

Effects of Gender Differences on Adolescent Students' Subject Preferences

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ABSTRACT

From the perspective of social discrimination, males are often perceived as more suitable gender groups for Science, Technology, Engineering, and Math (STEM) oriented majors, while females are more inclined to study arts and social science subjects. This review paper aims to identify how do gender differences influence adolescent students' choice of majors in college according to their interest in a particular discipline. Through analyzing this gender stereotype, the paper will explore the biological differences between males and females, the educational environment, and the implication of the social environment. It is found that the educational environment has a large degree of influence on adolescents' interests in selecting their subjects. In addition, the study will also analyze how gender affects the choice of preferred subjects, which can provide implications for future educational study.

Keywords: Gender differences, Subject preference, STEM, Stereotypes, Adolescent students.

1. INTRODUCTION

In the STEM fields, most female students are generally underrepresented [1]. The main reason for this phenomenon is the social stereotype of females in education, which are detrimental to society and to the development of individuals. The social stereotypes of gender limit the potential of both men and women in certain fields. The only way to better facilitate people's potentials is to understand the causes of the problem and solve the problem. In addition, this paper focuses on investigating and changing adolescents' social stereotypes during their education because gender differences affect the formation of their preferences for a particular subject and their choices of college majors and career paths.

2. INFLUENCING FACTORS

Both biological and psychosocial variables play an important role in their influence on the development of individuals [2]. When studying how do gender differences affect adolescents' preference for disciplines, it will be analyzed as comprehensively and objectively from the perspectives of biological variables (e.g., physiological structure), along with social and psychological variables (e.g., social-environmental impacts). In order to study to what extent do the physiological differences between males and females

affect their differences in learning a specific subject, the study of cognitive ability is a crucial direction.

2.1. Physiological Structure

Psychological skills or cognitive skills include perception, attention, memory (e.g., short-term work), exercise, language, visual and spatial processing, and execution functions [3]. These cognitive attributes are different between males and females. Generally speaking, females show advantages in language fluency, perceptual speed, accuracy and fine motor skills, while men are better than women in space, working memory and mathematical ability in traditional thinking. Men and women have some slight gaps in cognitive ability due to differences in their physiology. This is usually related to gonadal hormones [2]. Males' cognitive functions (i.e., attention, perception, executive and working memory) are comparable to those in females in the preovulatory phase. This may be due to the similar effects of testosterone in males and estrogen in females during the preovulatory phase of the brain. Thus, this study argues that testosterone and estrogen accentuate cognitive function in a similar manner. Both males and females (i.e., preovulatory) can compete equally in cognitive tasks.

On the other hand, in terms of memory, there are differences between men and women in memory,

content, speed and depth. Men's spatial memory imagination is stronger than that of women, while women's language memory imagination ability is stronger than that of men [4]. It can be inferred that females are more likely to read a long text and be more careful in tackling the question while males have more spatial and logical competency that provides a better view of doing a math test [5].

2.2 Social and Psychological Impacts

Even if biological variables are partial determinants of sex differences in cognitive ability, the importance of psychosocial factors cannot be ignored. There is a direct relationship between gender differences of males and females in the choice of disciplinary preferences. And socio-cultural gendering plays a pivotal role in this. When psychologists discuss sex differences in human behavior, they primarily consider the immediate and proximal causes of sex-differentiated behavior, such as gender roles and socialization experiences [6]. As Basow and Rubin argue, "the increasing pressures on adolescent girls are to conform to female gender role prescriptions" [7]. From the social and psychological perspective, the impact of gender is intensified from early adolescence onwards, as both internal and external demands are required to adjust to the changing environment among adolescent girls. The sociocultural procedure of gendering will influence their self-esteem, their formation of self-competence, along with their perceptions of their physical, sexual, and social selves [8]. These gendered expectations may promote increased stress, leading to lower self-esteem, resistance, and resilience.

The belief that psychosocial variables are primarily responsible for the differences between males and females, which has been referred to as the "nurture assumption" [9]. For example, parents spank their sons because of some misconduct, but leave their daughters in the room and did not provide her with dinner because of the same misconduct, which sends a strong gender role stereotyping message to all members of the family. Even if they behave the same, girls and boys are treated differently [2]. Apart from the family, the teachers that children meet will also pay attention to girls and boys for different reasons, and will implement different rules for girls and boys. Evidence of gender role stereotypes can be found throughout life. This gender stereotyped role concept is slowly deeply rooted, which subtly leads to the emergence of gender stereotypes and even affects the subject preferences of teenagers.

Gender stereotypes in STEM fields refer to the belief that many people believe that women are less capable of learning science and closely related subjects than men, and is a widespread gender stereotype in the current socio-cultural environment. Gender stereotypes in STEM fields have a significant impact on girls' learning in

science. Mathematics is not only a very important subject, but it is also the foundation for many other subjects. This is why researchers have found that there are few girls in high school science classes and many girls in liberal arts classes. Also there are fewer women in science and technology majors and more in humanities majors; and that there are very few women than men who have achieved high levels of success in science and technology.

Adolescence is the stage when one's ideas are gradually formed and interests are gradually fixed. This is also a stage that people should face with choices that have a great impact on the future, including the choice of a college major and the planning of a career. Women and minorities in STEM are able to successfully use their skills, earn income and contribute to society as a whole [10]. However, it excludes women and minorities from STEM education and the STEM workforce, which wastes a lot of talent and does not fill the needs of organizations for excellent STEM employees [11]. If this gender stereotype affects women with talents in STEM, it can undermine their self-confidence and make them believe that they are not capable of learning STEM fields as women, thereby leading to a lack of female talent in this field. This is not only a brain drain in STEM fields, but also a pity for the development of science, technology, and society in the country and the world [12].

With the diversification of the modern economy, traditional single disciplinary and occupational gender stereotypes cannot adapt to the changes in the increasingly competitive talent market. From the perspective of individuals, gender stereotypes of disciplines and occupations will limit the overall development, which will affect the individual's judgments and choices of professions and occupations. From the perspective of schools, gender stereotypes will enable educators set different requirements for male and female students in disciplines and occupations. Different treatment is not conducive to the implementation of equitable education and is not conducive to the overall development of the personality of male and female students. From the perspective of society, gender stereotypes of disciplines and occupations will create a monopoly of male and female in a certain occupation. From the social point of view, gender stereotypes of subjects and occupations can create a monopoly of men and women in a certain occupation and cause occupational gender segregation, which is not conducive to the long-term development of enterprises and threatens the stable development of society [13].

While girls are just as capable of developing STEM skills as boys, they are generally discouraged from doing so. Meanwhile, more women than men switch out of STEM programs in the university [14]. Gendered stereotypes are widespread in schoolings, including the behavioral cues of teachers and the tendency to write

educational materials. Previous studies have found that boys receive more attention from teachers in science classrooms, have more time to interact with teachers, receive more praise and critical feedback and corrections compared to girls [15]. Also, teachers trust and pay more attention to boys, but are more skeptical and less concerned and encouraging of girls [15]. Teachers rarely bother to teach in a way that is appropriate for girls' learning. [15]. There are also gender differences in the selection of mathematics textbooks, with more materials designed for males than females [16]. All of these give students the impression that men are stronger and women are weaker, which is very unfavorable to girls.

Under this circumstance, even though some young girls enjoy STEM subjects, as they grow older with outdated gender stereotypes, their families, teachers, and social environments do not advise them to delve into the field, and they begin to feel unsuited to STEM. Important sources of resistance to cultural messages are adhering to restrictive gender roles, including strong racial identity and verbal assertiveness, movements, strong female role models, feminist beliefs, and non-traditional attitudes. The study further finds that with the guidance of female role models and the push of social perceptions, the girls are more likely to persevere in studying [17]. In addition, having a teacher who is the same gender as the student creates a psychological affinity for the subject taught by that teacher, which in turn helps to stimulate interest in the subject. For example, assigning a female science teacher increases the likelihood that girls will find science useful for their future [18]. This is because some of the female science teachers are role models for young girls who can inspire girls to choose to study subjects that are stereotypically "unsuitable for girls," such as STEM.

2.3 A Comparative Analysis of East and West

Eastern and Western education systems differ due to their different cultures and indirectly show the advantages and disadvantages of both cultures [19]. In Western countries, especially in Central and Eastern Europe, girls have a significant advantage over boys in terms of educational achievement. This is because the developed countries are more successful in limiting the educational disadvantage of girls compared to boys in the education of mathematics and science subjects [20]. Second, the Western educational philosophy can somewhat circumvent some of the educational differences due to the gender of the student. Students in the Western educational philosophy behave as active learners in the classroom because the teaching and learning process is more focused on students being active learners in the classroom rather than focus on the teacher as the center of attention. It encourages students to actively present and share ideas to maximize their role as students rather than teachers in creating effective learning and teaching activities [21]. For example, whenever they are involved in performing a given task,

they are often in the form of a group discussion. All students are encouraged to think and express their ideas. This allows them to participate not only in the classroom but also helps them to be actively involved in the learning process even outside the classroom. Western education emphasizes active learning, student-centeredness, meaningful learning, creativity, compliments, and close teacher-student relationships. Eastern education, on the other hand, is characterized by the exact opposite of Western educational philosophy.

On the other hand, there is some evidence from Western industrialized countries that women are worse off despite their higher skills [22]. Moreover, in some Eastern transition countries, such situations exist, such as gender-induced wage gaps and occupational discrimination, indicating that even if women have better qualifications, they are more likely to face discrimination in the labor market.

3. CONCLUSION

Gender stereotypes are the main reason for the uneven gender distribution of disciplines, which is closely linked to the family and educational environment of adolescents. Research has found that the strength of female role models in STEM fields inspires adolescent girls to find the courage to address such stereotypes. In addition, the differences in the biological makeup of males and females are not negligible. It is undeniable that there are some cognitive gaps between males and females due to differences in physiology and thus different gonadal hormones. In a comparative analysis between Eastern and Western countries, the more developed countries are more likely to reduce the influence of gender stereotypes on female students' choice of major, but the effect is not particularly pronounced. Therefore, the formation of such gender stereotypes is complex and is related to the economic development of the society.

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