

GENDER AND SCIENCE: MEN AND WOMEN IN GREEK GYMNASIUM SCIENCE TEXTBOOKS

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Although the gender gap in science related occupations has been considerably reduced during the last 40 years, women still seem to be underrepresented in areas such as physics and technology. Several reasons have been suggested to explain the lack of interest of female students for science classes such as (a) the formation of sex-segregated groups of students especially in early school years, (b) parental attitudes and behaviour and (c) textbooks. Focusing on the latter, it has been argued that the way gender is portrayed in science textbooks may contribute to the sex role socialization of students; gender bias in science textbooks may influence the development of a view that science is a subject addressed more to boys than girls. This article focuses on the frequency of appearance of men/women and male scientists/female scientists in the illustrations of science textbooks of the Greek Gymnasium (students aged 12-15 years old). The analysis of 7 science textbooks shows that men and male scientists appear more frequently than women and female scientists respectively in the illustrations of physics, biology and chemistry textbooks. Relevant limitations and possible implications are discussed.

Keywords: Gender Issues, Curriculum, Science Education

INTRODUCTION

Although the gender gap in science related occupation has been considerably reduced during the last 40 years – for example, the number of women employed in science fields in US has increased significantly between 1980 and 2000 (Ceci & Williams, 2007) (Jones et al., 2000) – women still seem to be underrepresented in areas such as physics and technology (Frome et al., 2006) (Wang & Degol, 2017). Several strategies have been suggested in order to achieve a greater participation of women in science and technology (Brotman & Moore, 2008) (Scantlebury & Baker, 2007); however, it seems that girls generally start to lose interest in science at the age of 9-14, and few women choose to follow a relevant career (Vincent-Ruz & Schunn, 2017).

Several reasons have been suggested to explain the lack of interest of female students for science classes. Adamson et al. (1998) suggest that gender differences towards science are already evident in early school years and they claim that sex-segregated groups of students in elementary school contribute ‘to the divergence of boys’ and girls’ approach to science by maintaining sex-stereotypic values and attitudes, including the masculine image of science’ (Adamson et al., 1998, p. 855). Parental attitudes and behaviour seem also to influence children’s attitudes towards science. Investigating children’s and their parents’ attitudes towards science, Andre et al., (1999) report that the parents participated rated boys’ science skills higher than girls’ and they claimed science to be more important to theirs sons than their daughters. In another study, Crowley et al. (2016) report that when visiting a science museum, parents explained the exhibits to their sons three times more often than their daughters. Since this

difference was evident even when children were as young as 1 year old, the authors note that parents may contribute to creating sex-specific attitudes towards science learning.

Moreover, it seems that textbooks largely influence the gender differences observed in classroom when it comes to science learning. Textbooks are a source of social and cultural information on the ideas and attitudes that prevail within a society (Gouvias & Alexopoulos, 2018; Regueiro, 2000). The way gender is portrayed in science textbooks is believed to contribute to the sex role socialization of students; gender bias in science textbooks may influence the development of a view that science is a subject addressed more to boys than girls (Elgar, 2004). Researching English and Caribbean science textbooks, Whiteley (1996) argues that men appearing more frequent than women in textbooks' illustrations can lead to small numbers of girls choosing to follow studies in physics. Similar conclusions are reached by Elgar (2004), who report a gender imbalance in text and illustrations of textbooks of Brunei in favour of men, Potter & Rosser (1992), who underline the higher frequency of males depicted in illustrations of American biology textbooks, and Bazler & Simonis (1991), who claim that, although there are changes towards gender fairness in illustrations of American chemistry textbooks in years, in most textbooks men still dominate.

Considering the above, we decided to investigate gender representation in science textbooks. In this article we focus on the illustration of the Gymnasium science textbooks and the research questions formulated are the following:

1. How many men and how many women appear in the illustrations of the Gymnasium science textbooks?
2. How many male and how many female scientists appear in the illustrations of the Gymnasium science textbooks?

METHODS

For this study, we investigated the 7 textbooks of physics, chemistry and biology used in Greek Gymnasium (students aged 12-15 years old) during the school year 2018-2019:

- Physics with experiments (Kalkanis et al., 2013)
- Physics for the 2nd grade of Gymnasium (Antoniou et al., 2013a)
- Physics for the 3rd grade of Gymnasium (Antoniou et al., 2013b)
- Chemistry for the 2nd grade of Gymnasium (Avramiotis et al., 2013)
- Chemistry for the 3rd grade of Gymnasium (Theodoropoulos et al., 2013)
- Biology for the 1st grade of Gymnasium (Mavrikaki et al., 2017a)
- Biology for the 2nd and 3rd grade of Gymnasium (Mavrikaki et al., 2017b)

Initially, all humans who appeared in illustrations were identified and counted according to the following rules:

- For a series of illustrations where the same humans appear more than once (e.g. a human's movement shown in a series of consecutive illustrations) the depicted humans are counted only once.
- When an illustration is repeated in a textbook (e.g. at the end of every section) the humans depicted are counted only once.
- Only humans who are at the forefront of each illustration are counted. Humans who are part of the background or a watermark are not taken into account.
- When only parts of a human body are depicted they are not taken into account.

The identification and counting of humans were made by the two authors independently. In the few cases where there was a disagreement (e.g. whether a depicted human was in the foreground or background of an illustration) the humans involved in the disagreement were not counted.

The two authors classified independently all humans as men, women, and unknown gender (e.g. abstract figures). In the few cases where there was a disagreement, the humans involved in the disagreement were classified as unknown gender.

Moreover, the two authors went independently once more through all the humans identified, as explained above, and counted all the male and female scientists whose name was mentioned in illustration's caption or the adjacent paragraphs. In the few cases where there was a disagreement, humans who were involved in the disagreement were not classified as male or female scientists.

RESULTS

In all textbooks, men depicted are more than women: the difference ranges from 87 men / 17 women (physics for the 2nd grade of Gymnasium) to 52 men / 43 women (biology for the 2nd and 3rd grade of Gymnasium). Overall, men account for 66% of the humans depicted, while the percentage of women is 26% (Figure 1).

With regard to the number of male and female scientists, the difference is even more profound: in a total of 49 scientists shown in illustrations of science textbooks investigated, there are only three female scientists. The biggest number of scientists appear in illustrations of the physics for the 3rd grade of Gymnasium textbook (24) while in two textbooks (physics for the 1st grade of Gymnasium, and biology for 1st grade of Gymnasium) there are no illustrations of named scientists at all (Figure 2).

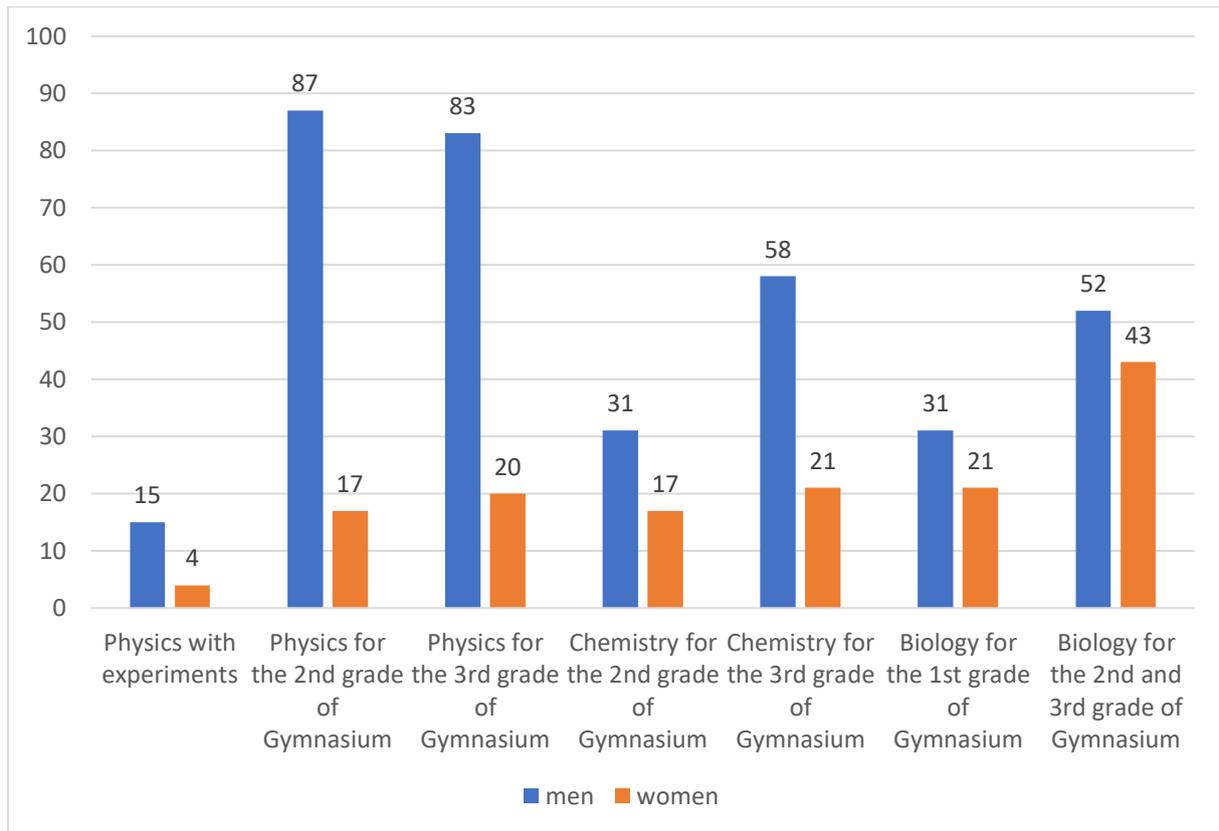


Figure 1. Frequency of men/women’s appearance in illustrations of Gymnasium science textbooks.

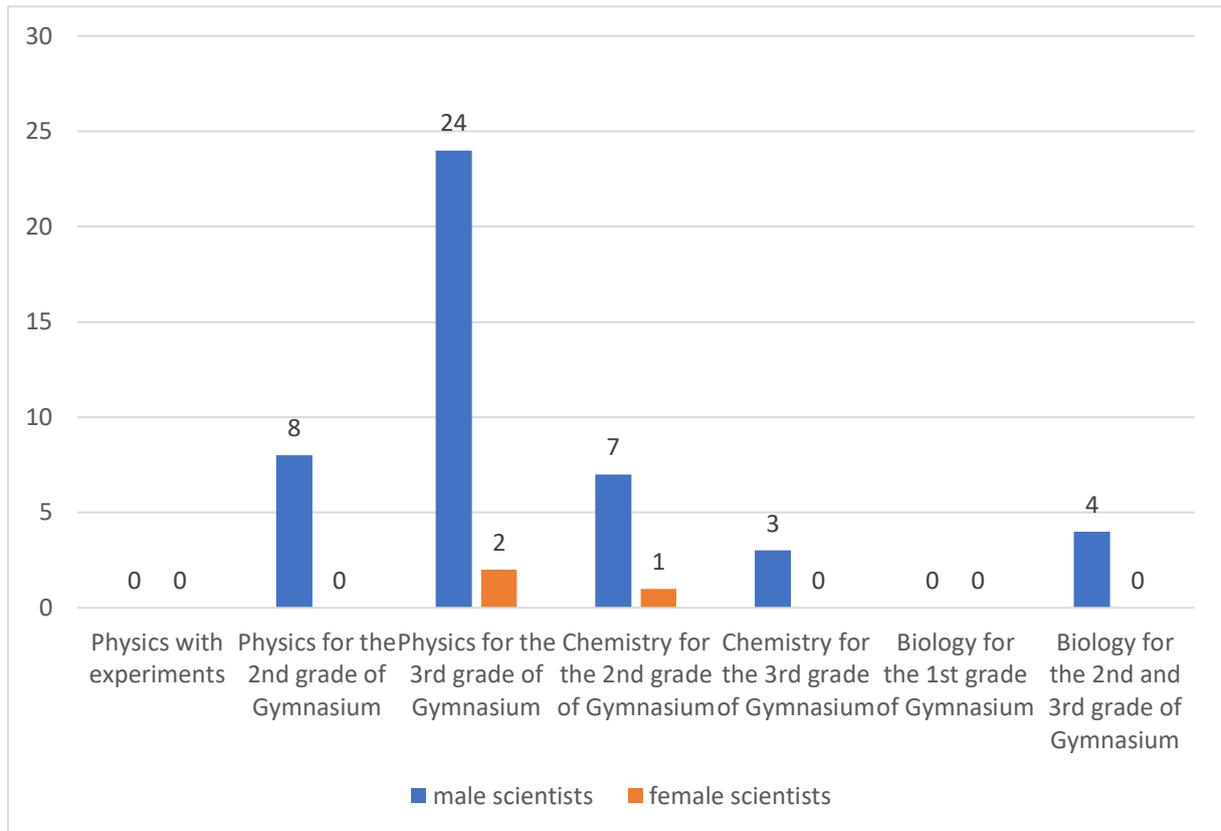


Figure 2. Frequency of male/female scientists' appearance in illustrations of Gymnasium science textbooks.

DISCUSSION

Men appear dominant in the illustrations of science textbooks used in the Greek Gymnasium. Whether appearing static (e.g. anatomy illustrations) or moving (e.g. a human throwing a ball), the human figures included in the illustrations are more likely to be men. A similar picture is formed concerning the proportion of male and female scientists. In a total of 49 scientists, only three illustrations depict female scientists, two of them depicting the same person (Marie Curie).

The dominance of male figures in science textbooks' illustrations may convey the message that males are the norm, the standard regarding science (Brickhouse et al., 2000). On the other hand, the dominance of male scientists in science textbooks' illustrations may convey the message that either the history of science has been written by men or only male scientists worth recognition (Potter & Rosser, 1992). A view that science is addressed more to boys than girls may lead female students to lose interest in science subjects and avoid a future career in science (Elgar, 2004).

Textbooks embody specific constructions of reality, which illuminate certain aspects of possible knowledge (Elgar, 2004; Gupta & Yin, 1990). However, we should acknowledge that their power to influence students' attitudes towards science comes with certain limitations. For instance, we should keep in mind that the way any written text is read depends on each reader's response to that text (Sunderland et al., 2000). Moreover, the way each learner responds to any given text included in a textbook may be related to the way that text is mediated by the teacher and peer students. Focusing on the role of teachers, Sunderland et al. (2000) note that teachers have three options when dealing with gender-biased texts: ignoring, subverting or endorsing the gendered messages.

Considering (a) the role of textbooks in shaping students attitudes towards science subjects, and (b) the under-representation of women and female scientists in the illustration of the Gymnasium science textbooks, we plan to extend our research by moving to the text of the same textbooks and investigating them in search of gendered messages. Finally, we argue it would be interesting to explore the reasons why, although male figures are in all cases more than female figures, the ratio of men to women differs considerably among the textbooks we explored for our research.

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