Gender stereotypes in Greek computer science school textbooks

Stamatios Papadakis

Department of Preschool Education,
Faculty of Education,
University of Crete,
Crete, Greece
Email: stpapadakis@gmail.com

Abstract: The formation of stereotypes and prejudices at an early age decisively contributes to gender discrimination, with a direct effect on accentuating inequalities between women and men throughout their entire life. As school textbooks are the main means of instruction, gender role portrayals in these teaching materials affect how learners think, feel, and behave regarding the two genders. The present study performs a qualitative study using content analysis to identify the elements of sexism and gender role stereotyping in a selected group of textbooks, which are used by teachers and students for computer science instruction in the three grades of general lyceum in Greece. Each textbook was carefully examined for the stereotypical presentation of gender roles of men and women. The findings show that the three textbooks, to a greater or lesser extent, perpetuate stereotyped prejudices regarding gender roles in relation to the new technologies.

Keywords: school textbooks; content analysis; general lyceum; gender roles; gender stereotypes.

Reference to this paper should be made as follows: Papadakis, S. (2018) 'Gender stereotypes in Greek computer science school textbooks', Int. J. Teaching and Case Studies, Vol. 9, No. 1, pp.48–71.

Biographical notes: Stamatios Papadakis is a graduate of the Economics and Business (AUEB) University, Athens, Greece, Department of Information. He received his MSc in Education from the University of the Aegean, Greece, and a PhD from the University of Crete, School of Education. He has been working for a series of years as an ICT teacher in public sector secondary education. He has published many articles in journals and has presented several papers in conferences. His research interests include ICT in education, mobile learning, novice programming environments and teaching of programming in primary and secondary education.

1 Introduction

The formation of stereotypes and prejudices at an early age decisively contributes to gender discrimination, with a direct effect on accentuating inequalities between women and men throughout their entire life (European Parliament, 2008; Good et al., 2010).
Females have been portrayed in a narrow and biased way for many years (Peterson and Lach, 1990; Gooden and Gooden, 2001). Education, as an essential factor for socialisation, should foster and contribute towards achieving equality between men and women. Therefore, it must set itself the aim, in all its activities, of eliminating inequalities between men and women. However, with a child's entry to school, the link between biological sex and the stereotypical attitudes and perceptions about the various social aspects of gender role is made through a series of hidden or overt pedagogical practices and approaches (Maragoudaki, 2007).

The role of school textbooks is recognised as a critical part of shaping gender identity and gender role in most individuals (Brugéilles and Cromer, 2009; Sovič and Hus, 2015). School textbooks, apart from being pedagogical tools (Gouvias and Alexopoulos, 2016), are tools through whose use society attempts directly or indirectly to preserve and transmit to future generations its social norms and collective values (Vitsilaki et al., 2001).

In the present study, we examine gender representation in the school textbooks which are used for the teaching of computer science, in the three grades of general lyceum, in Greece. The purpose was to find whether the two new school textbooks (for the first and second grade), which were introduced in the Greek educational system in the last two years and the third textbook, which is a newly republished version of an older book (for the third grade) incorporate a gender perspective or remain adhered to cultural stereotypes about gender roles contributing to the legalisation and/or the reproduction of gender asymmetry.

2 Education as a vehicle for gender equality

The theory and the research of the last decades have shown that the whole educational process acts decisively towards reproducing gender stereotypes and inequalities as it is traversed by the ideological construction of gender differences (Bigler et al., 2013; Vitsilaki et al., 2001). Gender stereotypes are often the basis of gender roles, the behaviours that society teaches that are ‘correct’ for boys and girls (Peterson and Lach, 1990; Gooden and Gooden, 2001).

In school, apart the ‘formal’ curriculum, there is another informal (possibly more powerful) one which is not taught but learned through informal forms of teaching (Burrow, 2005; Wolpe, 2006). This informal curriculum, or hidden curriculum or para-curriculum (Skelton, 1997; Kantartzí and Pliogkou, 2007), is largely responsible for the reproduction of gender stereotypes and the maintenance of social order and stability. Additionally, some feminist research studies have used reproduction and resistance theories to focus specifically on women’s experience in and throughout schooling. They have proved that although schools claim to support educational equality, the norms, values, expectations and practices of schools reinforce gender stereotypes and constitute a hidden curriculum (Skelton, 1997).

One of the dimensions of the hidden curriculum is the content of school textbooks. Stereotypes concerning the two genders are inscribed in the curriculum and become clear inside the school textbooks (Michel, 1986; Gouvias and Alexopoulos, 2016). A textbook – usually consisting of text and/or illustrations – reviews, structures, and renders the state
of knowledge in a given subject for a given age group accessible in order to lay the foundations for standard learning and a shared culture. It thusly transmits a society’s cultural capital to its youngest citizens at a moment (Brugeilles and Cromer, 2009). Many criticisms have been made about the textbooks’ content as it has been found that, to some extent, they reproduce preconceptions on gender (Kogkidou, 2007; Nikolopoulou, 2009; Tressou, 2007). Ironically, although textbooks are considered vehicles for learning, they may hinder success in half of the student population (Good et al., 2010; Gooden and Gooden, 2001). The language in books can be used to encourage or eliminate stereotypes (Gooden and Gooden, 2001). It is argued that learners often view textbooks as authoritative and the content they present is likely to be absorbed and assimilated by learners without comment (Lee, 2016).

The school textbook is a basic socio-political tool in the hands of parents, teachers, educators, etc., (Vitsilaki et al., 2011). School textbooks are one of the key concepts of the dominant ideology and an extremely efficient means of transmitting gender role attitudes and perceptions to students. The reason is that textbooks are one of the main teaching materials which are used in the context of teaching practices. Textbooks have been indicted for perpetuating gender stereotypes through the images and language they use. Women are not only underrepresented in the text but also in images (Good et al., 2010). According to UNESCO, discriminatory attitudes towards girls and women are manifested in the following ways: compared with boys and men, women are mentioned less often in texts and appear less frequently in illustrations, and the roles assigned to them are more restricted and less varied (Michel, 1986). The literature suggests that gender schemas influence a variety of cognitive processes, including comprehension, recall of material, clustering of learned concepts, and implications and inferences drawn from the material (Peterson and Lach, 1990). Consequently, both males and females suffer because of gender stereotypes. Students’ choices of what they want to become or do are limited by stereotypes. As the distinct gender gap in the achievement scores in Math and Science between male and female students does not emerge until high school, this has lead researchers to conclude that these differences in ability and preference between male and female students are not gender differences caused by genetic, chemical, or biological factors, but by gender role. Gender differences are learned through socialisation (Good et al., 2010). Gender bias prevents individuals from exploring the activities and interests that are best suited to their personality and abilities (Margolis and Fisher, 2003; Sunstein, 2005; Momsen, 2008; Gooden and Gooden, 2001).

The school textbook constitutes a building block of pedagogies and practices for learning building (Terner, 2014) and especially in countries like Greece its role becomes even more important for two reasons:

a The academic research on the language and other non-language codes used in the public-school textbooks has documented that there has been widespread discrimination against the female gender in the past decades (Gouvias and Alexopoulos, 2016).

b In general lyceum there is only one textbook per subject, per grade for every schoolchild (Kogkidou, 2007) so it is very easy for the textbook to operate as a transmitter of social rules and standards regarding behaviour and gender roles.
3 The teaching of information technology and the gender perspective in the Greek educational system

Schools have a duty to offer their pupils with an education which will enable them to adapt to an increasingly globalised, competitive, diversified and complex environment, in which creativity, the ability to innovate, a sense of initiative, entrepreneurship and a commitment to continued learning are just as important as the specific knowledge of a given subject (Official Journal of the European Union, 2008). For instance, Wang (2017, p.26) of Google highlights in the results of a recent research study (August 2017) that "regardless of race/ethnicity or gender, 80% of students who have learned CS said that they learned CS in a class at school, about twice the rate of any other means of learning, including on their own, through after school clubs, online, or in any other program outside of school". This data strongly suggests formal education is still the best way to ensure widespread and equitable access to CS learning (Wang, 2017). In this respect, new technologies play a key role in finding new job opportunities for young people especially in the IT industry. It is estimated, that in the western world the demand for IT jobs is expected to rise over the next five years (Talent, 2015; US Bureau of Labor Statistics, 2013). In the European Union, the demand for highly skilled people between 2011 and 2020 is projected to rise by over 16 million jobs (European Commission, 2011).

However, there is an internationally recognised under-representation of women in sectors related to IT, both in academia and STEM-related industries (Hill et al., 2010; Barnard et al., 2012; Tacsir et al., 2014). In the case of Greece, the research results are similar (Berdousis and Kordaki, 2016a; Kordaki and Berdousis, 2015).

Society will no doubt have a key part to play in influencing the image of women being projected regarding computer science, with the prevailing view that careers in information and communications technology (ICT) are restricted to men (Berdousis and Kordaki, 2013). Although school has an essential role to play in promoting inclusive societies and strengthening social cohesion by ensuring high-quality education for all pupils in accordance with the principle of equity (Bigler et al., 2013), in the subject of computer science there are serious indications to the contrary. In Greece, since the insertion of information technology as a secondary school subject since the early 1990s, and, until now, new technologies are an area in which it is particularly evident there are certain gender differences. Girls are falling further behind boys in access and familiarity with ICT, influencing both performances at school and study and career choices (Collins et al., 2000; Koukourikou, 2008). Many are the factors that have been assessed as exemplary of gender inequalities in relation to IT. In general, however, the interpretations of gender inequalities in the IT sector are related to the content as well as the way of using and teaching IT in education at different levels and the dynamic relations between schoolgirls and teachers (Vitsilaki et al., 2001). However, it should be noted, that various case studies in Greece have shown that girls show no differences compared to boys in their school performance in programming (Orfanakis et al., 2016; Orfanakis and Papadakis, 2016; Papadakis and Orfanakis, 2017; Papadakis et al., 2014, 2016) and ICT activities (Kalogiannakis and Papadakis, 2017a; Papadakis, 2016, 2017; Papadakis and Kalogiannakis, 2017) when they treated equally by their teachers. Studies in female pre-service kindergarten teachers in higher education also showed the same results (Kalogiannakis and Papadakis, 2017b, 2017c).
In Greece, the study of gender representation in teaching materials, especially in primary education has already been subjected to scientific evaluation for more than two decades (Hamilakis, 2002; Meselidis, 2009). However, while during the period 2006–2008 a systematic research was conducted among the largest Greek universities aimed at better promoting gender equality and refocusing actions for women’s empowerment in the educational process (Maragoudaki, 2007; Terner, 2014), the research field on gendered representations in IT textbooks is quite limited as there are only four documented studies.

Koukourikou (2008) analysed the computer science textbook for the lower secondary school (gymnasium). The results of the study were disappointing due to the fact that, as pointed out by the researcher themselves, “sexist speech pervades the book from beginning to end, especially in texts, examples, and questions at the end of each chapter, in summary, in self-assessment exercises, in activities and discussion issues at the end of each section” (p.4). In general, the textbook examples and structure give the impression that the book is especially for schoolboys and it should be taught only by male teachers. Secondly, the perception that only men have knowledge of new technologies and are able to use them is transmitted. The second research study was carried out by the University of Ioannina in 2007, within which the school textbooks of the science direction (Mathematics, Physics, Chemistry, and Biology) of lyceum were analysed from the gender perspective. The conclusions from the analysis of those textbooks as well as the school textbook entitled IT Applications – Computers which was addressed to the students of the first, second and third class was that “school textbooks and educational supporting materials are strengthening and perpetuating socially constructed perceptions, opinions and expectations about gender roles. The world described in the text and the pictures of the school textbooks develops different expectations to which both genders are expected to respond. School textbooks pass on in every way the message that science is a clearly male area” [Tressou, (2007), p.45]. The third research was that of Georgiadou and Kekeris (2009). The two researchers examined the way in which both genders were presented in nine secondary education computer science school textbooks as well as in four computer science textbooks of individual publishing houses in Greece. Also, they examined a textbook which was used for an in-service teacher training program in ICT. The researchers concluded that the authors of the book did not avoid gender-segregation and discrimination in the IT sector and, as a result, women appear to fall short of men in the use of new technologies.

The most recent research was that of Berdousis and Kordaki (2016b), which investigated the gender representations in two new computer science school textbooks for the second and third grade of the technical/vocational lyceum. The researchers following a content analysis concluded that, overall, in both school textbooks the stereotyped representations in favour of schoolboys are dominant. However, the researchers conclude on a more optimistic note, arguing that it seems that there has been an attempt for a more gender-neutral approach in the two textbooks, with regard to the past, in accordance with a liberal feminist approach.

4 The present study

The aim of this study which took place in the school-year 2015–2016 was to compare how women and men were represented in three school textbooks which are used to teach
computer science in the three grades of the general Lyceum. The study is regarded as important because two of the school textbooks (for the first and second grade) are very new (as they were published in 2014) so it is important to see the progress made for integrating the gender perspective in their content compared to a 15-year-old text book (third grade).

5 Method

The detection of gender stereotypes in teaching materials is not always easy, because stereotypes are, quite often, covert. A successful way, which is used internationally to identify sexism and gender bias in teaching materials, is through an examination of sexism in language, illustrations and texts (Tressou, 2007; Kantartzzi and Pliogkou, 2007; Kogkidou, 2007). More concretely:

- in the language: the use of sexist language is researched
- in the illustration: the gender asymmetry in the illustration of the cover page, and the inside pages is researched
- in the text: the gender asymmetry in the content of text is researched.

Content analysis was used as the research method (Cohen et al., 2013). In view of the above categorisation the content analysis performed was based on the axes that are depicted in Figure 1.

Figure 1 A framework of categories, to guide IT school textbooks content analyses (see online version for colours)

In the following subsections, due to the limited size of this paper, just some of the examples those aware of gender stereotypes male and female readers can easily identify are listed (Tressou, 2007). More common stereotype examples of the A and B class school textbooks are given in Annexes A and B. The school textbooks that were analysed were:

- First grade: Panselinas et al. (2014)
- Second grade: Doukakis et al. (2014)
5.1 School textbook writing teams

The writing teams (20 persons) were composed almost entirely of men, 90% (18 people) while women were particularly underrepresented, at just 10% (two people). Respectively, on juries, the rates were the same as above, as to the number of people involved, nine were men (82%) and only two were women (18%). In two out of three books, the proofreading had been undertaken by a woman which was the exact opposite of the artistic editing. The analysis results showed a gender inequality in creating the three school textbooks (Table 1). However, as pointed out by the Tressou (2007), we cannot affirm that the equal participation of women and men in the various committees would result in the publication of gender-neutral books.

Table 1  School textbooks writing teams data

<table>
<thead>
<tr>
<th>Grade</th>
<th>Number of writers</th>
<th>Evaluators</th>
<th>Proofreading</th>
<th>Artistic editing</th>
<th>Introduction year</th>
<th>Subject type**</th>
</tr>
</thead>
<tbody>
<tr>
<td>1st grade</td>
<td>Number 8</td>
<td>Number 3</td>
<td>Number 1</td>
<td>Number 1</td>
<td>2014–2015</td>
<td>Selection</td>
</tr>
<tr>
<td>*M – 7, F – 1</td>
<td>M – 3, F – 0</td>
<td>1 M – 0, F – 0</td>
<td>1 M – 0, F – 1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2nd grade</td>
<td>Number 5</td>
<td>Number 3</td>
<td>Number 1</td>
<td>Number 1</td>
<td>2014–2015</td>
<td>General education</td>
</tr>
<tr>
<td>M – 5, F – 0</td>
<td>M – 2, F – 1</td>
<td>M – 0, F – 1</td>
<td>M – 1, F – 0</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3rd grade</td>
<td>Number 7</td>
<td>Number 5</td>
<td>Number 1</td>
<td>Number 1</td>
<td>1998–1999</td>
<td>Orientation group</td>
</tr>
<tr>
<td>M – 6, F – 1</td>
<td>M – 4, F – 1</td>
<td>Private company</td>
<td>M – 1, F – 0</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Notes: * M: male, F: female. **In the Greek educational system, the students of general lyceum are taught subjects of general education as well as one subject of free choice. In 2nd and 3rd grade students are also taught subjects from orientation groups.

5.2 Linguistic sexism

Linguistic sexism refers to the use of words, phrases, or expressions in such a way that they present an unbalanced portrayal of women and men, which includes trivialising, diminishing, or excluding either gender, usually females (Lee, 2016).

5.2.1 Use of masculine form to denote both genders

Gender inequality can also be revealed through the structure and lexicon of a language. The masculine gender is often used in the three school textbooks to denote people of both genders. The Greek language, contrary to the English language, is not a gender-neutral language as it has three genders: masculine, feminine and neuter. Greek verbs have six endings (three persons, two numbers) and personal pronouns are rarely used, thus ensuring gender neutrality when needed. Difficulties arise with nouns denoting professions. Those ending in -ος are identical for men and women, but those ending in -ας or -ης are masculine with the corresponding feminine in -ρια. Some nouns denoting professions have no feminine form at all. In such cases, the masculine forms are used for women as well using feminine articles (Wikipedia, 2016).
In the first-grade school textbook, 104 references of the masculine gender were recorded. Typical examples are: “pupils will thus be able to” instead of the gender neutral “male and female pupils will thus be able to” (p.9), “the author reserves all rights” instead of the gender neutral “the man/woman author reserves all rights” (p.26). The page number of the gender-based reference in the original Greek text is quoted in brackets. An exception throughout the book is a unique reference for both genders, in which the female student is addressed first “Dear schoolgirl/dear schoolboy” (p.4).

In the second-grade school textbook, the results are identical as 44 reports of the masculine gender were recorded. Typical examples are: “If there are students with different backgrounds in your classroom” instead of the gender neutral “If there are male or female students with different backgrounds in your classroom” (p.81). However, five (positive) references which addressed both of genders were also recorded such as “seeks to develop the analytic and synthetic thinking of schoolboys and schoolgirls” (p.5), “organise data and information related to your class or your school (how many male and female students, how many classes)” (p.86).

In the third-grade school textbook, 29 references of the masculine gender were recorded. Typical examples are: “algorithm: allowed as an exercise for a student” instead of the gender neutral “algorithm: allowed as an exercise for schoolboys and schoolgirls” (p.57). There were no recorded gender-neutral references. The percentage of gender-neutral and not gender-neutral references in the three school textbooks are shown in Figure 2

**Figure 2** Percentage of gender-neutral and not gender-neutral references in the three textbooks
(see online version for colours)

In the three school textbooks, the exclusive use of the masculine form to declare rank or profession that could also be exercised by a man and woman implies and/or forms the view that men normally only hold these positions. Typical examples in the first-grade school textbook are: “the programmers based on” instead of the gender-neutral “the male and female programmers based on” (p.49), “that a computer programmer uses” instead of the gender-neutral “that a male and female computer programmer uses” (p.50), “implications for the worker” instead of the gender-neutral “implications for the male and female worker” (p.122).
Similarly, the second and third-grade school textbooks use only the masculine form in profession references. In the second-grade textbook, there are references such as: “addressed only to programmers and the user” instead of the gender-neutral “addressed only to male and female programmers and the male and female user” (p.57), “regarding the profession of programmer” instead of the gender-neutral “regarding the profession of female and male programmer”. Respectively in the third-grade textbook there are examples such as “developed for the programmer” instead of the gender-neutral “developed in order for the female and male programmer” (p.116) and “the knowledge and preferences of the programmer” instead of the gender-neutral “the knowledge and the preferences of the male and female programmer” (p.123).

Finally, it is important to emphasise that, in their prefaces, the three school textbooks are addressed only to male students. Examples for the first-grade textbook are: “information note for the student” instead of the gender-neutral “information note for the schoolboy and schoolgirl” (p.4), “students should be able to” instead of the gender-neutral “schoolboys and schoolgirls should be able to” (p.9), “the purpose of the chapter is that students” instead of the gender-neutral “the purpose of the chapter is that male and female student” (p.21). Examples in the second and third grade books are: “ask your classmate what he believes” instead of the gender-neutral “ask your female or male classmate what they believe” (p.13) and “this book is addressed to the students of the third grade (preface)” instead of the gender-neutral “this book is addressed to the female and male students of the third grade (preface)”, (p.8).

5.2.2 The use of masculine words

One form of linguistic sexism is the male-as-norm ideology, which makes women invisible or makes them feel excluded (Lee, 2016). The word user, child, boy, adolescent, person, is used most often to imply the male gender than the human species. Indicative examples from the first-grade school textbook are “cyber-bullying refers to intimidation, threats, humiliation or harassment of children and adolescents” (p.43), “to attract the interest of teenagers-pupils whom it concerns” (p.59), “today any person who is over 13 years old may become a member” (p.127). In the second and third grade school textbooks, there is only one gender biased reference: “the programming languages have been developed for the purpose of human communication (programmer) with the machine” (p.55) (second grade) and “in a waiting list, the first person who comes is the first served” (p.61) (third grade).

5.3 Illustration

The use of images – cartoons in school textbooks often reproduces activities under the scope of gender-specific stereotypes (Michel, 1986; Peterson and Lach, 1990; Gooden and Gooden, 2001; Good et al., 2010). Proponents of social learning theory argue that regular exposure to these biased gendered images will reinforce the perpetuation of gender stereotyping and hinder learners’ personal development (Lee, 2016).

Gender asymmetry was detected in the illustrations of the three school textbooks as there is a serious imbalance between women and men depicted in their contents. Indicatively, in the first-grade textbook 23 images-cartoons were recorded. Of these 23 images-cartoons, 16 depict men or male characters. Of the remaining images-cartoons, it is considered that only one image-cartoon does not reproduce activities under the scope
of gender-specific stereotypes as a woman is depicted engaged in robotic surgery (image 3.18, page 36). In contrast, there were four images detected which reproduce activities under the scope of gender-specific stereotypes (image 2.6 page 25, image 3.7 page 30, image 3.8 page 31, image 14.3 page 122). For example, images 3.7 (page 29) and 3.8 (page 30) show a woman using her mobile phone or a touch screen as a digital consumer and not as a digital producer. This example is a clear depiction of the distortion of the two genders role in the IT sector (Figure 3).

Figure 3  A wrong example of the female gender role in the IT sector (see online version for colours)

It is worth mentioning that important female persons in the IT sector are not mentioned in this textbook. In the second-grade school textbook, 16 images with persons from the IT sector were found, of which only two present women, Ada Lovelace (image 2.27, page 58) and Grace Hopper (image 2.28, page 59). An image depicting a boy (biased presentation) is repeated nine times as it is associated with the section of pre-questions at the beginning of each chapter (pages 7, 9, 13, 19, 55, 77, 83, 87, 93). In the third-grade school textbook although the authors used 14 images in the form of an asexual blue creature, an attentive reader can distinguish male characteristics in the illustration.

5.4  A reference to the female informatics teacher

The common under representation of women in texts and in visual images compared to men suggests that females are less important or less worthy of mention (Lee, 2016). Especially impressive is the fact that the female Informatics teacher is absent from the content of the three school textbooks. In the first-grade school textbook, eight references urging students to turn to the informatics teacher for help and advice were found, which were dominated by the male gender as if there is no woman Informatics teacher in Greek schools. According to this book, the teaching of Informatics should be the exclusive concern of men (Figure 4). The following are some of the example references: “with the guidance of your (male) teacher” instead of the gender-neutral “with the guidance of your male and female teacher” (p.12), “find, with the help of your (male) teacher” instead of the gender-neutral “find, with the help of your female and male teacher” (p.15), “consult your (male) teacher” instead of the gender-neutral “consult your female and male teacher” (p.66), “with the help of your (male) teacher create” instead of the gender-neutral “with the help of your male and female teacher create” (p.87), “create,
with the help of your (male) teacher” instead of the gender-neutral “create, with the help of your female and male teacher” (p.107). In the second and third-grade school textbooks, there is no mention of an informatic teacher, regardless of gender.

Figure 4 The teaching of informatics is an exclusive concern of men according the first-grade school textbook (see online version for colours)

5.5 Professions

Science textbooks display sexism not only by featuring boys more often in illustrations and texts, but also in their very marked encouragement to boys to take up science subjects, and their exclusion of girls from these (Michel, 1986). In all school textbooks, the number of occupational activities in which men appear is much greater than the number of women (Figure 5). In the first-grade textbook 16 occupational references which stress the male gender were recorded. Typical examples are “this category is usually aimed at professionals such as photographers, graphic designers, people who work in the field of television and cinema” instead of the gender-neutral “this category is usually aimed at female and male professionals such as photographers, graphic designers, men and women who work in the field of television and cinema” (p.24), “professional programmers use for the design of” instead of the gender-neutral “professional female and male programmers use for the design of” (p.52) etc. There is also a female occupational reference but it could be perceived as negative as it does not present a profession which makes use of new technologies but a stereotypical female role such as the profession of dressmaker: “traditional occupations from home such as ‘delivery of work under contract’ (dressmaking work at home for piece work) are not tele-working because they do not make use of technology” (p.121). In the second-grade school textbook, the six occupational references make exclusive use of the male gender. Typical examples are: “have an open discussion in the classroom concerning the occupation of programmer” instead of the gender-neutral “have an open discussion in the classroom concerning the occupation of female and male programmer” (p.74), “addressed only to developers and the user is unable” instead of the gender-neutral “addressed only to
female and male developers and the male and female user is unable” (p.57), “the programming languages developed for the purpose of human communication (programmer) with the machine (computer)” instead of the gender-neutral “the programming languages developed for the purpose of human communication (female and male programmer) with the machine (computer)”, (p.55). In the third-grade school textbook, the two occupational references that were detected were exclusively concerning men: “helps the programmer” instead of the gender-neutral “helps the female and male programmer” (p.170) and “the experienced programmer, but for the beginner” instead of the gender-neutral “the experienced female and male programmer, but for the male and female beginner” (p.184).

Figure 5  Number of occupational female and male activities in the three school textbooks (see online version for colours)

![Figure 5](image)

5.6 Famous persons

In a gender-biased school textbook, there is a glorification of the male gender, as the frequency of reference to various ‘famous men’ is much greater compared to ‘famous women’. As a result, men tend to operate as ‘role models’ for school children in their quest for future careers in most social fields (Gouvias and Alexopoulos, 2016).

The three school textbooks discriminate against women in their ‘famous persons’ references (Figure 6). In the first-grade school textbook, the 12 references to famous persons (in the form of text or images) related to the faces of famous men such as Richard Matthew Stallman (page 26), Stephen William Hawking (page 40), Marc Prensky (page 41) etc. In the second-grade school textbook of the 15 images, only two depict women as famous persons, specifically Augusta Ada King (better known as ‘Ada Lovelace’) (page 58) and Grace Brewster Murray Hopper (page 58), while all 23 written references concerned men exclusively. In the third-grade school textbook, the five written references are related to various ‘famous men’.
5.7 Stereotypical characteristics – gender roles

In school, textbooks strengthen and perpetuate socially constructed perceptions, opinions, and expectations about gender roles. Looking through the first-grade textbook it is found that the person who acts will only be a man. Furthermore, as already stated above, the references to women’s occupations are clearly stereotypical: “dressmaker work at home for piece work” and this directly conflicts with the reference of modern professions in the same sentence “it is not tele-working, because they do not use technology” (p.121). In the second and third-grade school textbooks although there are no direct references, a set of concepts or thoughts regarding the association of the male gender with the IT sector is easily detected.

6 Commentary on criteria-based content analysis

Undoubtedly, the results of the content analysis of the three school textbooks are disappointing given that, to a lesser or greater extent, they reproduce stereotypes about the role of gender on new technologies. However, it is surprising that the textbook that replicates the gender stereotypes to a lesser extent seems to be that which is addressed to third-grade students. It is a surprise since it is a textbook, which was written 20 years ago, when the studies and research in relation to gender had not yet flourished in Greece. That is why it can be surprising that the two newest books which were published just three years ago reproduce the gender stereotypes to such an extensive degree. Finally, an informal quantitative comparison of the stereotypical references which resulted from the textbooks’ content analysis seems to classify the first-grade textbook in the first position of the reproduction of gender inequality on new technologies.

In Table 2 the quantitative data for the three school textbooks confirming their sexist content is listed respectively.
Table 2  Number of sexist references in the three school textbooks

<table>
<thead>
<tr>
<th>Grade</th>
<th>Gender use</th>
<th>Word use</th>
<th>Woman IT teacher reference</th>
<th>Illustration</th>
<th>Famous persons</th>
<th>Professions</th>
</tr>
</thead>
<tbody>
<tr>
<td>3rd grade</td>
<td>SR: 29, NSR: 0</td>
<td>SR: 1, NSR: 0</td>
<td>SR: 0, NSR: 0</td>
<td>SR: 14, NSR: 0</td>
<td>SR: 5, NSR: 0</td>
<td>SR: 2, NSR: 0</td>
</tr>
</tbody>
</table>

Notes: *SR: sexist references, NSR: non-sexist references

7 Conclusions – proposals

Although eliminating gender bias in textbooks will most likely not eradicate the gender gap in science interest and achievement, it will begin to chip away at an ever-crumbling foundation (Good et al., 2010).

The present study contributes to the literature by examining gender representation in the school textbooks for teaching computer science in the three grades of the general lyceum in Greece. Overall, the present findings suggest that the prevalence of gender stereotypes is still significant in the computer science school textbooks. Contrary to expectation for the books of the first and second grade, males in the present study appeared alone more often than females in the illustrations. The present results were consistent with those of Koukourikou (2008), Tressou (2007), Georgiadou and Kekeris (2009) and Berdousis and Kordaki (2016b). However, this study does not share the optimism of Berdousis and Kordaki (2016) as it considers that the authors of the two new books did not take care to avoid any form of gender discrimination. As for the evaluation of Greek textbooks in general, it is also consistent with the study of Gouvias and Alexopoulos (2016) which unveiled the existence of strong gender stereotypes in the new Greek-language textbooks of the third grade of the Greek primary school as well as the study carried out by Maragoudaki (2007) which found the reproduction of gender stereotypes in the fifth and sixth grade Greek-language reading books of the Greek primary school.

The phenomenon of sexism in education shall be discussed and controlled with proper teaching materials free of any stereotypical perceptions of gender roles for men and women (in education, the media, public life, and the world of work). In this context, it is proper to revise the content of school textbooks to reflect current realities and policy priorities of gender roles in line with social changes. But, as it seems clear that stereotypes have not been expunged from the new school textbooks it is essential that educators still be aware and carefully critical in evaluating book content they plan to share with their female and male students.

However, it is hoped that this study will encourage teachers, publishers, parents, and librarians to continue to work toward eliminating the occurrence of gender stereotyping in children’s literature.
References


Michel, A. (1986). Down with Stereotypes!: Eliminating Sexism from Children’s Literature and School Textbooks, UNESCO.


Annex A

Indicative presentation of the sexist stereotypes that exist in the first-grade school textbook

Linguistic sexism

Stereotypical references

1. Information note for the student (page 4).
2. The opportunity to hear the opinions of your classmates (page 5).
3. Students should be able (page 9, 21, 37).
4. The purpose of the chapter is students to learn (page 21).
5. However, the author keeps all rights (page 26).
6. The reader’s interest, which may be (page 29).
7. It is enough to understand how they work (page 33).

Stereotypical free references

- Dear schoolgirl/dear schoolboy (page 4).

Informatic teacher references

1. With the guidance of your teacher and to recognise (page 12).
2. To find, with the help of your teacher (page 15, 87, 131, 131).
3. The informatics teacher in collaboration with the teacher of English (page 15).
4. Consult your teacher and implement the (page 66, 71).
5. Create, with the help of your teacher (page 107).

Illustration (see online version for colours)

<table>
<thead>
<tr>
<th>Image/cartoon</th>
<th>Image/cartoon</th>
</tr>
</thead>
<tbody>
<tr>
<td>Page 8</td>
<td>Page 95</td>
</tr>
<tr>
<td><img src="https://example.com/cartoon8.png" alt="Cartoon" /></td>
<td><img src="https://example.com/cartoon95.png" alt="Cartoon" /></td>
</tr>
</tbody>
</table>

**Eikóva 11.1. O Tim Bemers-Lee,
Illustration (continued) (see online version for colours)
Famous persons

1. From the mathematical-physical John von Neumann and his team (page 10).
3. Richard Stalman is the founder of (page 26).
4. The famous astrophysicist Stephen Hawking, (page 40).
5. The author and researcher Mark Prenski (page 41).
6. In 1971, Ray Tomlinson created the first electronic (page 82).
7. This protocol was the TCP of the Vint Cerf and Bob Kahn (page 82).

Professions

1. Addressed to professionals, such as photographers, graphic designers (page 24).
2. The graphic designers have to keep changing sizes (page 24).
3. Allow editors and designers to create (page 25).
4. The professionals’ programmers use (page 52).
5. Uses a programmer for the development of an application (page 54).
6. The professional programmers (page 56).
7. A novice programmer who aspires (page 56).
8. The professional and novice programmers upload (page 56).
9. The development company group (page 59).
10. Traditional occupations – dressmaker work at home for piecework (page 121).

Annex 2

Indicative presentation of the sexist stereotypes that exist in the second-grade school textbook

Linguistic sexism

Stereotypical references

1. Chapter goals are that students (page 9, 19, 55).
2. Discuss with your classmates and record two problems (page 13).
3. Ask your classmate (page 13).
4. The classification of students in alphabetical order (page 15).
5. Will need a postman to visit ten villages (page 15).
6. The student needs to be careful in the use of these two commands (page 34).
Stereotypical free references

1. Synthetic thinking of schoolboys and schoolgirls (page 5).
2. To help schoolboys and schoolgirls to (page 5).
3. The preparation stages of schoolboys and schoolgirls (page 5).
4. That the schoolboys and schoolgirls have already gained (page 6).
5. How many schoolboys, how many schoolgirls, how many classes (page 86).

Informatic teacher references

None

Illustration (see online version for colours)

<table>
<thead>
<tr>
<th>Image/cartoon</th>
<th>Image/cartoon</th>
</tr>
</thead>
<tbody>
<tr>
<td>Page 7, 9, 13, 19, 55, 77, 83, 87, 93</td>
<td>Page 72</td>
</tr>
<tr>
<td>Page 15</td>
<td>Page 73</td>
</tr>
<tr>
<td>Page 15</td>
<td>Page 84</td>
</tr>
</tbody>
</table>

Etikóna 2.36. Λίνους Τόρβαλς (Linus Torvalds)

Etikóna 2.37. Σέμουρ Παπέρε (Seymour Papert)

Etikóna 2.4. Alan Turing και Pierre de Fermat

Etikóna 3.10. Μία Β.Δ. με τρεις συλλογές δεδομένων.
Illustration (continued) (see online version for colours)

<table>
<thead>
<tr>
<th>Page</th>
<th>Image/cartoon</th>
<th>Page</th>
<th>Image/cartoon</th>
</tr>
</thead>
<tbody>
<tr>
<td>57</td>
<td>Εικόνα 2.25 Ντένις Ρίτσι (Dennis Ritchie). Ο δημιουργός της</td>
<td>93</td>
<td>Εικόνα 3.23. Ο Τζόιν Μοκκάρθο, (John McCarthy)</td>
</tr>
<tr>
<td>58</td>
<td>Εικόνα 2.30. Νικλάους Βιρθ (Niklaus Wirth)</td>
<td>95</td>
<td>Εικόνα 3.24. Λούθι Ζάντες (Lotfi Zadeh).</td>
</tr>
</tbody>
</table>

The only illustration of women in the two textbooks

<table>
<thead>
<tr>
<th>Page</th>
<th>Image</th>
<th>Page</th>
<th>Image</th>
</tr>
</thead>
<tbody>
<tr>
<td>58</td>
<td>Εικόνα 2.27 Η 'Αντα Λόβλες (Ada Lovelace), κόρη του Λόρ.</td>
<td>59</td>
<td>Εικόνα 2.28 Γκρέις Χόπερ (Grace Hopper). Αμερικανική καθηγή.</td>
</tr>
</tbody>
</table>
Gender stereotypes in Greek computer science school textbooks

Famous persons
1. All life is problem solving, Karl Popper (page 14).
2. Also, Goldbach’s conjecture (page 14).
4. In 1931, Gödel’s incompleteness theorems (page 15).
5. Fermat’s theorem (page 15).
6. Lame proved that the number of steps (page 24).

Professions
1. Addressed only to programmers and user does not have (page 57).
2. Regarding the profession of programmer (page 74).
3. Analyst. A person with a specialty in (page 100).
5. Software engineer. A person that (page 107).