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GENDER DISPARITIES IN ICT: EXPLORING SELF-EFFICACY AND MOTIVATION TO STUDY ICT AMONG HIGH SCHOOL STUDENTS

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Abstract

In an increasingly digitized world, ICT self-efficacy plays a critical role in shaping individuals' engagement with technology. This study explores the gender gap in ICT-related fields, examining factors such as academic performance, motivation, and technology self-efficacy among high school students. The research, based on a sample of 993 participants (68.2% female, 31.8% male), highlights significant gender differences. To measure key constructs, the study utilized the Brief Inventory of Technology Self-Efficacy (BITS) (Weigold & Weigold, 2021; Weingold, 2023) to assess ICT self-efficacy at novice, advanced, and expert levels. General self-efficacy was evaluated using the New General Self-Efficacy Scale (NGSE) (Chen & Eden, 2001). Motivation to study ICT was assessed through a five-item scale inspired by Mladenović et al. (2015) and Jenkins (2001), distinguishing between intrinsic, extrinsic, and achievement motivation. Gender-related stereotypes and discrimination were measured using the Stereotypes of Computer Science (CS) scale (Beyer et al., 2003). Statistical analyses included Welch's t-tests to examine gender differences across these measures. Despite female students outperforming males in mathematics and informatics, they demonstrate a lower intention to pursue ICT studies. Male students report higher intrinsic motivation and ICT self-efficacy at advanced and expert levels, while female students perceive greater formal discrimination in the field. The findings suggest that academic performance alone is insufficient to encourage female participation in ICT. Instead, interventions addressing intrinsic motivation, stereotypes, and skill development are crucial to fostering gender inclusivity in ICT careers.

Keywords: *ICT self-efficacy, gender differences, motivation, stereotypes, technology skills.*

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1. Introduction

The persistent underrepresentation of women in Information and Communication Technology (ICT) fields represents a significant challenge for educational systems and labor markets worldwide (Cheryan et al., 2017). This gender imbalance is particularly concerning given the growing importance of digital skills and the expanding role of technology across professional domains.

Self-efficacy, defined as belief in one's capabilities to execute courses of action (Bandura, 1997), has emerged as a critical predictor of educational and career choices. In technology domains, computer self-efficacy reflects individuals' confidence in their ability to successfully use and master digital tools. Studies consistently demonstrate gender differences in technology-related self-efficacy, with males typically reporting higher confidence despite similar or sometimes lower actual performance (Huang, 2013).

Complementing self-efficacy, motivation represents another crucial determinant of educational choices. According to expectancy-value theory (Eccles, 2009), individuals are more likely to pursue activities they both value and expect to succeed in. Gender differences in interest toward ICT emerge early and persist through adolescence, potentially shaped by stereotypes and limited exposure to female role models in the field.

Perceptions of gender stereotypes and discrimination create "belonging uncertainty" among female students (Master et al., 2016), potentially undermining their interest and confidence despite strong academic capabilities. These perceptions may be particularly influential during adolescence, when identity formation and career exploration are key developmental tasks.

This study investigates how these three factors—self-efficacy, motivation, and stereotype perceptions—relate to high school students' intentions to pursue ICT studies in Slovakia, addressing the following question: How do male and female high school students differ in technology self-efficacy, motivation to study ICT, and perceptions of gender stereotypes?

2. Method

2.1. Participants and procedure

The final research sample consisted of 993 participants (68.2% female and 31.8% male), aged 16-20 years (M = 17.05; SD = 0.97). Participants were from gymnasiums (38.3%) and secondary vocational schools (61.7%) across all eight administrative regions of Slovakia. Data collection occurred between September and December 2022 following approval from the ethical review board of the Centre of Social and Psychological Sciences, Slovak Academy of Sciences.

2.2. Measures

Academic Performance: Participants self-reported their most recent grades in mathematics and informatics on a scale from 1 (excellent) to 5 (insufficient), following the Slovak educational grading system.

Intention to Study ICT: Measured using three items assessing participants' intentions to enroll in IT programs and pursue careers in the IT sector ($\omega = .86$).

Computer Self-Efficacy: Assessed using the Brief Inventory of Technology Self-Efficacy (BITS) (Weigold & Weigold, 2021; Weingold, 2023), measuring self-efficacy across three levels: Novice ($\omega = .84$), Advanced ($\omega = .80$), and Expert ($\omega = .84$).

General Self-Efficacy: Measured using the New General Self-Efficacy Scale (NGSE) (Chen & Eden, 2001) consisting of eight items ($\omega = .89$).

Motivation to Study ICT: Assessed using five items categorized into three subscales: Intrinsic motivation (2 items, $\omega = .78$), Achievement motivation (1 item), and Extrinsic motivation (2 items, $\omega = .72$).

Stereotypes and Discrimination: Measured using eight items from the Stereotypes of Computer Science scale (Beyer et al., 2005), with subscales for stereotypes ($\omega = .75$) and formal discrimination ($\omega = .82$).

2.3. Data analysis

Welch's t-tests were performed to examine gender differences, with effect sizes calculated using Cohen's d.

3. Results

Welch's t-tests revealed significant gender differences across various measures, as shown in Table 1.

Female students demonstrated significantly better grades in mathematics (d = -0.301) and informatics (d = -0.267) compared to male students. Despite this academic advantage, male students showed a markedly higher intention to study IT (d = -0.664).

Regarding motivation, male students reported significantly greater intrinsic motivation toward ICT (d = -0.466), while female students demonstrated higher achievement motivation (d = 0.207). No significant difference was observed in extrinsic motivation (d = 0.019) or general self-efficacy (d = -0.048).

Female students reported experiencing significantly more formal discrimination (d = 0.644), while male students perceived slightly more stereotypes in the field (d = -0.138). In computer self-efficacy, male students scored significantly higher on both advanced (d = -0.687) and expert (d = -0.598) levels, while female students performed slightly better at the novice level (d = -0.169).

Table 1. Comparison of Males and Females (Welch's t-test).

	Group	N	Mean	SD	t	df	p	d
grade mathematics	female	675	1.778	0.853	-4.296	538.547	p < 0.001	-0.301
	male	316	2.057	0.997				
grade informatics	female	669	1.188	0.493	-3.710	477.308	p < 0.001	-0.267
	male	313	1.345	0.667				
intention to study IT	female	675	1.329	0.585	-9.065	437.688	p < 0.001	-0.664
	male	316	1.842	0.923				
intrinsic motivation	female	677	2.705	1.117	-6.728	564.311	p < 0.001	-0.466
	male	316	3.253	1.232				
extrinsic motivation	female	677	3.826	0.828	0.269	531.765	0.788	0.019
	male	316	3.809	0.982				
achievement motivation	female	677	3.792	1.113	2.983	567.787	0.003	0.207
	male	316	3.551	1.219				
stereotypes of the field	female	677	4.160	0.951	-1.998	579.777	0.046	-0.138
	male	316	4.296	1.017				
formal discrimination	female	676	4.451	1.130	9.352	586.263	p < 0.001	0.644
	male	316	3.703	1.194				
general self-efficacy	female	677	3.798	0.699	-0.701	620.986	0.484	-0.048
	male	316	3.831	0.691				
BITS novice	female	675	5.932	0.181	-2.607	796.162	0.009	-0.169
	male	316	5.959	0.136				
BITS advanced	female	674	3.687	1.118	-10.156	642.075	p < 0.001	-0.687
	male	315	4.437	1.064				
BITS expert	female	673	1.996	0.872	-8.393	497.838	p < 0.001	-0.598
	male	315	2.597	1.123				

Note: Lower grades indicate better academic performance in the Slovak educational system (1 = excellent, 5 = insufficient).

4. Discussion and conclusion

One of the most striking findings of this study is the paradox between female students' academic performance and their intentions to pursue ICT studies. Despite outperforming male students in both mathematics and informatics, female students reported significantly lower intentions to study ICT. This contradicts meritocratic assumptions that academic excellence naturally leads to corresponding career choices and aligns with previous research by Stoet and Geary (2018), who identified similar patterns across different educational contexts. According to expectancy-value theory (Eccles, 2009), career choices are influenced not only by ability beliefs but also by subjective task values and perceived costs. Our finding that male students reported higher intrinsic motivation toward ICT supports this explanation, suggesting that enjoyment and interest in the field—rather than merely performance—significantly influence career intentions. This gender difference in intrinsic motivation is consistent with research by Cortright et al. (2013), who found that intrinsic motivation was more strongly correlated with performance for male than female students.

The gender differences in computer self-efficacy provide additional insights into the persistent gender gap in ICT. While both genders demonstrated similar general self-efficacy, substantial differences emerged in domain-specific self-efficacy, particularly at advanced and expert levels. The increasing magnitude of gender differences as skill level increases suggests that gender disparities in technology self-efficacy widen with task complexity, consistent with previous research by Pethö and Bozogáňová (2023) on university students. According to Bandura's (1986) social cognitive theory, self-efficacy beliefs are shaped by mastery experiences, vicarious experiences, social persuasion, and psychological states. Male students may have more opportunities for mastery experiences with complex technologies through informal learning and tinkering (Margolis & Fisher, 2002), more abundant role models in technology fields, and more positive social messaging about their technological capabilities. These advantages could create a self-reinforcing cycle where higher self-efficacy leads to greater engagement with advanced technology, which further enhances skill development and efficacy beliefs.

The significant gender difference in perceptions of formal discrimination provides another important perspective on the persistent gender gap in ICT. Female students reported substantially higher perceptions of discrimination in the field, which likely influences their career considerations. This finding aligns with research by Master et al. (2016), suggesting that awareness of gender bias in male-dominated fields may deter women from pursuing careers in these areas. Interestingly, male students perceived slightly more stereotypes about the field itself, though this difference was relatively small. This might reflect different aspects of stereotyping that young men and women notice or internalize. While female students may be more attuned to discrimination directed at their gender, male students might be more aware of general stereotypes about people in ICT, such as the "nerd" stereotype often associated with computer science professionals.

Despite lower intrinsic motivation and higher perceptions of discrimination, female students demonstrated higher achievement motivation compared to male students. This finding, consistent with research by Clarke and Chambers (1989), suggests that female students may be more driven by the desire to excel and achieve high standards in their work. This higher achievement motivation represents a potential resource that could be leveraged to increase female participation in ICT. Educational interventions that connect achievement goals with ICT careers might help bridge the gap between female students' academic excellence and their career aspirations. For instance, highlighting how ICT careers can satisfy achievement-oriented goals such as solving important problems, making significant contributions, or achieving recognition could appeal to female students' achievement motivation.

From a practical perspective, addressing the gender gap in ICT requires multifaceted approaches. Enhancing advanced technology self-efficacy through structured opportunities for female students to develop and demonstrate advanced technology skills could help narrow the self-efficacy gap. Fostering intrinsic motivation by designing ICT education that connects to female students' interests and values, emphasizing the creative, collaborative, and socially impactful aspects of technology, might be particularly effective. Explicit efforts to counter stereotypes about who belongs in ICT fields and to create inclusive learning environments are essential, including diverse representation in teaching materials, addressing implicit biases among educators, and establishing clear anti-discrimination policies. Additionally, framing ICT careers in terms that appeal to achievement-oriented goals could help bridge the gap between female students' academic excellence and their career aspirations. Given that gender differences in technology self-efficacy appear to widen with skill level, early interventions that provide equal opportunities for skill development before these disparities become entrenched are critical for promoting gender inclusivity in ICT education and careers.

This study highlights the complex interplay of factors contributing to gender disparities in ICT education. Our findings reveal that despite female students' superior academic performance, they demonstrate lower intentions to pursue ICT studies. This paradox appears to be influenced by differences in intrinsic motivation, technology self-efficacy at advanced levels, and perceptions of discrimination.

Addressing the gender gap in ICT requires multifaceted approaches that go beyond promoting academic excellence, focusing on enhancing female students' advanced technology self-efficacy, fostering intrinsic motivation, combating stereotypes and discrimination, and leveraging their achievement motivation.

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References

Bandura, A. (1986). *Social foundations of thought and action: A social cognitive theory*. Prentice-Hall.

Bandura, A. (1997). *Self-efficacy: The exercise of control.* W H Freeman/Times Books/ Henry Holt & Co.

Beyer, S., Rynes, K., Perrault, J., Hay, K., & Haller, S. (2003). Gender differences in computer science students. *ACM SIGCSE Bulletin*, *35*(1), 49-53. https://doi.org/10.1145/792548.611930

Clarke, V. A., & Chambers, S. M. (1989). Gender-based factors in computing enrollments and achievement: Evidence from a study of tertiary students. *Journal of Educational Computing Research, 5*(4), 409-429. https://doi.org/10.2190/L4FC-Y6EV-VLUA-7N29

Chen, G., Gully, S. M., & Eden, D. (2001). Validation of a new general self-efficacy scale. *Organizational Research Methods, 4*(1), 62-83. https://doi.org/10.1177/109442810141004

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. https://doi.org/10.1037/bul0000052

Cortright, R. N., Lujan, H. L., Blumberg, A. J., Cox, J. H., & DiCarlo, S. E. (2013). Higher levels of intrinsic motivation are related to higher levels of class performance for male but not female students. *Advances in Physiology Education, 37*(3), 227-232. https://doi.org/10.1152/advan.00018.2013

Eccles, J. S. (2009). Who am I and what am I going to do with my life? Personal and collective identities as motivators of action. *Educational Psychologist, 44*(2), 78-89. https://doi.org/10.1080/00461520902832368

Huang, C. (2013). Gender differences in academic self-efficacy: A meta-analysis. *European Journal of Psychology of Education, 28*(1), 1-35. https://doi.org/10.1007/s10212-011-0097-y

Jenkins, T. (2001). The motivation of students of programming. *ACM SIGCSE Bulletin, 33*(3), 53-56. https://doi.org/10.1145/377435.377472

Margolis, J., & Fisher, A. (2002). *Unlocking the clubhouse: Women in computing*. MIT Press.

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. https://doi.org/10.1037/edu0000061

Mladenović, M., Žanko, Ž., & Mladenović, S. (2015). Elementary students' motivation towards informatics course. *Procedia-Social and Behavioral Sciences, 174*, 3780-3787. https://doi.org/10.1016/j.sbspro.2015.01.1113

Pethö, T., & Bozogáňová, M. (2023). General and technology self-efficacy among university students - Preliminary findings. In C. Pracana, M. Wang, A. Silva, & A. Huić (Eds.), *Psychological Applications and Trends 2023* (pp. 591-595). inScience Press.

Roach, D., McGaughey, R. E., & Downey, J. P. (2011). Gender within the IT major – a retrospective study of factors that lead students to select an IT major. *International Journal of Business Information Systems, 7*(2), 149-165. https://doi.org/10.1504/IJBIS.2011.038510

Stoet, G., & Geary, D. C. (2018). The gender-equality paradox in science, technology, engineering, and mathematics education. *Psychological Science, 29*(4), 581-593. https://doi.org/10.1177/0956797617741719

Weigold, A., & Weigold, I. K. (2021). The Brief Inventory of Technology Self-Efficacy (BITS): Developing and validating a measure of general technology self-efficacy. *Computers in Human Behavior Reports, 4,* 100151. https://doi.org/10.1016/j.chbr.2021.100151

Weigold, A. (2023). Brief Inventory of Technology Self-Efficacy (BITS) and Brief Inventory of Technology Self-Efficacy – Short Form (BITS-SF): Manual. Retrieved January 21, 2025, from www.bitssurvey.com