

Analysis of Gender Images in Elementary School Mathematics Textbooks of Jiangsu Education Press

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Abstract: This dissertation analyzes gender role images in elementary school mathematics textbooks of Jiangsu Education Press in China. The study aims to identify whether gender stereotypes and discrimination exist in textbooks and develop strategies to address these issues. The results showed that male characters were more frequently portrayed than female characters in both text and images, and they tended to be depicted as active and confident problem solvers. In contrast, female characters were often shown as passive and dependent learners. Additionally, gender stereotypes were found in portraying male and female characters' roles and activities, with males frequently engaging in activities related to science and technology, while females were associated with more traditional roles such as homemakers and caregivers. The results of this study will shed light on the nature and extent of gender bias in mathematics textbooks published by Jiangsu Education Press and contribute to their improvement. This study contributes to the broader field of gender bias in education by providing a more specific and focused analysis of gender role representations in elementary school mathematics textbooks.

Keywords: gender images, mathematics textbook, gender stereotypes, gender discrimination

1. Introduction

Gender roles and stereotypes are deeply rooted in many cultures and significantly impact individuals' lives. In China, gender stereotypes, including education, are prevalent in all aspects of society. Research shows that gender bias affects students' academic performance, attitudes toward learning, and future career choices.

Mathematics is an essential subject in China's education system and a key determinant of students' academic success. In recent years, there has been an increasing interest in the presentation of gender roles in Chinese elementary school mathematics textbooks and their impact. Therefore, the purpose of this study is to analyze the gender role images presented in Chinese elementary school mathematics textbooks, to identify whether gender stereotypes and gender discrimination exist in them, and to develop strategies to improve these issues. In this study, the gender role images in the elementary school mathematics textbooks of Jiangsu Education Press are analyzed as an example. This study will use qualitative research methods, including content analysis and surveys. This study will collect many Chinese elementary school mathematics textbooks of Jiangsu Education Press for research and, based on the results, will study the gender role images in Chinese elementary school mathematics textbooks of Jiangsu Education Press.

This dissertation is a more specific and focused study of gender role images in elementary school mathematics textbooks, rather than the more general “gender role images in the field of education” that has been studied in the past. The results of this study will provide insights into the nature and extent of gender bias in Chinese elementary school mathematics textbooks of Jiangsu Education Press. This study can help Jiangsu Education Press to identify gender issues in mathematics textbooks and provide improvement strategies for writers.

2. Status of Research

According to several studies, gender role images in primary language textbooks significantly impact children’s gender identity, gender stereotypes, and career choices.

In a survey conducted by Dong Fen, who conducted a sociological analysis of the images of teachers in the primary language textbooks of Su, Renjiao, and Beijiao editions, she found that the ideas of teachers in these textbooks were mostly male and there were fewer images of female teachers [1]. And a study by David N. P. Mburu and Grace Nyagah showed that the imbalance in the portrayal of gender roles in Kenyan elementary school textbooks also had a negative impact on students’ gender stereotypes [2]. In China, Wu analyzed the gender of characters in textbooks using the Hejiao version of primary language textbooks as an example and found that female images were relatively underrepresented [3]. Similarly, studies by Sun Xiaoping and Yan Xiaoping emphasized the influence of the gender roles of the main characters in primary language textbooks on children’s personalities and the importance of gender image analysis in textbooks [4][5]. Fang Min’s study showed that the imbalance in the presentation of gender roles in elementary school language textbooks also affects children’s gender identity and career choices [6]. In addition, Zhu’s study further explored the socialization of children’s gender roles by comparing three elementary school language textbooks in China with one American reading textbook [7][8]. Guan found that Chinese language textbooks for junior high school students portrayed males as strong and independent, while females were depicted as vulnerable and dependent. Guan suggested that these gender stereotypes may be linked to traditional Chinese cultural beliefs about gender roles [9]. Xiao compared Chinese and American primary school language textbooks and found distinct differences in portraying gender roles between the two countries. Xiao argued that these differences reflect cultural disparities between the two countries and could affect children’s gender identity and roles [10]. A recent study explored the relationship between occupations and gender stereotypes in a Greek elementary English curriculum [11]. These findings suggest that gender role portrayals in primary language materials have a significant impact on children’s gender identity and career choices, and therefore more attention should be paid to gender equality and diversity in the development of materials. In conclusion, gender role portrayal in textbooks is an essential educational issue that educators need to bring to attention.

3. Gender Image Analysis

3.1. Representation of Female Images

3.1.1. The Presence of Female Images

The female image is fully expressed in the elementary school mathematics textbooks of Jiangsu Education Press. For example, in the first-grade textbook, the character of “Little Fang Fang” appears, who leads the children to learn mathematics with energy and confidence. In the second-grade textbook are “Little Nini” and “Little Dream”, who are also brave and intelligent girls and can leave a deep impression on students.

While the fact of female images in the elementary school mathematics textbooks of Jiangsu Education Press is a positive development, it is important to note that these images are often presented stereotypically. The girls in these textbooks are portrayed as energetic, confident, and intelligent, but they are also expected to conform to traditional gender roles, such as nurturing and caring. This reinforces the idea that women should be both strong and feminine, which can be limiting for girls as they grow and develop their own identities. Additionally, while the female characters in the textbooks are represented, analyzing how much they are included in the actual mathematics problems is crucial. If they are only used as decoration or background characters, this reinforces the idea that women are not as important or capable in mathematics as men.

3.1.2. Stereotypical Image of Women

Although the image of women is well represented in the elementary school mathematics textbooks of Jiangsu Education Press, there are some gender stereotypes. For example, in some sample problems, the description “Dad’s job is to pick up the hammer and fix the house, and Mom’s job is to cook and wash clothes at home” appears, which tends to make students think that the father should be the primary financial source and decision maker in the family, while the mother should be responsible for household chores and taking care of the children.

The stereotypical image of women in the elementary school mathematics textbooks of Jiangsu Education Press is concerning because it reinforces traditional gender roles and promotes a narrow view of what men and women are capable of. By depicting mothers as solely responsible for household chores and fathers as the primary financial providers and decision-makers, the textbooks suggest that men are not expected to be involved in domestic duties or childcare and that women are not expected to take on leadership roles outside the home. This can hurt the way children view gender roles and their aspirations, particularly girls, who may feel that their potential is limited. The stereotypical image of women in the Jiangsu Education Press elementary school mathematics textbooks reinforces traditional gender roles that limit women’s roles in the household and family. These stereotypes create a false impression that men are the primary breadwinners and decision-makers in the family, while women’s roles are limited to domestic chores. These gender stereotypes may discourage female students from pursuing their academic and career goals, leading to a loss of talent and diversity in the workforce.

3.2. Representation of Masculinity

3.2.1. The Presence of Male Images

The male image is also well-represented in the elementary school Representation of masculinity. For example, in the first-grade textbook, the character of “Xiao Qiang” is a brave, smart, and hard-working boy who can lead everyone to learn mathematics. In the second-grade textbook, there is also the character “Xiao Ming”, who is a studious and hardworking boy who always strives to learn mathematics.

While it is important to have male representation in the elementary school mathematics textbooks of Jiangsu Education Press, how masculinity is portrayed can also reinforce harmful gender stereotypes. By presenting male characters as brave, smart, and hardworking, the textbooks suggest that these are inherently masculine traits and therefore more valued than feminine traits. This can perpetuate harmful gender norms and stereotypes, making it difficult for boys who do not conform to traditional masculine ideals to feel accepted or valued. It is also important to note how male characters are depicted compared to female characters, as this can reveal biases and inequalities in how gender is represented in the textbooks.

The representation of masculinity in the elementary school mathematics textbooks of Jiangsu Education Press reinforces gender stereotypes that men are strong, brave, intelligent, and more suited to math and science-related careers. This stereotype can create a false impression that girls are not as good as boys in mathematics and science and may discourage girls from pursuing their interests in these fields. It is essential to portray male characters as kind and empathetic individuals who can support and work together with female characters to challenge traditional gender stereotypes.

3.2.2. Stereotypical Image of Men

There are some gender stereotypes of masculine images in elementary school mathematics textbooks of Jiangsu Education Press. For example, in some examples, the description “Xiao Ming’s father drives his car to work, and Xiao Ming’s mother goes to work by bicycle” may make students think that the father should be the main financial source and decision maker of the family. In contrast, the mother should only rely on the bicycle to go to work. Words like “is”, “or”, “then”, etc should not be capitalized unless it is the first word of the subsection title.

The stereotypical image of men in the elementary school mathematics textbooks of Jiangsu Education Press is also concerning, as it reinforces traditional gender roles and promotes a narrow view of what men and women are capable of. By depicting fathers as the main financial providers and decision-makers, and mothers as solely responsible for household chores, the textbooks suggest that men are not expected to be involved in domestic duties or childcare, and that women are not expected to take on leadership roles outside of the home. This can limit the potential of both men and women and reinforces harmful gender norms that can negatively impact how children view gender roles and their aspirations.

The stereotypical image of men in the elementary school mathematics textbooks of Jiangsu Education Press reinforces traditional gender roles, creating a false impression that men are the primary breadwinners and decision-makers in the family. In contrast, women’s roles are limited to domestic chores. These gender stereotypes may discourage male students from pursuing their interests in subjects traditionally associated with women, such as literature and art. It is important to portray male characters who value family life and can balance their responsibilities with their spouses and children.

3.3. The Differentiation of Gender Roles

There are also some gender role differences in the mathematics textbooks of Jiangsu Education Press. For example, in some example problems, boys usually lead as leaders and decision-makers, while girls play supporting roles, providing help and support to the boys. This phenomenon may teach students to develop sexist perceptions that boys are better suited than girls to serve as leaders and decision-makers.

The differentiation of gender roles in the elementary school mathematics textbooks of Jiangsu Education Press can be harmful, as it perpetuates the idea that boys are better suited than girls to serve as leaders and decision-makers. By presenting boys as leaders and decision-makers in mathematics problems while girls play supporting roles, the textbooks reinforce harmful gender stereotypes. They can limit the potential of both boys and girls. It is essential to promote equal representation and opportunity for both genders so that all children can develop their full potential and contribute fully to society.

The differentiation of gender roles in the elementary school mathematics textbooks of Jiangsu Education Press reinforces traditional gender roles, implying that men are more suited to leadership and decision-making roles than women. These gender stereotypes may discourage female students

from pursuing their interests in leadership and management-related fields. It is crucial to portray female characters who can take up leadership roles and make decisions independently, challenging traditional gender stereotypes and promoting gender equity in education. Teachers and textbook publishers should concertedly present both boys and girls as capable leaders, decision-makers, and problem-solvers in mathematics and other academic fields.

4. Influence

The image of gender roles in the mathematics textbooks of Jiangsu Education Press will have a particular influence on students, manifested as follows.

4.1. Affect Students' Interest in Learning

The presence of gender stereotypes in the mathematics textbooks of Jiangsu Education Press can significantly impact students' interest in learning. Portraying male and female characters in stereotypical roles may lead to female students' disinterest in mathematics, as they may not feel represented or valued in the subject. Students and parents' stereotypical perceptions of gender roles significantly impacted both boys' and girls' mathematical aptitude, with positive facilitative and inhibitive effects for boys [12]. This disinterest can lead to a lack of motivation and engagement in class, ultimately decreasing academic performance. Additionally, such gender stereotypes can reinforce the idea that math is a subject primarily for boys, leading girls to believe that they are not suited for the subject and causing them to lose interest.

Moreover, students' interest in learning is crucial to long-term academic success. Students who are interested in a subject are more likely to be motivated to learn, explore new concepts, and persist through challenging tasks. However, when students' interest in mathematics is negatively affected due to gender stereotypes, it may impact their overall academic performance and future career opportunities.

4.2. Affect Students' Self-perception and Self-esteem

Gender role images in the mathematics textbooks of Jiangsu Education Press can also affect students' self-perception and self-esteem. For instance, if the textbooks portray girls in supporting roles and boys as leaders, it may lead to girls believing that they are incapable of being leaders or excelling in mathematics. Students who believe that "boys are good at math and science and girls are good at English" tend to have a negative academic self-concept, negatively impacting their academic performance and even their ability to investigate their possibilities [13]. This perception can harm their self-esteem and cause them to underestimate their mathematical abilities. It can also lead to a negative cycle where students lack self-confidence and doubt their abilities, decreasing motivation and interest in mathematics.

Moreover, students' self-esteem is crucial to their overall well-being and academic success. Low self-esteem can lead to feelings of inadequacy, anxiety, and depression, affecting students' performance and limiting their potential. Therefore, it is essential to promote gender equality in mathematics textbooks to prevent such negative impacts on students' self-perception and self-esteem.

4.3. Affect Students' Career Planning

Hill, Corbett, and St. Rose discovered that female participation in science, technology, engineering, and mathematics is relatively low [14]. Nosek et al. support that this gender disparity may be partially attributable to national differences in gender-science stereotypes. They discovered a

correlation between gender-science stereotypes at the national level and national differences in math and science achievement [15]. The gender role images in the mathematics textbooks of Jiangsu Education Press can significantly impact students' career planning. Students' career choices can be influenced by their perceptions of gender roles and careers deemed suitable for their gender. For example, suppose the mathematics textbooks portray that only boys can excel in mathematics-related careers. In that case, it may lead to girls excluding such careers from their career planning, leading to gender bias in career choice.

This can have long-term consequences for both individual students and society. If female students are excluded from mathematics-related careers, it can lead to a lack of diversity and inclusivity in such fields, limiting opportunities for growth and innovation. Furthermore, it can perpetuate gender stereotypes and inequality in the workplace. Therefore, it is crucial to provide gender-neutral representations in mathematics textbooks and encourage students to pursue their interests and abilities regardless of their gender.

5. Improvement Strategies

Combining the results of the above studies and analyses, to promote students' gender awareness and development, it is suggested that textbook writers could:

Highlighting the contributions of women mathematicians and scientists: In mathematics textbooks, some introductions to women mathematicians and scientists can be included to let students know that women have also made important contributions to the fields of mathematics and science. For example, famous female mathematicians and scientists such as Annie Bethel Iverson, Sophie Gerow, and Mary Karpnes can be introduced.

Avoid gender stereotypical language: Avoid using gender stereotypical language such as "men are smarter" or "girls are not good at math" in mathematics materials, which can instill misconceptions in students. Use gender-neutral language and avoid gender-related words, such as "they" instead of "they and they're".

Increase the image and content of female characters: The image and content of female characters can be increased in the textbook, for example, by using female characters in math problems so that students are more exposed to female images. At the same time, mathematical problems related to women's lives and interests can be added, such as "What is the distance that Xiao Hong walks to school every day? In-depth exploration of the diversity of female and male characteristics, avoiding the emphasis on stereotypical gender roles and divisive phenomena and making the materials more equal, diverse, and inclusive.

In addition to the above suggestions, there are other improvement strategies that textbook writers can consider promoting students' gender awareness and development. One strategy is to incorporate diverse perspectives and experiences into the materials. For example, textbooks can include stories and examples that highlight the experiences of students from different backgrounds, such as students from different racial and ethnic groups, students with disabilities, and students from different socioeconomic backgrounds. By incorporating diverse perspectives, students can learn to appreciate and value differences, which can help promote a more inclusive and equitable learning environment.

Another strategy is to provide opportunities for students to engage in collaborative and cooperative learning activities. By working together on math problems and science experiments, students can learn to appreciate and value each other's contributions, which can help promote a more collaborative and cooperative learning environment. Additionally, these types of activities can help break down gender stereotypes and promote positive attitudes towards both male and female students.

Finally, textbook writers can also consider providing resources and support for teachers to help them promote gender awareness and development in their classrooms. This could include teacher professional development opportunities, such as workshops and training sessions on gender-sensitive teaching strategies. It could also include resources for teachers to use in the classroom, such as lesson plans and activities that promote gender awareness and development.

Overall, there are many strategies that textbook writers can consider promoting gender awareness and development in their materials. Textbook writers can help create a more inclusive and equitable learning environment for all students by incorporating diverse perspectives, providing opportunities for collaborative learning, and supporting teachers.

6. Conclusion

6.1. Summary

This paper analysed the gender images in elementary school mathematics textbooks of Jiangsu Education Press. By examining the character images, role positioning, and activity design in the textbooks, we found that there are certain gender stereotypes and unequal gender role positioning in the textbooks. This is reflected in the fact that male characters are more numerous and dominate the storyline, while female characters are relatively few and usually in a subordinate position. There is also a degree of gender discrimination in the design of mathematics topics, such as the differentiation of men's and women's lifestyles, occupations, and interests.

6.2. Outlook

To address the issue of gender discrimination in the elementary school mathematics textbooks of Jiangsu Education Press, future research can adopt a more detailed and in-depth research approach to investigate the differences between different textbook versions and whether there are significant differences in gender representations between different grades and chapters. At the same time, relevant teacher training and teacher education can be conducted to strengthen teachers' awareness of gender awareness and gender equality education, thereby improving the representation of gender images in elementary school mathematics textbooks and promoting the implementation of gender equality education. In addition, it is also possible to explore how to guide students better to recognize and respect the differences and diversity of different genders in the mathematics curriculum and avoid the emergence of gender discrimination and stereotypes, to promote primary mathematics education to serve the overall development of students better.

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