproduces gender inequality through biased teacher expectations, teaching and learning processes, and curricula and teaching materials, and these have strong impacts on students (Bursuc, 2013; Leach, 2003). Teachers' gendered beliefs that boys are superior to girls, that boys perform better, or that women/girls should not resist male authority, cause girls to fail to reveal their best potential, and restrict their aspirations for further educational studies. Additionally, gender inequality in a teaching-learning environment reproduces a situation in which girls are discouraged from speaking, boys absorb a disproportionate amount of the teachers' energy and physical conditions do not support equal access to education (Aikman & Unterhalter, 2007). Students also learn gendered beliefs through the formal curriculum (Ballantine, Hammack & Stuber, 2017), affecting their development and their future academic and career choices (Lee, 2018). In this regard, teaching materials such as textbooks contribute to reproducing gender stereotypes by presenting dominant patterns of gender relations and gendered behaviours (Blakemore, Berenbaum & Liben, 2009), and students will carry these into their adult life (Leach, 2003). Gendered messages in textbooks have received a great deal of attention in many countries (Blumberg, 2008). Eventhough, across the globe, numerous studies reveal gender inequality in textbooks, the contents of textbooks still continue to reproduce gender stereotypes (Ballantine, Hammack & Stuber, 2017).

In Turkey, equality of opportunity in education, which refers to access to schooling, learning and other experiences within schools, is guaranteed by legal and constitutional legislation: the Principles of Turkish National Education state that 'Education institutions are open for everyone, regardless of their language, race, gender, disability and religion. No privileges can be granted in education to any person, family, group or class' (Basic Law of National Education, 1973). Unfortunately, gender equality is yet to be achieved in the Turkish education system. First, official data proves that there is gender inequality in the schooling rate. Each year, the Turkish Statistical Institute presents the student sex ratio, which indicates the relative size of the female schooling ratio compared to the male gross schooling ratio in a specific educational year and level of education. This student sex ratio, for the 2018-2019 academic year, shows that gender equality was not achieved. Except in lower secondary school where the ratio was 101.9, there is generally differentiation in favour of boys. In addition to quantitative inequality, promoting a masculine culture in the school environment (Sayılan & Özkazanç, 2009), teachers with gendered behaviours and attitudes (Esen, 2015; Nurlu, 2018; Sayılan, 2012), the formal and hidden curriculum (Eren Deniz, 2014; Tan, 2005) and also textbooks (Artemur Çimen & Bayhan, 2018; Esen, 2007; Gümüšoğlu, 2008; Kalaycı & Hayrsever, 2014; Kaya, 2003; Kırbasoğlu Kılıç & Eyüp, 2011; Kuşçu, 2014; Sayılan, 2012) all contribute to the reproduction of gender inequality in the Turkish education system.

Textbooks have a special place in the Turkish education system, because they are the main source of knowledge (Altun, 2013), and are offered without charge by the government. Besides, they are the most frequently used materials in classrooms (Kılıç & Seven, 2007). Therefore, textbooks also play a critical role in presenting gender stereotypes by internalising a patriarchal ideology (Esen, 2007).

Previous textbook studies conducted in Turkey have demonstrated that textbooks convey very strong messages about what it means to be a woman or a man. The presentations of gender in textbooks are problematic in two ways: There is a lack of balance in the representation of the genders, and stereotyped portrayals of males and females are reproduced. Even though it has been reviewed constantly over the years, the underrepresentation of females in textbooks still continues. Gender bias in the representation of characters exists in favour of males (Can, 2009; Çubukçu & Sivashgil, 2007; Kırbasoğlu Kılıç & Eyüp, 2011; Özkan, 2013). On the other hand, gender stereotypes are reproduced in textbooks by the presentation of activities, locations and occupations that seem to be appropriate for a specific gender. Women are predominantly portrayed cooking (Çelik, Aydoğan Yenmez & Gökçe, 2019; Demirel, 2010; Vatandaş, 2011), cleaning (Esen Sevege, 1998; Sarıtaş & Şahin, 2018; Vatandaş, 2011), caring for children (Asan, 2006; Kasa & Şahan, 2016; Sarıtaş & Şahin, 2018; Topal, 2012; Vatandaş, 2011), and doing housework (Kasa & Şahan, 2016; Vatandaş, 2011). However, men are presented as heads of the family and are not seen dealing with domestic activities (Esen Sevege, 1998; Vatandaş, 2011). Most textbooks do not display women outside the home, but they show men in public areas and generally in workplaces (Esen & Bağlı, 2002; Helvacıoğlu, 1996; Kırbasoğlu Kılıç & Eyüp, 2011; Özkan, 2013; Vatandaş, 2011; Yıldız, 2013). Besides, occupations in textbooks are gender biased and also stereotyped.

The underrepresentation of females in work activities indicates the gender biased nature of the textbooks (Çubukçu & Sivasslıgil, 2007; Kırbasoğlu Kılıç & Eyüp, 2011; Kösel, 2009; Yıldız, 2013). Further, males are portrayed in a variety of occupations (Demir & Yavuz, 2017; Kasa & Şahan, 2016; Kükrer & Kıbrıs, 2017), especially physically demanding (Topal, 2012) and mechanised ones (Yorgancı, 2008), while females are displayed in a limited range of occupations such as those of a teacher or a nurse (Sarıtış & Şahin, 2018; Yorgancı, 2008).

In Turkey, studies related to gender equality in textbooks have mostly been focused on social subjects (Can, 2009; Çubukçu & Sivasslıgil, 2007; Demir & Yavuz, 2017; Demirel, 2010; Sarıtış & Şahin, 2018; Yıldız, 2013), especially Turkish (Esen & Bağlı, 2002; Kasa & Şahan, 2016; Kırbasoğlu Kılıç & Eyüp, 2011; Kükrer & Kıbrıs, 2017; Yaylı & Kitiş Çınar, 2014; Yeşil, 2014), but very little research has been conducted on mathematics textbooks (Çelik, Aydoğan Yenmez & Gökçe, 2019; İncikabı & Ulusoy, 2019; Özdemir & Karaboğa, 2019). The view that mathematical knowledge is culture free and purely rational (Tang, Chen & Zhang, 2010) may be one of the reasons for the low interest in gender equality issues in mathematics textbooks. Nevertheless, the sociology of knowledge asserts that 'knowledge' cannot be regarded just as knowledge, since it is also shaped by social practices (Tang, Chen & Zhang, 2010) such as gender stereotypes. Indeed, all scientific knowledge fields are gendered (Özkazanç, 2010), as well as mathematics. Many people accept that mathematical thought and female nature are incompatible (Koblitz, 2002, p. 93). The effects of the stereotype that men are better at mathematics on academic skills have been revealed by researchers (Brown & Josephs, 1999; Schmader, 2002; Schmader, Johns & Barquissau, 2004; Spencer, Steele & Quinn, 1999). Research shows that these gender stereotypes are transferred from one generation to another in culture through the media (Kalaycı, 2015), children's books (Taylor, 2003), language (Wigboldus, Semin & Spears, 2000), parents (Eccles & Jacobs, 1986), and teachers (Esen, 2013; Keller, 2001). Also, textbooks for teaching mathematics play a significant role in reinforcing and reproducing this stereotype by displaying traditional gender role allocations (Özdemir & Karaboğa, 2019; Moser & Hannover, 2014; Tang, Chen & Zhang, 2010). For this reason, it was thought to be important to analyse mathematics textbooks to see, how gender is portrayed first, and then consider this and seek solutions for eliminating gender inequality and stereotypes.

The main goal of this study was to investigate the portrayals of gender in the texts of primary school mathematics textbooks in Turkey. The following research questions were addressed in this study to assess whether these books are fair concerning gender:

- What are the frequencies of the appearances of female and male characters in mathematics textbooks?
- How are female and male characters in mathematics textbooks portrayed in carrying out activities, parental roles and occupations?
- What is the composition of groups or pairs of female and male characters in mathematics textbooks?
- What are the locations (indoors/outdoors) of female and male characters in mathematics textbooks?
- What are the frequencies of the appearance of famous people and characters of different genders in mathematics textbooks?

2. Methodology

2.1. Research Model

This study was designed as a basic qualitative research study. Textbooks as documents constituted the main data sources. As is explained in detail in the following sections, basic content analysis was used to analyse these documents by establishing basic descriptive categories and preliminary codes for coding.

"Basic content analysis is largely deductive in form. The researcher's area of interest and preliminary codes are typically developed prior to data collection and analysis drawing on existing theoretical and empirical work. This approach also allows data collection and data reduction using computer software algorithms. Data analysis in basic content analysis is generally quantitative and centers on the use of descriptive statistics" (Driscoll & Maschi, 2016, pp. 21-22).

2.2. Research Sample

The sample for the study was compiled as follows. The textbooks selected for the purpose of the study were approved by the Ministry of National Education and published for use in the 2019-2020 school year in Turkey. A total of four out of the eight mathematics books for the different grades of primary education were randomly selected. The mathematics books MHG Publication (Kayhan Atalay, Özyıldırım Gümüş, Yaman, Özer & Şengil Akar, 2018) (first grade), Ministry of National Education Textbook (Apladı, Canbaz Kırıkcıoğlu & Cerit, 2019) (second grade), Ministry of National Education Textbook (Genç, Güleç, Şahin & Taşcı, 2019) (third grade), and Ata Publication (Özçelik, 2018) (fourth grade) were investigated to see whether they were gender fair.

2.3. Data Analysis

In this study, content analysis and chi-square tests were used. Firstly, content analysis was applied to summarise the data in frequencies tables. During content analysis, texts were read several times, and coding units were identified. While determining the codes for the texts (all the questions, explanations, exercises and solutions), the classification used by Piatek-Jimenez, Madison and Przybyla-Kuchek (2014) and Moser and Hannover (2014) was adopted. The pictures surrounding the text were used to clarify of the characters if to minimise the number of unknown codes. Then, by grouping codes, categories were generated. Finally, a chi-square test was performed to explore if the differences in categories are significant regarding genders. The categories used for analysing the texts are presented in Table 1 below.

Table 1. *Categories Used in Analysis of Data*

Textual Codes
1 Frequencies of genders
2 Activities of genders
3 Parental roles
4 Occupations of genders
5 Composition of groups and dyads by gender
6 Locations of genders (indoors/outdoors)
7 Famous people or characters

A sample of the analysis for each code is given below.

2.3.1. Frequencies of Genders

Each name in the text was coded as that of a girl, a boy, a woman, or a man. If the name was unisex and there was no picture related to the text, it was coded as undefinable and was not included in the study. The use of a first name with 'Hanım' (addressing a woman, as in Miss/Mrs) or 'Bey' (like Mr.) was interpreted to indicate an adult. In addition, adults were described with kinship terms such as mother, aunt, father, or uncle. On the other hand, the use of only a first name was regarded as indicating a child. Moreover, when necessary, the pictures were used to decide on the characters. There was a focus on clothing (e.g. school uniform or suit) and physical characteristics (e.g. height, beard) to classify characters in pictures as children or adults. Examples are given below:

Sample analysis:

Let's determine the length of the line that Özgür draws on the paper. (4th grade, p. 11)

This was coded as a boy, because Özgür (a male name) was used alone.

Sample analysis:

According to the election of class representatives, Deniz became a class representative by getting more votes than the other candidates. (4th grade, p. 160)

Deniz is a unisex name. Therefore, the name was coded as undefinable.

Sample analysis:

Zeliha Hanım collected 1240 Turkish Liras. (4th grade, p. 41)

Zeliha (a female name) was used with Hanım. Therefore, the case was coded as a woman.

Sample analysis:

A watermelon seller has 67 watermelons. The seller sold 9 watermelons to the first customer. The seller sold 14 watermelons to the second customer. How many watermelons remain? (2nd grade, p. 99)

It was impossible to judge the gender of the seller from the text. Therefore, the case was evaluated with the picture next to the text (see Figure 1 below).



Figure 1. *Watermelon Seller*

Given the picture, the case was coded as a man.

2.3.2. Activities of genders

The activities that the characters were engaged in were coded as leisure context (e.g. social responsibility activities, having a picnic or carrying out cultural activities such as reading), school context (e.g. doing a project, doing homework, studying), daily life (e.g. eating, sleeping, shopping), and working life (e.g. teaching, working on a construction project, harvesting). Here also, when necessary, pictures were used to determine the genders of the characters. Some examples of the 'activities of genders' code are presented below:

Sample analysis:

Cemil has 25 kuruş (Turkish currency). He wants to buy a pastry which is sold for 50 kuruş from the canteen. Is the money Cemil has enough to buy a pastry? (2nd grade, p. 213)

As seen from the text, there was no expression for an adult after the character's name, and Cemil is a male name. He was in a shopping story. Therefore, the case was coded as 'a boy in a daily life context'.

Sample analysis:

Fisher Huseyin sold 25 kg anchovies, 18 kg sardines and 13 kg seabasses in the bazaar. How many kg fish did the fisher sell in total? (2nd grade, p. 257)

As presented in the text, the character was a male and an adult. He was selling fish. Therefore, the case was coded as 'a man in an occupational activity'.

Sample analysis:

Competitors are warming up before the marathon. (1st grade, p. 153)

It was difficult to determine the genders of the characters from the text. Therefore, the case was evaluated with the picture above it (see Figure 2 below).



Figure 2. *Racers*

There were four boys and one girl warming up, and the case was coded as 'a girl in a leisure time activity' and four instances of 'a boy in a leisure time activity' considering the picture.

2.3.3. Parental Roles

It was not necessary to prepare a default list for coding the parental roles. The roles of mother, father, grandmother and grandfather were directly incorporated into the coding system. Some examples of the 'parental role codes' are set out below:

Sample analysis:

How many tomatoes did Grandmother Sevcan peel? (1st grade, p. 75)

As seen from the text, the character was directly indicated by a kinship term, so the case was coded as 'a grandmother'.

Sample analysis:

My father buys 2 loaves of bread every day. Find how many loaves he buys in a week. (2nd grade, p. 168)

As understood from the text, the character was given directly as a father, and therefore the case was coded as 'a father'.

2.3.4. Occupations of Genders

Occupations of genders were also directly coded from the text. Moreover, when it was necessary, the pictures were used to determine the characters' genders. Some example analyses are set out:

Sample analysis:

Tailor Rahime sews 3 dresses in a week. Let's find how many dresses she will sew in a month. (2nd grade, p. 205)

The text shows that the character was a tailor and Rahime is a female name, so the case was coded as 'a woman tailor'.

Sample analysis:

Uncle post worker brings 6 letters to Cemile and 5 letters to Ayberk. How many letters does he bring in total? (1st grade, p. 122)

As is shown in the text, the character was a post carrier and described with a kinship term, uncle, and therefore the case was coded as 'a man post carrier'.

Sample analysis:

A simit seller sold 43 simits in the morning, 25 simits in the afternoon. Find how many simits the seller sold during the day (2nd grade, p. 82)

It was not possible to determine the seller's gender from the text. However, the gender of the character was clear in the picture next to it (see Figure 3 below).



Figure 3. Simit seller

Given the picture, the case was coded as 'a male seller'.

2.3.5. Composition of groups and pairs by gender

The composition of groups and pairs by gender was analysed by two codes. A person was a part of either a group (same-gender adult group, same-gender children group, same-gender adult and children group, mixed-gender adult group, mixed-gender children group, mixed-gender adult and children group) or a pair (an adult and an adult of the same gender, an adult and a child of the same gender, a child and a child of the same gender, an adult and a child of opposite genders, an adult and an adult of opposite genders, a child and a child of opposite genders). Some examples are presented below:

Sample analysis:

Doğa [a female name] was born on 14th November, Saturday. Eliz [a female name] was born one day after Doğa, Beren [a female name] was born one day before Doğa. Let's find Eliz and Beren's birthdays. (1st grade, p. 177)

As seen from the text, there were three female names and there was no expression to show that any of them were adults. Therefore, the case was coded as 'a same gender children group'.

Sample analysis:

Grandfather Lütfü and Grandmother Sevcan join a coach tour. (1st grade, p. 89)

From the kinship terms in the text, it is understood that there were two adults, and that one of them was female and the other one was male. Therefore, the case was coded as 'mixed gender, an adult and an adult'.

2.3.6. Locations of Genders

Locations of genders were analysed to determine whether the characters were presented indoors or outdoors. Examples of the analysis are given below:

Sample analysis:

There are 57 story books and 36 novels in Zeynep's bookcase (3rd grade, p. 78)

A female was pictured looking for a book in her bookcase (see Figure 4 below) and there was no expression after her name to show she was an adult. Therefore, the case was coded as 'a girl indoors'.



Figure 4. Location of Zeynep

Sample analysis:

Little brother Kerem and his big brother went to the bazaar. (3rd grade, p. 168)

Kerem (a male name) and his brother go out shopping, and therefore the case was coded as 'a boy outdoors'.

2.3.7. Famous People and Characters

The genders of famous people and characters were analysed. Examples of the analysis are given below:

Sample analysis:

Karagöz and Hacivat [traditional Turkish shadow play characters], starting at 14.15 and ending at 15.25, lasts ... minutes. (3rd grade, p. 180).



Figure 5. *Karagöz and Hacivat*

As is known and can be seen from the Picture below the question (see Figure 5 above), Karagöz and Hacivat are male characters. Therefore, the case was coded as two instances of 'male character'.

Sample analysis:

We prepared puzzles about mass balancing for you. While preparing the puzzles, we were inspired by the balancing principle that the Greek scientist Archimedes put forward. (3rd grade, p. 200).

It is known that Archimedes is a famous male scientist. Therefore, the case was coded as 'a famous male person'.

2.4. Reliability

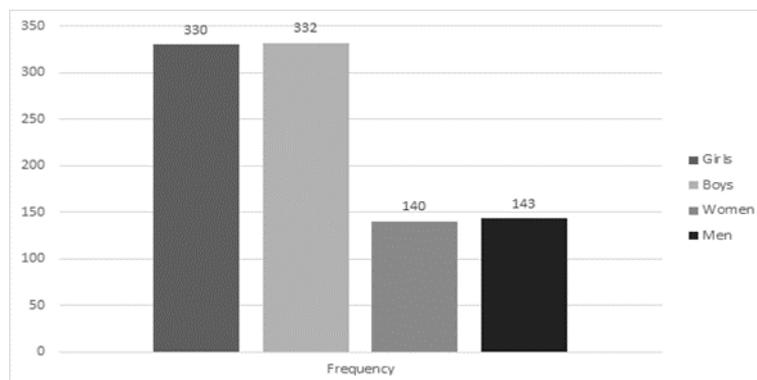
Parallel to the coding system, a manual was prepared with explanations for each code. The analyses were conducted with the MAXQDA 20 program. Two colleagues coded independently. The coders first analysed the text. When there was no gender indication, but the picture had an indication, the picture surrounding the text was used. Inter-coder reliability was computed for the 3rd-grade mathematics book, which was selected randomly. Miles and Hubermann's (1994) formula was used to assess agreement between the two coders. Inter-coder reliability for the study was calculated as 73%. According to Miles and Huberman (1994), anything above 70% for reliability is acceptable. Therefore, the results obtained from the analysis were considered to be reliable.

3. Findings

This section shows the study results using descriptive statistics and graphs to show the number of cases and whether gender equality was present. The chi-square test was used to examine the presence of significant differences between females and males.

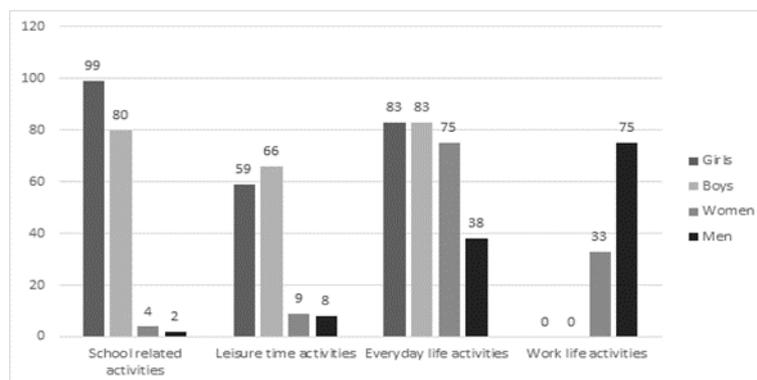
3.1. Frequencies of Genders

In the primary school mathematics textbooks, 945 characters were coded in total. For two of them, it could not be decided whether the character was male or female. As shown in Graph 1 below, there were a total of 283 adults (140 women, 143 men) and 662 children (330 girls, 332 boys). Even though children are depicted much more often than adults, it can be seen that none of the comparisons for girls/boys ($\chi^2=0.00$, $df=1$) and women/men ($\chi^2=0.03$, $df=1$) revealed a significant dominance of either gender group.



Graph 1. Frequencies of Genders

3.2. Activities of Genders 708 activities were coded in total in the primary school mathematics books. 464 activities were coded for children (235 for girls, 229 for boys), and 244 activities were coded for adults (121 for women, 123 for men).



Graph 2. Activities of Genders

As shown in Graph 2, girls were shown most often in school-related activities, then in daily life activities and then in leisure time activities. Boys were presented most commonly in daily life activities, then in school-related activities and then in leisure time activities. Statistical analysis shows that none of these activities has reliable differences in frequencies between the genders. The frequencies of the five most frequent activities that girls and boys were shown engaged in were compared (mathematical, cultural, sports, food-related and shopping activities). Most of these activities do not show remarkable differences in frequencies between genders, but a significant difference is found between the genders for sports activities. The boys do more sports activities than the girls ($\chi^2=5.48$, $df=1$, $p<0.05$).

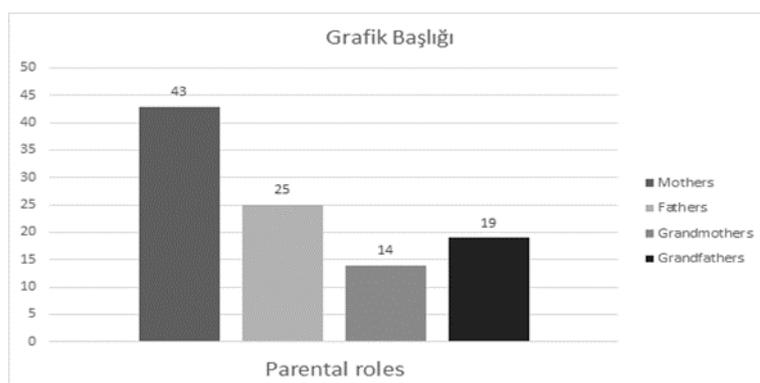
As seen from Graph 2 above, women were most commonly presented in daily life activities, then in work life activities, then leisure time activities and lastly school-related activities. Men were depicted most commonly in work life activities, then in daily life activities, then leisure time activities and lastly school-related activities. The frequencies of the daily life activities ($\chi^2=12.11$, $df=1$, $p<0.05$) and work life activities ($\chi^2=16.33$, $df=1$, $p<0.05$) differ reliably between the genders. While women were shown less often in work life activities than men, they were mostly presented performing daily life activities. The frequencies between the women and the men for the five most frequent activities shown in the primary school mathematics textbooks (kitchen-related activities, shopping activities, dealing with children activities, construction work activities, and selling activities) were compared. There were notable gender differences in most comparisons. First, a significant difference was found for kitchen-related activities ($\chi^2=9.78$, $df=1$, $p=0.05$). Even though statistical analysis cannot be performed for the activities of dealing with children (women 14, men 0) or performing construction work (women 0, men 12), the gap between the genders is quite clear. The women were more often engaged in kitchen-related activities and dealing with children than the men, and the men pursued construction work activities more often than the women. Nevertheless, neither shopping nor selling activities show reliable differences in frequencies between the genders.

To summarise, reliable gender differences were observed for daily life activities and work life activities concerning the frequencies with which the women and the men engaged in them. In addition, considering the

differences in the most frequent activities for each gender, it can be seen that the women were more often engaged in kitchen-related activities and dealing with children than the men, and that the men pursued construction work activities more than the women. On the other hand, no gender difference was observed in activities with respect to girls and boys. However, a significant difference is found in one of the most frequent activities, sports activities. It was observed that boys are more often presented taking part in sports activities than girls.

3.3. Parental Roles

101 people filling parental roles were found in the primary school mathematics textbooks. Graph 3 below presents the significant dominance of mothers (43) compared to fathers (25) ($\chi^2=4.76$, $df=$, $p<0.05$), whereas no reliable difference was found for the frequencies of grandmother (14) and grandfather (19) ($\chi^2=0.75$, $df=1$).



Graph 3. Parental Roles

To summarise, the dominance of mothers compared to fathers can be clearly seen, but balanced numbers of grandmothers and grandfathers were found.

3.4. Occupations of Genders

In the primary school mathematics textbooks, no occupational roles were determined for the children, but 106 individuals playing occupational roles were coded for adults. As Graph 4 (below) shows, men were represented significantly more often in jobs than women ($\chi^2=9.66$, $df=1$, $p<0.05$). Additionally, a larger variety of occupations was found men (36) than women (21). This difference is also significant ($\chi^2=3.94$, $df=1$, $p<0.05$).

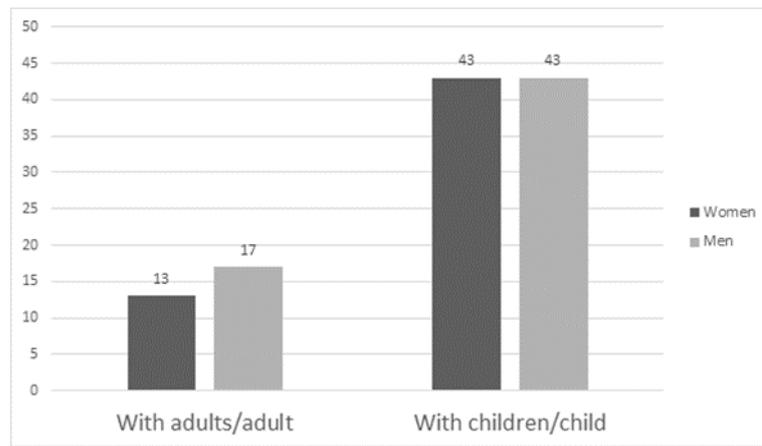


Graph 4. Frequencies and Variations of Ccupations

To sum up, men were more often presented at work than women, and men's occupations were more diverse than women's.

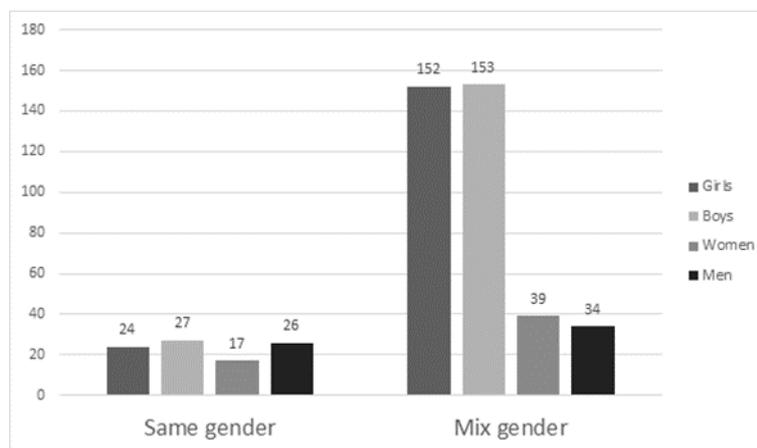
3.5. Composition of Groups and Pairs by Gender

The study examined the genders among groups and pairs in the primary school mathematics textbooks. As shown in Graph 5 below, women and men were shown equally with children or a child, but men were more often depicted with adults than women; however, this difference was not significant ($\chi^2=0.53$, $df=1$).



Graph 5. Composition of Adult/Children Groups

To explore whether the characters were presented with people of the same/opposite gender, the gender compositions of groups and pairs were examined. Graph 6 belows shows that characters were mostly depicted in mixed-gender groups/pairs in the primary school mathematics textbooks. Girls, boys and women were significantly more often shown in mixed-gender compositions than in same-gender groups (girls; $\chi^2=93.09$, $df=1$, $p<0.05$; boys $\chi^2=88.20$, $df=1$, $p<0.05$; women $\chi^2=8.64$, $df=1$, $p<0.05$). Similarly, men were presented more often in mixed-gender than in same-gender compositions, but this difference was not found to be significant ($\chi^2=1.06$, $df=1$).

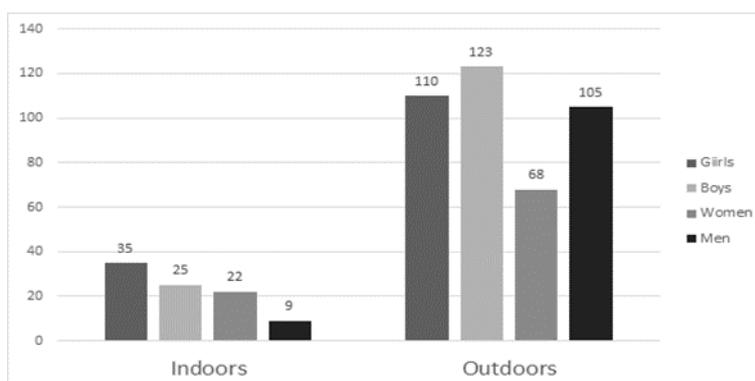


Graph 6. Composition of Groups

To sum up, the analyses revealed that adults were equally commonly depicted with children; however, even though there is no significant difference here between women and men, men were shown with adults more often than women. Moreover, children and adults were mostly presented in mixed-gender groups/pairs. These differences were reliable for girls, boys and women, but not for men.

3.6. Locations of Gender

To test whether the genders were systematically related to the locations in which the characters were presented, the study examined whether the characters were performing their activities indoors or outdoors. 543 locations were coded in total, but 43 of these could not be defined. 500 locations were analysed for indoor/outdoor information. As seen in Garph 7 below, the characters were significantly more often shown outdoors than indoors (girls; $\chi^2=38.79$, $df=1$, $p<0.05$; boys $\chi^2=68.89$, $df=1$, $p<0.05$; women $\chi^2=23.51$, $df=1$, $p<0.05$; men $\chi^2=80.84$, $df=1$). Additionally, comparisons regarding genders were analysed to discover whether there was a significant difference between the locations of different characters. While women were more often presented indoors than men ($\chi^2=5.45$, $df=1$, $p<0.05$), and men were more often depicted outdoors than women ($\chi^2=7.91$, $df=1$, $p<0.05$), that kind of difference was not found for girls and boys (indoor $\chi^2=.166$, $df=1$; outdoors $\chi^2=0.72$, $df=1$)).



Graph 7. Locations of Genders

To sum up, the child and adult characters were all significantly more often depicted outdoors. Their gender did not affect whether they were shown in an indoor or an outdoor location for the children. However, the analyses revealed a significant difference in how the genders of adults related to the locations. The results show that women were depicted indoors significantly more often than men, and men were depicted outdoors significantly more often than women.

3.7. Famous People and Characters

Six famous people and characters were found in the primary school textbooks, and all were male. Three of them were famous people: the founder of the Turkish Republic, Gazi Mustafa Kemal Atatürk; a scientist, Archimedes; and an architect, Mimar Sinan. The others were traditional Turkish characters. Two of these were the shadow play characters, Hacivat and Karagöz, and the other was a joke character, Nasreddin Hodja.

4. Conclusion and Discussion

Numerous studies have attempted to examine gender representations in textbooks from the early period of the Turkish Republic until today. Common conclusions from these investigations have been the predominance of males, and traditional role allocations for occupations and activities (Esen, 2007). Although there was some movement towards more gender fairness at the beginning of the present century, textbooks in Turkey continue to reproduce gender roles unhealthily (Gümüüşođlu, 2008). The present study aimed to investigate gender fairness in the primary school mathematics textbooks that currently in use in Turkey, examine the frequencies with which female and male characters are presented, and study their activities and the professional and parental roles in which they are engaged. Furthermore, the study investigated where and with whom female and male persons were depicted. The genders of famous people and characters in the textbooks were also examined.

In contrast to the results asserted by many researchers (Bursuc, 2013; Can, 2009; Çubukçu & Sivaslıgil, 2007; Gouviás & Alexopoulos, 2018; Kırbasıođlu Kılıç & Eyüp, 2011; Moser & Hannover, 2014; Özkan, 2013; Tang, Chen & Zhang, 2010; Ullah, Ali & Naz, 2014), this study found a balanced representation of males and females. In the mathematics textbooks, children were depicted more often than adults, girls were shown as frequently as boys, and adults were equally likely to be presented as female or male. As Porreca (1984) states, the implicit message of fewer females appearing in textbooks is that females are not sufficiently important to be included. In this regard, it is possible to consider the textbooks to be gender fair. However, to ensure gender equality in textbooks, there is more to be done beyond presenting a balanced representation of males and females, because the content may be biased in various ways.

The detailed analysis of the activities revealed that the indication of the girls' and the boys' activities did not restrict them to the traditional gender stereotypes. The only exception was for sports activities. In conformity with the stereotype, boys were portrayed more often than girls in sports activities. Also, in parallel to earlier studies (Asan, 2006; Bursuc, 2013; Çelik, Aydođan Yenmez & Gökçe, 2019; Demirel, 2010; Esen Sevrge, 1998; Kasa & Şahan, 2016; Saritaş & Şahin, 2018; Vatandaş, 2011; Yasin, Hamid, Othman, Abu Bakar, Hashim & Mothi, 2012; Yıldız, 2013), the activities of the women and men depicted in the textbooks were stereotypically gendered. It was observed that in the textbooks, activities were allocated in a traditional way, with women

engaged in child care and kitchen-related activities and men doing construction work that required physical strength.

Earlier textbook research has demonstrated that males stereotypically occupy a wider range of social and professional roles and women are portrayed mainly in domestic and nurturing roles (Bursuc, 2013; Çelik, Aydoğan Yenmez & Gökçe, 2019; Çubukçu & Sivaslıgil, 2007; Demir & Yavuz, 2017; Gouvias & Alexopoulos, 2018; Kasa & Şahan, 2016; Kırbaşoğlu Kılıç & Eyüp, 2011; Köseleler, 2009; Kükrer & Kıbrıs, 2017; Moser & Hannover, 2014; Yaylı & Kitiş Çınar, 2014; Sarıtaş & Şahin, 2018; Yasin et al., 2012; Yıldız, 2013). In this study, the analysis of the adults' occupational and parental roles gave similar results to the earlier research. Men were presented at work and performing different jobs more often than women, while many more women than men were depicted in a parental role in the textbooks. A woman is still pictured in textbooks playing the family role of the nurturer at home, to support the man who is the breadwinner. When it comes to the public sphere, women assume caregiving roles such as nurses or teachers. However, the presentation of an equal prominence for women and men in professional settings and a variety of occupations in textbooks may encourage girls to plan a full range of career options (Yasin et al., 2012), which must be the main purpose of education.

Previous textbook research has rarely investigated how males and females are presented with other people. The few who have done so only looked at whether adults were shown in interactions with children or adults (Esen & Bağlı, 2002; Esen Sevrge, 1998). Unlike earlier studies, this study found equal numbers of women and men being shown with children. However, even though this difference was not significant, women appeared with adults less frequently than men, which is very similar to what was found in earlier studies. Again, this can be considered a reflection of the stereotypical role of the woman as a caregiver for children. It is also not surprising that if men are mostly portrayed in business life then they are less often shown interacting with children. Going beyond the earlier textbook studies conducted in Turkey, the study aimed to find out whether adults and children were shown in same-gender or mixed-gender groups/pairs. As in the earlier research, the study found that adults and children all appeared more often in mixed-gender than in same-gender groups/pairs (Bursuc, 2013).

The detailed analysis of locations did not yield any indication of gender bias in terms of being depicted in an outdoor or an indoor location. Like earlier research, all characters were more often shown outdoors (Moser & Hannover, 2014). However, when the frequencies of women and men in outdoor/indoor locations were compared, it was seen that, while women were presented indoors significantly more often than men, men were presented outdoors significantly more often than women. In line with many studies, the stereotypical location of a woman is still at home, and this reveals a deep-rooted belief that pushes women to the edge of social life, almost subordinating them (Özdemir, 2018; Esen & Bağlı, 2002; Sarıtaş & Şahin, 2018; Yasin et al., 2012; Yıldız, 2013).

The design of the study also compared the frequencies with which characters and famous people of different genders were shown. As found in earlier research (Gouvias & Alexopoulos, 2018; Yıldız, 2013), male persons and characters were shown more often than female ones. Although textbooks can take advantage of the opportunity to expose students to female role models, according to the study by Piatek-Jimenez, Madison and Przybyla-Kuchek (2014), which is very similar to the present study, it is difficult to say that textbooks are utilising this opportunity.

Considered as a whole, the findings of the study prove the existence of a relatively egalitarian discourse in mathematics textbooks. The proportions of females and males were equal compared to previous studies, such as the study by Kırbaşoğlu Kılıç and Eyüp (2011) (who reported that only 36.3% of all characters presented in textbooks were female). Also, no gender differences in the activities, compositions, and locations for children were found.

However, imbalances regarding men and women engaging in work life and daily life activities and occupational and parental roles were seen in the mathematics textbooks. Raising children and performing kitchen-related activities were shown to be tasks mostly done by women, while occupational activities were mostly related to men. It is possible to say that this imbalance is in parallel with real-life gender differences. Therefore, it could be argued that textbooks, which fulfil the socialisation function by presenting socially accepted norms in an explicit or implicit way (Esen & Bağlı, 2002), naturally reflect this reality. According to the kernel of truth theory, gender stereotypes have some empirical validity, but stereotypes do not simply

reflect real-life differences: they exaggerate them (Basow, 1992). Describing a woman as a mere 'mother and wife', and a man as 'working outside', provides a very limited framework for girls' and boys' educational and professional ideals and options (Tan, 1979). As Lee (2018) states, these stereotypes shown in textbooks imply that males are superior to and stronger and more powerful than females in society. Girls who see women in textbooks only as mothers or wives or in low-income and unskilled jobs cannot find a motivational model to study hard and plan for a career (Leach, 2003).

In fact, since there are limited examples of women working in a profession, girls do not have the opportunity to see what education can bring in terms of their future (Hablemitoğlu, 2004). Therefore, textbooks should contribute to the individual development of children by offering as wide a range of models and activities as possible, rather than limiting the possibilities (Esen & Bağlı, 2002). Hence, it would be desirable that future textbooks not only include socially accepted norms and the reality of life, nor exaggerate these, but also provide children with more egalitarian and democratic structures by, for example, presenting more female models in work life and, conversely, more males in parental roles and kitchen-related activities.

Additionally, it should be noted that this study is limited to investigate gender issues in primary school mathematics textbooks in 2019-2020. Thus, it is needed to conduct some research beyond this. For instance, in the future (5 years, 10 years and 20 years later), this study can be repeated by considering the textbooks of that year in order to see whether the gendered elements in the textbooks and the proportions of these elements have changed. It can be determined if there is a social change in sexism and if this change is included in the textbooks. Other educational materials such as crammer books, and bulletin boards can also be investigated regarding gender stereotypes. Besides, it is known that as age groups increase, gender stereotypes become more clear. Textbooks can also be examined in higher grades as they may affect this result.

5. References

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