

# FEMALE STUDENTS' PARTICIPATION IN HIGH SCHOOL COMPUTER SCIENCE. A SOCIAL-PSYCHOLOGICAL ANALYSIS OF EDUCATIONAL CHOICE

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**Abstract:** Computer science has become a central discipline shaping technological innovation, economic development, and participation in contemporary digital societies. Despite its growing importance, female students remain significantly underrepresented in computer science education, particularly during secondary school, when academic specialization and career trajectories begin to take shape. This article provides a social-psychological analysis of the psychological, cultural, and social factors influencing female students' participation in computer science. Drawing on research in STEM education and social psychology, the article examines the roles of self-efficacy, gender stereotypes, sense of belonging, parental expectations, and educational climate in shaping girls' academic aspirations. The analysis suggests that female underrepresentation in computer science cannot be explained solely by differences in ability; rather, it emerges from the interaction of individual beliefs and broader sociocultural structures. Understanding these processes is essential for developing educational strategies that promote gender equality and broaden participation in computer science education.

**Keywords:** computer science education, gender stereotypes, self-efficacy, STEM education, social psychology, educational choice, hybrid programming education.

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## 1. Introduction

In the contemporary knowledge economy, computer science plays a central role in technological innovation, economic development, and participation in digital societies. Programming skills, computational thinking, and technological literacy are increasingly recognized as essential competencies for educational advancement and future employment.

Despite the growing importance of computing, women remain significantly underrepresented in computer science education and careers worldwide (Wang & Degol, 2017: 121). This gender gap often becomes visible during secondary education, when students begin selecting academic tracks that influence their future educational and professional trajectories.

Research suggests that gender disparities in computer science cannot be explained solely by differences in academic ability or cognitive performance. Rather, these disparities are shaped by psychological beliefs, social expectations, and cultural norms that influence how students perceive their abilities and opportunities (Cheryan et al., 2017: 2–4). Adolescents' educational decisions develop within complex social environments that include families, schools, peer networks, and broader cultural narratives.

Recent research also emphasizes the importance of belonging in shaping girls' participation in computing. When students perceive that they belong in computer science environments, they are more likely to engage with the discipline and persist in related learning pathways (Master et al., 2016: 424–427).

This article examines the psychological, cultural, and social factors influencing female students' participation in high-school computer science. It argues that female underrepresentation in computing should be understood not as a reflection of ability differences, but as the result of interacting psychological beliefs, sociocultural expectations, and educational experiences that shape girls' perceptions of competence, belonging, and future opportunity.

## **2. Theoretical Framework**

Understanding gender disparities in computer science requires theoretical perspectives that explain how individual beliefs interact with social structures.

Self-Efficacy Theory emphasizes individuals' beliefs about their ability to perform tasks successfully (Bandura, 1977: 193). Students with stronger self-efficacy are more likely to persist in challenging academic domains such as programming and computational problem solving.

Social Role Theory explains gender differences in career choices as the result of socially constructed expectations regarding appropriate roles for men and women (Eagly, 1987). Technology-related fields are often associated with masculine characteristics such as technical competence and analytical reasoning.

Expectancy-Value Theory proposes that educational decisions depend on both expectations of success and the value individuals assign to a particular activity (Eccles, 1994: 587). Even when students possess the necessary abilities, they may avoid certain academic fields if they anticipate social or psychological costs associated with participation.

Together, these perspectives provide a coherent framework for understanding how psychological confidence, social expectations, and cultural norms influence girls' participation in computer science education.

## **3. Gender Stereotypes, Self-Efficacy, and Belonging**

Gender stereotypes play a central role in shaping students' perceptions of STEM disciplines. Computer science and engineering are frequently perceived as male-dominated fields, which may influence girls' sense of belonging in computing environments (Cheryan et al., 2017: 5).

Experimental research has shown that stereotypes suggesting that girls are less interested in computing can significantly reduce the latter's motivation to enroll in computer science courses (Master et

al., 2021: 3). Such stereotypes may also weaken students' confidence in their abilities.

Self-efficacy therefore becomes a crucial factor in explaining participation in computer science. Female students often report lower confidence in their computing abilities compared to male students with similar academic performance (Lewis et al., 2011; Wang & Degol, 2017).

Recent studies also highlight the importance of STEM identity in shaping educational aspirations. When girls develop a stronger identification with STEM domains and perceive themselves as capable of success, they are more likely to pursue technology-related pathways (Zhao et al., 2024: 3).

#### **4. Family, School Climate, and Social Influence**

Educational choices during adolescence are strongly influenced by social environments. Families play an important role in shaping students' aspirations and perceptions of possible career opportunities.

Parental encouragement can significantly influence girls' engagement with STEM subjects (Eccles, 1994: 594). When parents communicate that technological careers are appropriate and valuable for their daughters, students are more likely to develop positive attitudes toward computer science.

School climate also plays a critical role. Inclusive classroom environments and supportive teaching practices can strengthen students' confidence and sense of belonging in computing education (Cheryan et al., 2017).

Peer influence further shapes students' academic interests. Adolescents frequently evaluate educational choices in relation to social acceptance and peer norms.

#### **5. Cultural Context and Educational Decision-Making**

Educational decisions are also shaped by broader cultural contexts. Cultural norms and social expectations can influence how students interpret educational opportunities and evaluate possible career paths.

In many societies, gender roles continue to influence perceptions of appropriate professional trajectories for women and men. These expectations may affect girls' willingness to enter male-dominated fields such as computer science.

Understanding how cultural contexts interact with psychological factors, such as self-efficacy and belonging, is therefore essential for explaining patterns of female participation in computer science education.

## **6. Methodological Orientation**

The conceptual discussion presented in this article is connected to a broader doctoral research project examining the psychological, cultural, and social determinants of female students' decisions to study computer science in secondary education.

The doctoral research adopts a mixed-methods design integrating quantitative and qualitative approaches. Questionnaires administered to students, parents, and teachers measure constructs such as self-efficacy, gender stereotypes, attitudes toward computer science, and perceptions of educational support.

Qualitative interviews complement the quantitative findings by exploring participants' experiences and the cultural meanings associated with educational decision-making.

In this sense, the present article functions as a conceptual and theoretical foundation for the empirical phases of the broader doctoral research project.

## **7. Educational Implications**

Addressing gender disparities in computer science requires coordinated efforts from educators, families, and policymakers. Interventions should not only encourage girls to participate in computing but also address the psychological and social conditions that shape students' perceptions of competence and belonging.

Educational strategies may include promoting female role models in technology fields, strengthening mentorship programs, and

creating inclusive classroom environments that support female participation (Tal et al., 2024).

## **8. Future Research**

Future research should further investigate how psychological, social, and cultural factors interact to influence female participation in computer science education.

Longitudinal studies may explore how students' attitudes toward computing evolve across key educational transitions. Intervention-based research could evaluate programs designed to increase girls' participation in computer science.

Another promising direction involves exploring innovative pedagogical approaches that respond to individual learner differences. One potential avenue is the development of a hybrid educational programming language that combines the accessibility and flexibility of Python with selected structural and object-oriented features of C#. Such approaches may contribute to creating more inclusive computer science learning environments that support diverse learners and reduce barriers to participation.

## **9. Conclusion**

Female underrepresentation in computer science should not be interpreted as a simple matter of preference or aptitude. Rather, it reflects the cumulative interaction of self-efficacy beliefs, stereotype-based expectations, social support, and educational climates that shape how girls interpret their place within computing-related fields.

Addressing gender disparities in computer science requires interventions that strengthen confidence, expand belonging, diversify role models, and challenge the social meanings that continue to mark computing as a male-typed field.

The analysis presented in this article also suggests the importance of exploring innovative pedagogical solutions that respond to diverse learner differences. One possible direction involves the development of a hybrid educational programming language that combines the accessibility and simplicity of Python with selected structural and

object-oriented features of C#, potentially creating a more inclusive learning environment that supports broader participation in computer science education.

Encouraging female participation in technology is essential not only for gender equality in education but also for fostering diversity, creativity, and innovation in the future technological workforce.

## БИБЛИОГРАФИЯ / REFERENCES

**Bandura, A.** (1977). Self-efficacy: Toward a unifying theory of behavioral change. *Psychological Review*, 84(2), 191–215.

**Cheryan, S., Ziegler, S. A., Montoya, A. K., & Jiang, L.** (2017). Why are some STEM fields more gender balanced than others? *Psychological Bulletin*, 143(1), 1–35.

**Eccles, J. S.** (1994). Understanding women's educational and occupational choices: Applying the Eccles et al. model of achievement-related choices. *Psychology of Women Quarterly*, 18(4), 585–609.

**Eagly, A. H.** (1987). *Sex differences in social behavior: A social-role interpretation*. Erlbaum.

**Lewis, C. M., Yasuhara, K., & Anderson, R. E.** (2011). Deciding to major in computer science: A grounded theory of students' self-assessment of ability. In *Proceedings of the Seventh International Workshop on Computing Education Research* (pp. 3–10). ACM.

**Master, A., Cheryan, S., & Meltzoff, A. N.** (2016). Computing whether she belongs: Stereotypes undermine girls' interest and sense of belonging in computer science. *Journal of Educational Psychology*, 108(3), 424–437.

**Master, A., Meltzoff, A. N., & Cheryan, S.** (2021). Gender stereotypes about interests start early and cause gender disparities in computer science and engineering. *Proceedings of the National Academy of Sciences of the United States of America*, 118(48), e2100030118.

**Tal, M., Lavi, R., Reiss, S., & Dori, Y. J.** (2024). Gender perspectives on role models: Insights from STEM students and professionals. *Journal of Science Education and Technology*, 33, 699–717.

**Wang, M.-T., & Degol, J. L.** (2017). Gender gap in science, technology, engineering, and mathematics (STEM): Current knowledge, impli-

cations for practice, policy, and future directions. *Educational Psychology Review*, 29(1), 119–140.

**Zhao, M., Ozturk, E., Law, F., Joy, A., Deutsch, A. R., Marlow, C. S., Mathews, C. J., McGuire, L., Hoffman, A. J., Balkwill, F., Burns, K. P., Butler, L., Drews, M., Fields, G., Smith, H., Winterbottom, M., Mulvey, K. L., & Hartstone-Rose, A. (2024).** Reciprocal associations between science efficacy, STEM identity and scientist career interest among adolescent girls within the context of informal science learning. *Journal of Youth and Adolescence*, 53, 1270–1287.