How Gender Stereotypes Impact Students' Academic Achievement

Tianyi Zhao(✉)

Department of Psychology, Queen's University, Kingston, ON K7L 3N6, Canada
18tz46@queensu.ca

Abstract. Due to historical reasons, females around the world had been labelled as "not good at science subjects" for a relatively long time, and this stigma had gradually become a gender stereotype because of people's repetition. This paper summarized the factors of gender stereotypes on female adolescents' academic performances from the family, the school and the society, and the impact on students' academic achievement development. The results showed that parents, teachers, and the society were all associated with gender stereotypes. Females were likely to grow up with negative influences from all three perspectives, resulting in lower self-confidence and more mental health issues, hence catering to a rigid social identity rather than choosing a future path based on their abilities. Furthermore, women's concessions and the lack of important findings deepened the biases of they were not good scientists, this made fewer women willing to enter the related field and further worsened the current situation of gender equality in this area. These findings in the paper extended our understanding of gender stereotypes.

Keywords: Gender stereotypes · Education · Academic success · Adolescence

1 Introduction

In the 21st century, even though higher education had been open to all women for around three hundred years, "females are naturally not good at science" was still a common brief. Due to the influence of traditions and misguiding information on social media, this widespread dissemination of theories had made girls unsure of their grades in science subjects, while boys were simultaneously pressured to be good at certain subjects if they are "a real man".

Although there was actual evidence that can prove boys usually had higher grades in math than girls during and after puberty [1], that did not mean that the differences between males' and females' brain structures caused this gap. By measuring the neural development of children around three to ten with functional magnetic resonance imaging (fMRI), scientists figured out that the students presented clear gender similarities in neural functioning, stating that children engaged in the same neuronal system during the development of mathematics [2]. Furthermore, in one research of boys' and girls' achievement differences in math, the researchers showed evidence that there were no significant differences between students' actual maths achievements, but a significant gap

Y. Chen et al. (Eds.): ICMETSS 2022, ASSEHR 693, pp. 911–918, 2023.
https://doi.org/10.2991/978-2-494069-45-9_110

was found in the way the two genders explain their performance [3]. This evidence clearly demonstrated that the gap between men and women in the science subject (like math) was not due to differences in brain structure, but rather to external influences. Scholars had found that success in science-related subjects might conflict with girls' gender identity, misled them to believe that science, technology, engineering, and mathematics (STEM) were all masculine areas [4], and thus lost interest and confidence in pursuing in-depth studies in this area.

Therefore, this paper aimed to review the factors of gender stereotypes, included family (parents), the schools (teachers), the society and the impact on students' academic achievement.

2 Factors

2.1 The Family

Parents, as the children's first teachers, had important influences on children's values and future choices. Starting with parenting styles, it was common that parents would educate or raise their children based on certain stereotypical norms. For example, parents tended to buy pink dresses for girls and let them play with Barbie dolls, while the blue T-shirts and toy trucks were usually for boys. These commonalities were so typical that many parents had adopted them as certain rules without knowing they contained stereotypes. Therefore, adults would have implicit and explicit expectations and attitudes regarding the gender of children and future roles, which impact how they interact with their baby, how they communicate, and the behaviours they embody [5].

One research proved that the career preferences and degree expectations of female college students were affected by their fathers' perceived judgments of the attractiveness of women who were mostly housewives [6]. If the father showed a positive attitude towards housewives, then the daughter had a higher probability to follow the traditions to be a housekeeper instead of getting a job and vice versa. Additionally, the parental stereotypes of mothers were still anchored in society and were more rigid than those of fathers [7]. By comparing the time parents stay with them, kids could be easily misled by this fixation on roles and thus believe that the mother was the one who needed to be responsible for housework and looking after the children, thus learned this biased idea when parents even had not noticed. Since children were likely to choose a similar career as their parents [8], such stereotypical career choices were quite likely to be perpetuated.

Furthermore, parents usually considered the STEM subjects were not quite proper for girls to study, while they believed languages and education as less suitable for boys [9]. Being impacted by the biased impressions, parents were likely to not support children to study certain majors because that choice obeyed the ideal path they designed for children. Parents' support had been concluded to be essential in developing children's informal mathematical knowledge [9], and the related knowledge was quite likely to be an opportunity for students to develop an interest in the science area. From another perspective, many students still needed their parents to provide financial support when they were getting higher education. Young adults today were more likely to fall below the economic scale with low-paying jobs and were unable to pay to repay their student loans [10]. Particularly, the unemployment rate had risen due to COVID-19 [11], and

a number of students had to depend on their parents' support. In such cases, it was difficult for young people to continue their studies and research in a specific field if they could not gain the understanding of their parents, and the gender stereotypical thinking of academic achievement therefore could not be changed in the short run and would continuously impact more people.

2.2 The School

Schools as social institutions that educated children with knowledge and values, required teachers to be able to correctly identify students' talents and provide guidance when they needed it. Nevertheless, gender stereotypes still exist in the process of teaching since teachers were not immune to social norms, and some of them might bring personal biases into the classrooms. One research had presented evidence that stereotyped beliefs about adolescents' qualifications had a significant impact on teachers' attitudes., making them advise female students to study art subjects like languages or education, and encourage males to study STEM subjects [12]. Compared with boys, girls' achievements in math were more heavily influenced by negative expectations and benefited less from the positive bias [13]. Girls got lower marks when their math teachers were females [13], this reality not only reflected the female teachers' low confidence in this field, but would also make the girls lose confidence and think they were not good at this subject.

The neglect of girls was also reflected in the varying levels of concern teachers had for students of different genders. Researchers had observed that teachers would make comments on girls' appearance but pay less attention to them in the classrooms [14]. Also, since girls scored higher on diligence, sensitivity, and compassion but boys often higher on self-reported untidiness, laziness [14], and aggressiveness, teachers would naturally focus on their actions and performances, giving them better reflections because boys seemed to overcome more difficulties. Under the influence of this implication and disparity, many girls were convinced to believe that girls were inferior to boys in math, thus conforming to their parents and society's preference to focus on liberal arts or other subjects that seem more appropriate to their identity. Moreover, a study verified that females showed worse performances than males on the high-stakes exams of STEM subjects while they did better on the other assignments [15], which meant females would be easier to feel disappointed because of the difference between their daily performance and the exam grades. Hence, the current educational methods and the biased behaviours of teachers were likely to impact students to inadvertently endorse gender stereotypes, and chose their future career paths based on such wrong expectations.

2.3 The Society

The primitive society was matrilineal [16], and the opportunity for the transformation of this social system into a patrilineal system was due to the physical disparity embodied in the labour process. Females were taught to depend on men in order to have better lives, while males naturally took the lead in society and gave females less voice to speak for themselves. Women were depicted as objects of sexual impulses and people who were responsible for reproduction, thus allowing men to own and control women in a seemingly rational and civilized way. In the process, in an effort to make women more

submissive, all the females, especially females in lower social class, had little access to education [17]. Women had gotten the opportunity to gain higher education in western countries until the nineteenth century [18], and there were still many girls not able to go to colleges in China because their poor families needed them to go to work and support their brothers. The thousand years of history of preventing women from studying had actually caused a profound effect on women and society. Females were labelled as "not good at studying" while they were even not allowed to study before. This unjustified gender stereotype seemed to have been transformed into a universal truth by the propaganda of people. Girls were still not suggested or encouraged to choose a science subject as their major by families or schools even nowadays, and some women also used this stereotype as an excuse to explain their failure in exams of science subjects [19].

Such a history, therefore, created labels for both men and women. Men had been characterized as aggressive, forceful, independent, and decisive, whereas women were characterized as kind, helpful, beautiful, and concerned about others [12]. Although people had started to consciously try to get rid of stereotypes, the descriptive gender stereotypes still resulted in disadvantages for women or men who were perceived as not having the attributes needed to succeed in opposite-sex-dominated fields [12]. Apparently that academia, especially in STEM areas, the male had been the gender who has dominance [12]. Even in psychology, a field in which there were more women scholars than men, male experts still take up the majority of the faculty and tenured positions, while females were overrepresented among adjunct, nontenure-track lecturers, and other temporary positions [20]. As a result, the biases and misconceptions that female scholars often received became the reasons for their inability to focus fully on their research. These problems included but were not limited to sexual harassment, gratuitous devaluations, deliberate neglect, and assigning different tasks to males who could devote more time to research [12, 21]. External factors like these were all significant reasons why female scholars were unable to conduct research as males did. In addition, females' traditional characters in society had always been still housekeepers who need to take care of the family [21, 22], and raising children automatically became their main responsibility after the pregnancy, asking them to spend more energy and time. Under this pressure, most women found it difficult or even impossible to continue their research.

3 Impacts on Students' Academic Achievement

After being impacted by the social environment, the problems and failures in academia, students might be affected by mental health issues [23]. The unstable psychological state would make it more difficult for them to achieve academic success, therefore creating a vicious circle.

Confidence had been detected as an important element to predict academic achievement in math, and the students who had to deal with anxiety and depression actually had less probability to do well in school [24]. Unfortunately, female students usually represented less confidence and more depressive symptoms [15, 25] in schools, and that is related to the gender stereotypes in both academia and society. Bonnot and Croizet clarified that exposure to mathematical stereotyping was negatively related to the performance of girls by lowering their mathematical competence beliefs [26]. This point was

tested by the research that Organization for Economic Cooperation and Development (OECD) did in 2012. It analyzed the academic performance of fifteen-year-old students around the world and discovered that most boys outperformed females in math [24]. Moreover, women tended to use stereotypes as a reason for their failure at certain times (e.g., got a poor score on a particular test). This behaviour could make them feel less embarrassed in the moment, but this would make them less identified with math and put less effort into it in a long run [19].

Even in environments where people had a higher level of education, such as colleges or universities, gender stereotypes still existed and would impact students' further achievements. One study demonstrated that in the seminar or tutorial class, women usually spoke less and were interrupted by male students repeatedly when they tried to share their opinions. Male students, on the other hand, felt more comfortable speaking during class [25]. The difference in confidence gave men natural advantages in the classroom environment: they talked more often, were less likely to be interrupted, and their confidence made their opinion more persuasive. These privileges made men appear to be better students, even though women were likely to share the same views. This frustration could lead women to maintain a conservative attitude toward subsequent academic challenges because they had higher anticipation, thus getting tangled in a cycle of self-trapped behaviours [15]. In such a situation, women's academic achievement would show a gap with male scholars due to the limitation of the social environment and their lack of self-confidence.

Although many single-sex schools were claiming that they could solve the issues of academic achievement because they were showing a more supportive attitude to girls [27], this way was actually deepening the gender stereotypes. Dividing students into different schools according to sex was a presence of dichotomy, while there was no marked difference in the number of female students graduating from single-sex schools and co-educational schools who chose STEM subjects as their majors [28]. One research had suggested that establishing more single-gender schools could have unintended negative consequences, such as an increase in stereotypical beliefs [27]. It was hardly possible for students to know how and why they need to against this rigid ideology when they did not even know how the opposite gender was treated at school. As a result, the solution to gender stereotypes and their impacts was still focused on solving the problem of people's ideology. Starting with the teachers, as people who needed to meet a number of students in their career path, they were suggested to reflect on the teaching purpose, expand their subjective action space, and learn more gender-related knowledge in order to improve their teaching methodology [12].

Parents, on the other hand, were more likely to have a deeper stereotype about children's actual abilities due to the fewer interactions with other students. It was significant that parents learn more about children's development and then eliminate biases, since a study had discovered that mothers who had higher education levels would be 1.3 times more likely to give more positive feedback on children's math abilities [13]. Besides, the parental work by teachers was essential to make parents aware of their problems on stereotypes and figure out ways to solve them as well. Overall, this requires the combined efforts of teachers, parents and society.

4 Conclusion

This study concluded how the gender stereotypes impacted female students' academic achievements, and pointed out the negative influences from family, schools and society would lead to lower confidence and increased mental health problems during students' development. Hence, caused them to be bound by the traditional female identities, exhibit lower grades in specific subjects, and got fewer academic achievements.

The findings in this paper contributed to a better understanding of the association between gender stereotypes and academic achievements. More importantly, the current study in this field still focused on the theories, with few more constructive and effective ideas on practical applications that can make a significant difference to students' future development. Therefore, the future researchers were suggested to design more experiments to figure out effective solutions to reduce gender stereotypes and apply them in everyday lives.

References

1. M. E. Badger, Why Aren't Girls Better at Maths? A Review of Research, Educational Research 24(1) 1981 11-23. DOI: https://doi.org/10.1080/0013188810240102
2. A. J. Kersey, K.D. Csumitta, J.F. Cantlon, Gender similarities in the brain during mathematics development, Nature 4(19) 2019. DOI: https://doi.org/10.1038/s41539-019-0057-x
3. S. N. Georgiou, P. Stavrinides, T. Kalavana, Is Victor Better than Victoria at Maths?, Educational Psychology in Practice 23(4) 2007 329-342. DOI: https://doi.org/10.1080/02667360701660951
4. N. Archard, Adolescent girls and leadership: the impact of confidence, competition, and failure, International Journal of Adolescence and Youth, 17(4) 2012 189-203. DOI: https://doi.org/10.1080/02673843.2011.649431
5. A. Morawska, S. Baker, S. Johnston, "The parent trap": gender stereotypes and parenting roles in an Australian parenting website, Australian Journal of Psychology 73(3) 2021 272-281. DOI: https://doi.org/10.1080/00049530.2021.1906162
6. C. L. Ridgeway, Predicting College Women's Aspirations From Evaluations of the Housewife and Work Role, The Sociological Quarterly 19(2) 1978 281-291. DOI: https://doi.org/10.1111/j.1533-8525.1978.tb01170.x3
7. M. Ross-Plourde, M. Lachance-Grzela, A. Charbonneau, M. Dumont, A. Roy-Charland, Parental stereotypes and cognitive processes: evidence for a double standard in parenting roles when reading texts, Journal of Gender Studies 2021. DOI: https://doi.org/10.1080/09589236.2021.1960154
8. J. A. Heath, The roots of success: Why children follow in their parents' career footsteps: David N. Laband and Bernard F, Economics of Education Review 7(2) 1988 264-265. DOI: https://doi.org/10.1016/0272-7757(88)90057-X
9. P. Starkey, A. Klein, Fostering Parental Support for Children's Mathematical Development: An Intervention with Head Start Families, Early Education and Development 11(5) 2000 659-680. DOI: https://doi.org/10.1207/s15566935eed1105_7
10. K. L. Fingerman, Millennials and Their Parents: Implications of the New Young Adulthood for Midlife Adults, Innovation in aging 1(3) 2007. DOI: https://doi.org/10.1093/geroni/igx026
11. C. Thorbecke, US unemployment rate skyrockets to 14.7%, the worst since the Great Depression. ABC News 2020. https://abcnews.go.com/Business/us-economy-lost-205-million-jobs-april-unemployment/story?id=70558779

12. M. Kollmayer, B. Schober, C. Spiel, Gender stereotypes in education: Development, consequences, and interventions, European Journal of Developmental Psychology 15(4) 2018 361-377. DOI: https://doi.org/10.1080/17405629.2016.1193483
13. S. McCoy, D. Byrne, P. O'Connor, Gender stereotyping in mothers' and teachers' perceptions of boys' and girls' mathematics performance in Ireland, Oxford Review of Education 48(3) 2022 341-363. DOI: https://doi.org/10.1080/03054985.2021.1987208
14. S. Matheis, L. K. Keller, L. Kronborg, M. Schmitt, F. Preckel, Do stereotypes strike twice? Giftedness and gender stereotypes in pre-service teachers' beliefs about student characteristics in Australia, Asia-Pacific Journal of Teacher Education 48(2) 2020 213-232. DOI: https://doi.org/10.1080/1359866X.2019.1576029
15. C. J. Ballen, S. Salehi, S. Cotner, Exams disadvantage women in introductory biology, PloS one 12(10) 2017. DOI: https://doi.org/10.1371/journal.pone.0186419
16. D. Kennett, S. Plog, R. George, et al., Archaeogenomic evidence reveals prehistoric matrilineal dynasty, Nat Commun 8 2017. DOI: https://doi.org/10.1038/ncomms14115
17. P. Parker, The Historical Role of Women in Higher Education, Administrative Issues Journal: Connecting Education, Practice, and Research 5(1) 2015 3-14. DOI: https://doi.org/10.5929/2015.5.1.1
18. C. A. Woyshner, B. H. K. Tai, The History of Women in Education, Harvard Educational Review 67(4) 1997 v-xiv. DOI: https://doi.org/10.17763/haer.67.4.385197673w145773
19. M. Burkley, A. Andrade, E. Burkley, When Using a Negative Gender Stereotype as an Excuse Increases Gender Stereotyping in Others, The Journal of Social Psychology 156(2) 2016 202-210. DOI: https://doi.org/10.1080/00224545.2015.1090945
20. C. Willyard, Men: A growing minority?, gradPSYCH Magazine 2011 https://www.apa.org/gradpsych/2011/01/cover-men
21. M. Filandri, S, Pasqua, 'Being good isn't good enough': gender discrimination in Italian academia, Studies in Higher Education. 46(8) 2021 1533-1551. DOI: https://doi.org/10.1080/03075079.2019.1693990
22. China Internet Information Center, Women's Choice: Home or Work? 2001. http://www.china.org.cn/english/2001/Apr/11788.htm
23. K. Lee, Social support and self-esteem on the association between stressful life events and mental health outcomes among college students, Social Work in Health Care 59(6) 2020 387-407. DOI: https://doi.org/10.1080/00981389.2020.1772443
24. OECD. PISA 2012 Results: What Students Know and Can Do 1 2014. DOI: https://doi.org/10.1787/9789264208780-en
25. J. Robson, B. Francis, B. Read, Gender, student confidence and communicative styles at university: the views of lecturers in history and psychology, Studies in Higher Education 29(1) 2004 7-23. DOI: https://doi.org/10.1080/1234567032000164840
26. J. Song, B. Zuo, F. Wen, L. Yan, Math-gender stereotypes and career intentions: an application of expectancy–value theory, British Journal of Guidance & Counselling 45(3) 2017 328-340. DOI: https://doi.org/10.1080/03069885.2017.1283680
27. R. A. Fabes, E. Pahlke, A. Z. Borders, K. Galligan, US principals' attitudes about and experiences with single-sex schooling, Educational Studies 41(3) 2015 293-311. DOI: https://doi.org/10.1080/03055698.2015.1005576
28. H. Law, J. Sikora, Do single-sex schools help Australians major in STEMM at university?, School Effectiveness and School Improvement 31(4) 2020 605-627. DOI: https://doi.org/10.1080/09243453.2020.1755319