The Influence of Gender Stereotypes on Gender Identity and Academic Performance

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Abstract:

Gender stereotypes in the field of education constitute a significant barrier to educational equity and the comprehensive development of students. Although their existence has been widely recognized, a systematic, integrative review is lacking on how these stereotypes simultaneously shape students' gender identity and academic achievement via distinct mediating mechanisms. This study aims to systematically synthesize empirical evidence along these two pathways, revealing the interactions among teacher biases, classroom environment, and individual psychological factors, thereby addressing a gap in the current research. Research indicates that the influence of gender stereotypes on gender identity and academic achievement constitutes a mutually reinforcing feedback loop. This study emphasizes the urgency of implementing interventions that simultaneously address the dual pathways of teacher behavior and student psychology. The findings suggest that future educational practices should be dedicated to advancing efforts in teacher training, curriculum content, and social awareness in a coordinated manner. Future research should further investigate the mechanisms of gender stereotypes across different educational stages and within multi-disciplinary contexts, aiming to provide more targeted solutions for the promotion of educational equity.

Keywords: Gender stereotypes, educational equity, gender identity, academic achievement, teacher bias

1 Introduction

Gender equality serves as a vital indicator of societal progress, while educational equity represents a critical pathway to achieving this objective. However, within contemporary campus environments, an implicit force continues to influence student growth and development—namely, gender stereotypes. Throughout history, the notion that "boys are suited for science, while girls are suited for the

humanities" has functioned as an invisible constraint, limiting the choices and development of numerous students. This phenomenon persists not only throughout history but also manifests in various forms within current educational practices. Unconscious differential evaluations by teachers, solidified gender role portrayals in teaching materials, and differing expectations and feedback during classroom interactions—these subtle, routine educational behaviors are quietly shaping students' self-perception and future developmental trajectories. Particularly in the field of STEM (Science, Technology, Engineering, and Mathematics) education, the impact of gender stereotypes is especially pronounced. Numerous studies indicate that female students often lack confidence in mathematics and science courses due to the stereotype that "these subjects are not suitable for girls," and are even more likely to give up when encountering difficulties (Zhou, 2020). This situation not only results in a waste of talent resources but also leads to unequal opportunities for individual development. As observed in practical teaching scenarios, a female student with a strong interest in mathematics may gradually lose motivation due to subtle suggestions from peers and teachers that "girls are not good at math." Similarly, a male student passionate about literature might abandon his interests under pressure from the expectation that "boys should pursue science and engineering." The significance of this phenomenon cannot be overlooked. With the growing societal demand for innovative and diverse talent, breaking the constraints of gender stereotypes and enabling every student to develop freely according to their interests and abilities has become a critical issue for contemporary education. This matter not only concerns the growth and development of individual students but also relates to the optimal allocation of human resources and the enhancement of innovative capabilities across society as a whole.

This study aims to systematically review existing research findings to explore how gender stereotypes influence the construction of students' gender identity and their academic performance in depth, with a particular focus on elucidating the critical role of teacher behavior in this process. The literature review method will be employed to conduct a comprehensive analysis of recent relevant empirical studies. The aim is to provide educators with targeted recommendations, assisting them in better identifying and eliminating gender biases in teaching practices, thereby creating a more equitable and inclusive growth environment for every student.

2 Introduction to the key concepts

2.1 Gender Stereotypes

Gender stereotypes refer to fixed and generalized perceptions regarding the behavior, personality, and abilities of males and females. Gender stereotypes may manifest across various aspects of daily life. For instance, in educational settings, instructors holding gender stereotypes may perceive male students as more proficient in logical thinking and scientific disciplines, while female students are often considered more adept at artistic endeavors and humanities subjects. In daily life, parents or other elders holding gender stereotypes often believe that male children should exhibit more decisive and courageous traits, while female children are expected to be more gentle and quiet. These stereotypes typically originate from traditional culture and widespread societal perceptions. Strong gender stereotypes may lead to the neglect of the uniqueness of individuals across different genders, thereby exacerbating gender inequality within society.

2.2 Gender Identity

Gender identity refers to an individual's perception and expectations regarding their own gender. It encompasses perceptions of "what men and women are expected to" (for example, men are expected to be strong and engage in more physical labor, while women are expected to be gentle and pursue care-oriented professions). Different cultures, religions, and educational backgrounds contribute to diverse forms of gender identity. Establishing an appropriate gender identity plays a crucial role in the psychological well-being and development of individuals.

2.3 Academic Achievement

Academic achievement serves as one of the key metrics for evaluating students' performance in their studies. It reflects both the extent of students' mastery of specific courses and, to some degree, the effectiveness of teaching instruction. Academic achievement is typically assessed through standardized tests (such as the National College Entrance Examination or IELTS) and summative evaluations (such as final examinations). It is influenced by a variety of factors, including individual student characteristics, the teaching environment, and social policies. Therefore, relying solely on academic achievement to evaluate student performance is not considered rigorous; it should be integrated with other indicators (such as daily performance and teacher evaluations).

3 The Impact of Gender Stereotypes on Gender Identity

Primary and secondary school students are in a critical period of gender identity development. Consequently, gender-stereotyped behaviors exhibited by teachers may adversely affect the formation of their gender identity. To investigate the presence of gender stereotypes in teachers' daily instructional practices, Li Chaoqun et al. selected students from grades 4–6 across four primary schools and grades 7–9 across three middle schools in Beijing. The final sample comprised 1,150 primary and secondary school students (with an average age of 11.02 ± 1.70 years; 47.5% urban students; 55.6% male; 57.7% primary school students) and 38 homeroom teachers (with an average age of 37.87 ± 8.45 years; average teaching experience of 16.05 ± 10.10 years; 84.2% female; 60.5% primary school teachers). A researcher-developed questionnaire on teachers' gender-related educational behaviors was utilized, in which students evaluated their homeroom teachers' gender-related educational practices across three dimensions: academic expectations, personality trait expectations, and activity-related expectations. The questionnaire employed a Likert 5-point scoring system, ranging from "1 = strongly disagree" to "5 = strongly agree." Higher scores indicate more stereotypical gender-related educational behaviors by teachers. The study utilized Mplus 7.0 to construct a multilevel linear model, specifically a two-level individual-class model, with teacher variables treated as class-level variables for data analysis. Results indicated that higher levels of gender stereotypes among teachers were associated with stronger gender stereotypes among students. This correlation may be attributed to students continually receiving and internalizing gender-related messages through daily interactions with their teachers (Li, Xu, & Li, 2021). The researchers focused on students' perceptions of gender stereotypes exhibited by homeroom teachers. However, compared to studies such as those by Martinez, which compared the impact of gender stereotypes across different teachers, the work of Li Chaoqun et al. provided less extensive investigation into the influence of other subject-specific instructors, such as mathematics or English teachers. Future research could expand the sample scope and include a wider variety of teacher types. For instance, Martinez conducted a longitudinal study tracking approximately 1.7 million students in Peru over a ten-year period (from age 13 to 23) to investigate the long-term effects of teachers' gender stereotypes on students. The study administered Implicit Association Tests (IAT) to 1,102 mathematics teachers and 950 language teachers to measure their stereotypes regarding student gender and subject-specific abilities. The study employed a quasi-experimental design, controlling for student characteristics (such as age, gender, socioeconomic background, and prior academic performance) and teacher attributes (such as gender, teaching experience, and educational qualifications) to minimize model bias. Descriptive statistics were utilized to analyze students' high school enrollment rates and college application rates. The results revealed that teachers exhibited systematic gender bias in their expectations of student performance. Furthermore, prolonged exposure to instructors with systematic biases regarding subject-specific achievement led to significant declines in female students' self-efficacy, gender role identity, and enrollment rates. This effect was particularly pronounced among female students from economically underdeveloped regions (Martinez, 2022). The researchers primarily described the impact of teachers' gender stereotypes on female students' gender role identity, with limited discussion regarding its effects on male students. Additionally, as the study focused exclusively on students and teachers in Peru, the generalizability of its conclusions to other cultural contexts requires further validation.

Currently, given the widespread presence and potential impact of gender stereotypes in the field of education, scholars have conducted multi-faceted research on their influence on gender identity. However, variations exist in research focus and methodology. For example:

Dennesen et al., through a systematic review, indicated that teachers' implicit biases in STEM education significantly affect students' self-perception, particularly reducing female students' self-efficacy in mathematics and science subjects (Dennesen, Wang, & Jacobs, 2022). The researchers emphasized the necessity of targeted teacher training to mitigate these biases, though the effectiveness of such interventions across diverse cultural contexts still requires further validation. Zhou employed classroom observation to analyze specific gender-stereotypical behaviors exhibited by teachers during instruction, such as asserting that "boys are more suited for science" or "girls are more meticulous." It was noted that these behaviors subtly yet persistently influence students' perceptions of gender roles (Zhou, 2020). Wei, from a student perspective, found that female high school students could overcome the constraints of stereotypes through self-efficacy and family support (Wei, 2024). Liu and Sun further validated the mediating mechanism through which teachers' stereotypical behaviors reinforce students' gender biases (Liu & Sun, 2021).

4 The Impact of Gender Stereotypes on Academic Performance

Zhu Min and Gao Man selected 7,844 middle school students from the China Education Panel Survey (CEPS) as valid samples, consisting of 4,070 boys and 3,774 girls, covering 112 schools in China. Students from both urban and rural areas as well as those from different family background were included. The study aimed to investigate the variations in their mathematics scores from Grade 7 to Grade 8. The large sample size and wide coverage are beneficial for sample has a large size and a wide coverage are beneficial for improving external validity of the results. The dependent variable is mathematics scores of the students, which is measured by standardized scores from mathematics test. The core explanatory variable is whether students agree with the gender stereotype "boys are better at mathematics than girls", determined through baseline questionnaire. The mediating variables included cognitive ability in mathematics learning, expectations for mathematics and the level of learning engagement. The control variables included age of students, types of registered permanent residence, ethnicity and educational attainment of the parents. For data analysis method, this study utilized the Ordinary Least Squares (OLS) model, which is controlled for fixed effects of classes to eliminate interference at group level, and heterogeneity and mechanism analyses to explore the influence paths. The data analysis revealed that the stereotype "boys are better at mathematics than girls" has a significant negative impact on girls' math performance, while boys who hold this view has significantly higher grades compared to those who did not support it. The results of heterogeneity analysis indicated that negative effects were stronger among girls with fathers of higher educational attainment and rural girls. This might be associated with limited educational resources and conservative gender concepts in society. The influence mechanism analysis showed that gender stereotypes mainly functioned by reducing girls' self-perception of their mathematical abilities and learning expectations, but had no significant impact on learning engagement (Zhu & Gao, 2024). However, the weakness of this study is that the sample only included middle school students in grade 7 and grade 8, excluded primary school and high school students. In addition, the influence of gender stereotypes may change with age and grade. As a result, the research conclusions based solely on analysis of middle school students are difficult to be generalized to a wider group of teenagers.

The research of Song Shujuan, Jiang Na and Ji Lingkai was divided into two parts. In Study One, 194 female students in their second year of high school from the quality classes of three county-level ordinary high schools were selected as valid samples. In Study Two, 172 female students in their second year of high school majoring in science from two county-level key high schools were selected as valid samples. Both research samples were female high school students in grade 11 and covered different types of high schools, whether these be regular high schools or key high schools. The measurement tool used was the Growth Mindset Scale (GMS) developed by Dwek, consisting of 20 questions and scored on a 4-point scale. A teacher-compiled mathematics test (15 items; total score = 20) was used. The data analysis method of this research adopted SPSS20.0 for statistical analysis. The Study One employed an independent sample t-test to compare performance differences between the threat group and non-threat group. Moreover, the PROCESS program and the Bootstrap method were used with a sample size of 5,000 and a 95% confidence interval to test the moderating effect of thinking model. Study Two used "whether receiving training" and "whether in a threatening situation" as independent variables, and "mathematics score" as the dependent variable. A 2×2 analysis of variance was conducted and interaction effect was analyzed through simple effect tests. The data analysis results in Study One confirmed existence of stereotype threat effect, because the mathematics scores of female students were significantly lower in threatening situation compared to non-threatening situation. Study Two demonstrated that performance of non- training group in threatening situation was significantly lower in non-threatening situation, indicating that training can mitigate threat effect effectively (Song, Jiang, & Ji, 2022). The weakness of this study is that the sample was limited to female high school students in grade 11, and it did not include primary, junior high and university students. Moreover, the mathematics tests used in this study were compiled by teachers. In this case, the results may be limited in their application.

Li Yang et al., through quantitative research, demonstrated that gender stereotypes significantly reduce motivation and persistence in mathematics learning among female seventh-grade students. Structural equation modeling indicated that this effect is primarily mediated by the weakening of female students' self-perception (Li, Huang, Li, & Si, 2022).Hong Wei's research further highlighted that while gender stereotypes negatively affect female students' academic performance, introducing counter-stereotypical role models (such as female mathematicians) can effectively enhance their learning motivation, offer-

ing new insights for educational interventions (Hong, 2024). Ren Jinghan's study revealed the moderating role of gender in the impact of stereotypes within the physics discipline (Ren, 2020).The seminal research by Ortiz and Morton further emphasized that Black female students face dual stereotype threats—racial and gender-based—in STEM fields, resulting in a more complex impact mechanism (Ortiz & Morton, 2022). Zhang Xunjia summarized the effectiveness of intervention measures such as growth mindset training (Zhang, 2025).

5 Discussion and Suggestion

5.1 Overall Conclusion

The study deeply explored the mechanism by which gender stereotypes affect gender identity and academic performance based on relevant literature. Overall, gender stereotypes exert significant and differentiated impact on students' gender identity and academic performance.

In terms of gender identity, the gender stereotyping behaviors of teachers, such as their fixed expectations regarding academic abilities and personality traits of male and female students can influence students' gender role cognition and self-identity significantly. In addition, prolonged exposure to teachers who hold gender stereotypes can diminish girls' self-efficacy and dampen their desire to pursue higher education, especially for girls in underdeveloped areas and those in STEM fields.

In terms of academic performance, girls who endorse the stereotype "boys are better at mathematics than girls" tend to exhibit significantly lower math scores, whilst boys who hold this belief performed better in math. A wealth of studies has confirmed the existence of stereotype threat and found that growth mindset training and introduction of counter-stereotype role models can reduce its negative impact effectively. On top of this, the detrimental effects of gender stereotypes on girls are more prominent in science-related subject whether these be math or physics, and are most severe in regions characterized by conservative social attitudes and underdeveloped economies.

5.2 Suggestions and Insights

Based on the results above, the following suggestions may reduce the negative impacts of gender stereotypes and promote the development of gender equality education. First of all, education department can incorporate gender equality into pre-service and in-service teacher training to help teachers recognize and correct their own gender stereotypes, and focus training for teachers in STEM sub-

jects. Moreover, the media need to create a gender equality social atmosphere through increasing positive coverage of women in science and engineering fields, thus reducing the portrayal of single "traditional gender role". In addition, the content of gender stereotypes should be eliminated and gender-neutral expressions should be increased in textbook compilation. For instance, female representatives and achievements in field of science and technology can be added in textbook.

5.3 Future Research Direction

The current research sample are mostly middle school students and focus on mathematics. In the future, it can be expanded to different educational stages such as kindergartens and universities, and cover more subjects such as Chinese, English and music, to explore impact of gender stereotypes in various educational stages and different subjects.

6 Conclusion

This study, through a systematic review, elucidates the impact of gender stereotypes on gender identity and academic achievement. It concludes that teachers' gender stereotypes negatively influence the development of students' gender identity and lead to a decline in academic performance, particularly in mathematics among female students. This study aims to highlight the impact of gender stereotypes on gender identity and academic achievement, thereby raising broader societal awareness regarding gender equality in education. It seeks to rectify erroneous gender biases prevalent in traditional educational practices and foster a more equitable, respectful, and inclusive educational and social environment.

Authors Contribution

All the authors contributed equally and their names were listed in alphabetical order.

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