"Technology is feminine!": motivations for women's enrollment and attrition in IT courses, Belém-PA, Brazil

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A B S T R A C T

This study aimed to identify the possible causes of the low number of women in Information Technology (IT) and computer courses in Higher Education Institutions (HEI) located in Belém and the Metropolitan Region (PA). The research was conducted through an online questionnaire administered to 47 women who were students or graduates of IT courses in the region. The study identified issues related to sexism, sexual harassment, prejudice, discrimination, and questioning of female cognitive ability or intellectual capacity as reasons why these women dropped out or quit IT or computer courses. Many participants revealed feeling isolated due to the low number of women in the course, as well as uncomfortable with "jokes" made by professors and classmates, and subjected to prejudice as women in a predominantly male course, sometimes even having their sexual orientation questioned. In light of these findings, it is understood that representation is a fundamental element for overcoming stereotypes and paradigms, and for encouraging girls to pursue careers in these fields. It demonstrates that women are capable of performing manual tasks, solving complex mathematical equations, and addressing operational problems within corporations.

RESUMO

O presente trabalho objetivou identificar as possíveis causas do baixo número de mulheres em cursos de Tecnologia da Informação (TI) e computação de Instituições de Ensino Superior (IES) sediadas em Belém e Região Metropolitana (PA). A pesquisa foi realizada por meio da aplicação de um questionário online junto a 47 mulheres estudantes ou formadas em cursos de TI na RMB. No que diz respeito aos motivos pelos quais essas mulheres trancaram, abandonaram ou desistiram dos cursos de TI e ou computação, identificou-se questões relacionadas ao machismo, a assédio sexual, ao preconceito, à discriminação, ao questionamento da capacidade cognitiva ou intelectualidade feminina. Nesse sentido, muitas participantes revelaram que se sentiram: isoladas por haver poucas mulheres no curso e também pelo comportamento de colegas homens, incomodadas com "brincadeiras" feitas pelos professores e colegas de sala e, por fim, alvo do preconceito por ser mulher em um curso predominantemente masculino, sendo a orientação sexual por vezes questionada. À luz do exposto, entende-se que a representatividade é um elemento fundamental tanto para a superação de estereótipos e paradigmas como para o incentivo de meninas em seguir carreira nessas áreas, pois demonstra que as mulheres são capazes de realizar trabalhos braçais, resolver equações matemáticas complexas e solucionar problemas operacionais dentro de corporações.

Introduction

Within a sexist culture, certain habits are established for girls from childhood, such as posture and expected behaviors to follow. In cases where a woman does not adhere to social conventions, society's persecution is common and trivialized, with judgmental looks and offensive comments that reaffirm the imposition and framing of her into a femininity socially constructed by patriarchy. In this regard, Margolis and Fisher (2002) argue that boys have always been encouraged to interact with technological toys, reinforcing the argument that computers are considered boys' toys while dolls are considered girls' toys. Such stereotypes, therefore, originate from cultural aspects of structural sexism.

As a reflection of this, the report from the Brazilian Computing Society (SBC) in 2018 indicated that the number of women entering computer science courses in Brazil amounted to 23,933 out of a total of 171,205 students. In the Northern region, during the same year, only 921 women enrolled out of a total of 5,090 students. The number of female graduates in Brazil was 6,725 out of a total of 47,285, and in the Northern region, only 352 women out of a total of 1,955 students completed their studies (SBC, 2018). This context is also reproduced in Belém and its Metropolitan Region (PA), as some studies (Corrêa, 2018; Nascimento & Nascimento, 2018) conducted by researchers in the region have pointed out the persistent low number of women in IT and computer science courses.

In the literature, issues involving this theme have been addressed from different perspectives, both at the national level (Carneiro et al., 2020; Cunha, Miranda & Rambo, 2020; Loch, Torres & Costa, 2021; Quirino et al., 2018; Tonini & Araújo, 2019) as internationally (Avolio, Chávez & Vílchez-Román, 2020; Christie et al., 2017; Paredes-Walker, 2020; Uamusse, Cossa & Kouleshova, 2020). Studies such as those by Christie et al. (2017) and Quirino et al. (2018) highlight that in Science, Technology, Engineering, and Mathematics (STEM) courses, while the percentage of female participation is low, attrition rates are high. In the study by Avolio, Chávez and Vílchez-Román (2020), which conducted an extensive literature review covering 470 articles published between 1985 and 2018, at least five factors affecting the underrepresentation of women in STEM careers were identified: 1) individual, 2) family, 3) social, 4) educational, and 5) economic-labor. Thus, in the academic debate, there is an agreement that female trajectories are generally more challenging, as women face barriers imposed by the patriarchal system (Quirino et al., 2018).

In Brazil, according to Cunha, Miranda and Rambo (2020), although recent research has indicated a significant increase in the number of women in STEM courses, female participation is still lower than male participation. Furthermore, this representation tends to decrease as the level of qualification increases. Thus, Tonini and Araújo (2019) argue that it is essential to encourage girls to pursue these careers from an early age, so that they can have exposure to these fields and realize that they can occupy spaces historically designated for boys.

In light of the above, this study aimed to understand the causes of the low number of women in Information Technology (IT) and computer science courses in Higher Education Institutions (HEI) located in Belém and its Metropolitan Region (PA). The specific objectives are as follows: 1) to delineate the socioeconomic profile of female students in IT and computer science, 2) to understand the motivations that led these students to enroll in courses in this field, and 3) to identify the reasons why these women dropped out or quit these courses.

Methodology

The research methodology followed a qualitative and quantitative approach with a descriptive and exploratory nature. Regarding techniques, bibliographic, documentary, and empirical research were conducted. The empirical research took place from July 5th to August 26th, 2020, involving 47 graduates from IT and computer science courses in the Metropolitan Region of Belém. Due to the COVID-19 conditions, the questionnaire was administered online using the Google Forms platform. This data collection instrument was widely disseminated on social media platforms such as Facebook, Instagram, and WhatsApp. It consisted of 36 semi-structured questions that covered topics such as: 1) Socioeconomic data; 2) Institutional and academic information; 3) Motivations for enrolling in the course; 4) Course attrition; 5) Course persistence; 6) Female representation in IT; and 7) Prejudice and discrimination against women in IT.

After data collection, the obtained data was tabulated and systematized using Microsoft Office Excel 2016 software and analyzed through Descriptive Statistics, in dialogue with discussions present in similar research. Thus, a non-probabilistic sample was also employed, working from a general perspective, considering the lack of knowledge about the sample of women studying and/or having studied IT in Belém and the Metropolitan Region. It is worth noting that, according to Marconi and Lakatos (2003, p. 98), "[...] non-probabilistic samples are composed accidentally or intentionally, and [...] there is no guarantee of representativeness of the universe we intend to analyze."

On the other hand, qualitative data was analyzed using content analysis, which aimed to "[...] obtain, through systematic and objective procedures for describing the content of messages, indicators (quantitative or not) that allow the inference of knowledge related to the production/reception conditions (inferred variables) of these messages" (Bardin, 2011, p. 47). The use of content analysis consisted of three fundamental phases: 1) Pre-analysis, 2) Material exploration, and 3) Treatment of results, following Bardin's principles (2011).

Results and Discussions

Socioeconomic Profile

After obtaining and tabulating the data, as shown in Table 1, it was observed that the majority of the participants (34%) were above the age of 30. There was also a percentage of

31.9% of women aged between 18 and 25 years, 27% were between 26 and 30 years old, and 6.4% were under 18 years old. The data regarding marital status showed that a significant portion of the respondents were single (74.5%) or in a stable relationship (17%), followed by married (8.5%). The majority self-identified as mixed race (57.4%), followed by 36.2% who identified as white, 4.3% as Black, and 2.1% as Indigenous or from quilombola communities. Belém was the city with the highest population of these women, accounting for 68.1% of the respondents, followed by Ananindeua with 23.4%, Castanhal with 6.4%, Benevides with 2.1%, and Marituba with 0%.

The data presented regarding the respondents' employment status showed that the majority (44.2%) were employed in the private sector, 20.6% were in public employment or service, and 17.6% of the respondents were either interns or self-employed professionals. Based on these findings, it can be observed that the socioeconomic profile of the respondents consists of women over 30 years old, single, self-identified as mixed race, residents of the city of Belém, and all engaged in some form of remunerated activity.

Table 1.

Socioeconomic profile of research participants

Age group	Under 18 years 6.4%	6,4%
	From 18 to 25 years	31,9%
	From 26 to 30 years	27,7%
	Above 30 years	**34%**
Marital status	**Single**	**74,5%**
	Common-law marriage	17%
	Married	8,5%
	Separated/Divorced	0%
	Widowed	0%
Ethnicity	Black	4,3%
	White	36,2%
	Mixed race	**57,4%**
	Indigenous or Quilombola	2,1%
City of residence	**Belém**	**68,1%**
	Ananindeua	23,4%
	Marituba	0%
	Benevides	2,1%
	Castanhal	6,4%
Employment status	Internship	17,6%
	Private employment	**44,2%**
	Self-employed	17,6%
	Public employment or service	20,6%
	Retired	0%
	Unemployed	0%

Note: Prepared by the authors (2020).

In a general analysis, it is assumed that these women entered the field later either because they started their university life later or because they switched courses upon realizing a greater affinity and skill in the field of IT, as revealed in the testimony of one of the inter-

viewees: "Because I had already studied Medicine at UFPA + UEPA to please my parents. I did BCC [Library Science] privately because I had been in the college entrance exam life for 4 years, and I always enjoyed video games, so there was an interest in computing" (Participant 08). It is presumed that the majority are still single in an attempt to escape traditional impositions placed on women, such as the expectation to marry and start a family for procreation and child-rearing. In contrast to this, these women are certainly seeking a different life from what is morally imposed, aiming to qualify themselves, find employment, and have a stable and independent life. Perhaps marriage and the dream of having children are more distant and secondary objectives for them.

According to Reis et al. (2018: 399), "[...] women's entry into university, the expansion of education, and the reduction of fertility rates have influenced women in seeking new opportunities in their professional careers." The current socioeconomic context of these women is a reflection, as seen in the literature review, of historical educational and professional achievements. Despite this, women still encounter obstacles in higher education, career advancement, and unequal pay.

According to Moraes (2016), these obstacles are a result of a social, historical, and cultural construction of masculine and feminine categories, indicating that gender relations, as a system, structure the hierarchical difference between sexes, reflecting a relationship of oppression and domination. Furthermore, in terms of intersectionality, the marker of race should be considered, as the majority of the respondents identified as mixed race (57.4%). According to Souza (2017), the processes that perpetuate racial inequalities are an indicator of the low participation of black women in the labor market, as well as the high participation of white men.

When considering that the majority of the respondents are engaged in the labor market, particularly in private sector jobs, gender inequalities remain evident. In the literature on the subject, there is evidence that women's work has become more professionalized, diversified, and progressively occupying new spaces of greater importance in the labor market. Ac-cording to similar studies (Sousa & Melo, 2009), prioritizing academic qualifications is a fundamental strategy for women in their path to accessing managerial positions. This has become a competitive advantage in the pursuit of opportunities within organizations. The search for better positions in the market aligns with the demands for academic qualifications (Sousa, 2017).

Institutional and Academic Information

In an effort to identify the main motivations for entering the field, questions were formulated regarding the institutional and academic information of women who have pursued or are pursuing IT and computer science in the RMB. Among the obtained results, it was found that 8.60% entered the field between 2005 and 2008, 17.10% between 2009 and 2012, 46.80%

between 2013 and 2016, and 27.70% between 2017 and 2020. Additionally, the ma-jority of them studied Information Systems (42.6%), followed by Computer Engineering (25.5%), Systems Analysis and Development (10.6%), Computer Science (10.6%), and others. Therefore, it is evident that the majority of these women have completed their studies and, as previously shown in the data from Table 2, are engaged in paid activities in the private sector.

In this regard, more than half of the women who participated in the research did not receive any scholarships (53.2%). It was observed that 19.1% of them had FIES (Student Financing Fund) scholarships, 14.9% had PROUNI (University for All Program) scholarships, and the remaining 12.8% had other types of scholarships (Table 2). With these data, it is evident that those participants who did not receive any scholarships studied at private universities (63.8%) or public universities (36.2%) (Table 3) – the factor of free education may have influenced their choice of public universities. Therefore, the data from Table 2 align with those presented in Table 3, regarding the higher education institutions attended by the participants.

Table 2.

If the participants have or had a scholarship.

Has or had a scholarship	%
PROUNI (University for All Program)	14,9%
FIES (Student Financing Fund)	19,1%
Other type of scholarship	12,8%
Did not have a scholarship	53,2%
Total	**100%**

Note: Prepared by the authors (2020).

Table 3.

Which educational institution the participants study or studied at.

Institution attended or studied at		%
Private	Cesupa	8,6%
	Estácio FAP	29,8%
	FACI	4,2%
	UniNassau	4,2%
	IESAM	6,4%
	UNAMA	10,6%
	Total in Private	**63,8%**
Public	IFPA	6,4%
	UFPA	25,6%
	UFRA	4,2%

	Total in Public	36,2%
Total		100%

Note: Prepared by the authors (2020).

Among the reasons for choosing the higher education institutions, the following were mentioned: a) the institution being public, and therefore free; b) its reputation; c) being a federal institution; d) family reference; e) inability to gain admission to a public institution; f) lower tuition fees; g) being one of the few public institutions offering the course; h) the course curriculum; i) being the institution that offered the scholarship; j) being the only institution that offered FIES. As illustrated in the word cloud below (Figure 1), the participants' reports/testimonies were systematically analyzed, and based on the recurring responses, the larger words represent the central motivations for these women to enter the field. In a similar study conducted in Porto Alegre, by Flores (2013), it was found that the majority of the interviewees attended public institutions and studied Computer Science. This differs somewhat from the reality in Belém, which had a higher number of women graduating from private higher education institutions.

Figure 1.

Motivations for enrolling in IT and computer science courses in Belém and surrounding areas (PA)

Note: Prepared by the authors (2020).

Motivations for Course Enrollment

In order to identify the motivations behind women's enrollment in IT and computer science courses, the participants were asked whether they had any prior knowledge of the field before starting their respective courses. The results showed that 57.4% did not have any prior knowledge, while 42.6% did (Table 4). Among those who reported having some form of prior

knowledge, they were asked where that knowledge came from. It was found that 25.4% acquired it through technical courses, 8.6% were self-taught, and 8.6% gained it from computing activities in school (Table 5). These data indicated that, overall, the participants in the study entered the courses with some motivation, as they chose the courses for reasons other than having extensive knowledge of the field. The fact that the majority of the women did not have prior knowledge aligns with the findings of Quirino et al. (2018), reflecting the challenging paths that women face, as they are not encouraged to study or pursue careers in STEM fields.

Table 4.

Did the participants have any prior knowledge in the IT field before enrolling in the course?

Prior knowledge	%
Yes	42,6%
No	57,4%
Total	**100%**

Note: Prepared by the authors (2020).

Tabela 5.

Prior knowledge derived from:

Prior knowledge derived from:	%
Computing activities in school	8,6%
Technical course	25,4%
Self-taught	8,6%
No prior knowledge	57,4%
Total	**100%**

Note: Prepared by the authors (2020).

Furthermore, when asked about the main reasons for choosing the field, with the option to choose multiple responses, the results were as follows: 74.5% felt they had an affinity for the course content, 72.3% saw good earning possibilities, 38.3% were encouraged by family members, friends, and/or teachers, 21.3% mentioned knowing a woman who studied or worked in the field as one of the reasons for their choice, and finally, 4.3% revealed a liking for mathematics and knowing that it would be used in the course (Table 6). According to Cunha, Miranda & Rambo (2020), various studies have shown a significant increase in the number of women pursuing STEM courses, reflecting changing paradigms regarding women's roles. However, despite these advancements, female representation in these courses is still lower, in percentage terms, compared to male students.

Table 6.

Reasons for the participants' choice of the field:

Reasons for the choice:	%
Thought I had an affinity with the course content	74,5%
Saw good possibilities for remuneration	72,3%
Was encouraged by my family, friends, and/or teachers	38,3%
Knew a woman who was studying or working in the field	21,3%
Liked mathematics and knew it would be used within the course	4,3%

Note: Prepared by the authors (2020).

To understand if the participants had any fears or doubts prior to choosing the course, 74.6% responded "yes" (Table 7). Among these, the main sources of fear and doubt were (Table 8): the need for technology knowledge (59.6%), doubts about what they would learn in the course (46.8%), fear of poor academic performance (46.8%), concerns about not being successful in their careers due to gender bias in the field (46.8%), fear of feeling isolated as it is a predominantly male-dominated field (31.9%), fear or doubt due to not knowing any or very few women studying or working in the field (27.7%), doubts or fears about the need for extensive mathematical skills (21.3%), and fear because they were not encouraged to pursue the course by anyone they knew (14.9%). In Flores' study (2013), 50% had doubts about what they could learn during the course, and 43.1% had doubts about the need for prior knowledge of technologies and programming languages.

Table 7.

If the participants had fear and/or doubts before choosing the course.

Fear or doubts	%
Yes	74,6%
No	25,4%
Total	**100%**

Note: Prepared by the authors (2020).

Table 8.
If the participants had fear and/or doubts before choosing the course.

Fear or doubts	%
I didn't know or knew very few women who studied/worked in the field.	27,7%
I wasn't encouraged by anyone I knew to pursue the course.	14,9%
I had doubts about what I would learn in the course.	46,8%
I was unsure/fearful about the need for extensive mathematics knowledge.	21,3%
I was unsure if I needed to have technology knowledge.	**59,6%**

I feared feeling isolated as it's a predominantly male-dominated field.	31,9%
I feared not performing well academically.	46,8%
I feared not being successful in my career due to gender bias and prejudice against women in IT and computer science.	46,8%

Note: Prepared by the authors (2020).

According to Loch, Torres, and Costa (2021), factors that may discourage women from pursuing careers in STEM fields can start as early as childhood, when girls are given toys related to household chores and caregiving (Margolis & Fisher, 2002), which can limit or delay their cognitive and emotional development in these areas. Consequently, important aspects in STEM fields, such as spatial awareness, computational and mathematical skills, and the study of natural phenomena (physics and chemistry), can be seriously hindered. The lack of encouragement in these areas is perpetuated by family, schools, society, and universities, leading women to believe that they are not suited for technological careers. Additionally, Loch, Torres, and Costa (2021) highlight that the experiences shared by female researchers can shed light on the difficulties faced in balancing family, motherhood, and career responsibilities.

Motivations for Course Abandonment

Regarding the motivations for course suspension, abandonment, or withdrawal, 70.2% of the participants indicated that they felt demotivated after enrolling in the course (Table 9). When cross-referencing the question about demotivation with the type of institution the participants graduated from, it was found that demotivation occurred in both private and public institutions, proportionally to the number of respondents (Graph 1). According to Christie et al. (2017), the focus group technique revealed that informants were influenced in their choice of STEM courses by psychological factors such as low self-esteem. Despite having the skills and competencies to study the subjects, they expressed feeling insecure due to a lack of encouragement during secondary education (Christie et al., 2017). This issue, from another perspective, reflects the study by Cunha, Miranda & Rambo (2020), which observed that female representation tends to decrease as the level of qualification increases.
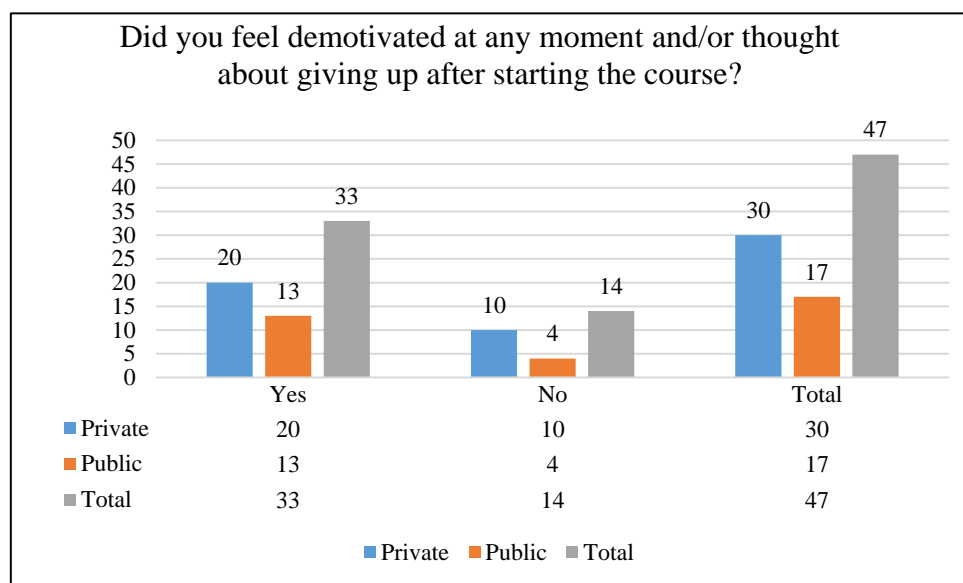
Table 9.

After enrolling in the course, did the participants feel demotivated or consider giving up?

Demotivacion	%
Yes	70,2%
No	29,8%
Total	**100%**

Note: Prepared by the authors (2020).

Graph 1.

Relationship between the type of educational institution (IES) and demotivation after enrolling in the course reported by the participants.

Did you feel demotivated at any moment and/or thought about giving up after starting the course?

	Yes	No	Total
■ Private	20	10	30
■ Public	13	4	17
■ Total	33	14	47

■ Private ■ Public ■ Total

Note: Prepared by the authors (2020).

In this regard, among the main reasons for demotivation (Table 10), 38.3% felt isolated because there were few women in the course, 29.8% mentioned the "jokes" made by teachers that they considered inappropriate, 25.5% considered the "jokes" made by classmates inappropriate, 17% felt isolated due to the behavior of male classmates in the course, and 14.9% reported experiencing prejudice from classmates and/or teachers simply because they were women in a predominantly male field. In a similar study conducted by Avolio, Chávez, and Vílchez-Román (2020), besides other factors, feelings of isolation, competition among students, and prejudice against women in the field also emerged as sources of demotivation, as these factors affect the psychological well-being of these women, according to Christie et al. (2017).

Table 10.

Contributing factors to demotivation in relation to the course environment.

Main factors for demotivation:	**%**
Being a target of prejudice from classmates and/or professors.	14,9%
Considering the jokes made by professors as inappropriate.	29,8%
Considering the jokes made by classmates as inappropriate.	25,5%
Feeling isolated due to the behavior of male classmates in the course.	17%
Feeling isolated because there were few women in the course.	38,3%

Note: Prepared by the authors (2020).

The demotivations experienced during the course had consequences for 59.5% of the participants (Table 11). The notable consequences were: 21.3% dropped out of the course, 17% suspended the course for one or more semesters, 17% passed but believed they would have performed better if they had been motivated, and 14.9% abandoned or canceled one or more subjects (Table 12). Flores (2013), on the other hand, identified that 50% of the participants in their study believed they would have performed better if they had been motivated, and 19.32% abandoned or canceled more than one subject. According to Paredes-Walker (2020), building support networks among women working in these fields is of paramount importance, as sharing experiences can provide coping mechanisms. Furthermore, institutional initiatives play a crucial role in defending and protecting female students and professionals in these areas, as well as encouraging and setting precedents for other women.

Table 11.

Were there any consequences resulting from the demotivation?

Were there any consequences resulting from the demotivation?	%
Yes	59,5%
No	40,5%
Total	**100%**

Note: Prepared by the authors (2020).

Table 12.

If yes, what were the consequences of the participants' demotivation?

Consequences of demotivation:	%
I took a leave of absence for one or more semesters.	17%
I dropped/canceled one or more courses.	14,9%
I obtained passing grades, but I believe I would have performed better if I were motivated.	17%
I gave up on the course.	21,3%

Note: Prepared by the authors (2020).

Based on the extensive literature review, Avolio, Chávez and Vílchez-Román (2020) note that the factors influencing women's access to STEM careers are diverse, complex, and sometimes inseparable. These factors can vary depending on the life stages and social and cultural contexts in which women find themselves. Avolio, Chávez and Vílchez-Román (2020) systematized these factors into five categories: **1) individual factors**, which are external variables based on women's agency, i.e., their ability to interpret, assimilate, redefine, and/or reproduce; **2) family factors**, which involve the transfer of knowledge, norms, and values previously constructed in society within a social relationship, often with blood relatives; **3)**

educational factors, which are related to institutional and educational pedagogical issues, as they involve the transmission of knowledge among people and are also social factors; **4) social factors**, which are socio-cultural constructions of groups transferred through social relationships; and **5) economic factors**, which include women's involvement in labor activities.

Finally, according to Quirino et al. (2018), it is crucial to highlight that despite the achievements of women in non-traditional fields such as STEM, gender segregation within occupations remains persistent, especially when examining the wage disparities between men and women in the same positions. In other words, although some women are breaking societal norms, there is still a tendency for them to choose professional paths different from men, which are often undervalued in terms of professional and economic recognition.

Final Considerations/Conclusions

Gender equity has been widely discussed in the technological world, as it is a predominantly male-dominated field, despite its significant female historical contributions. Female involvement in technology continues to be overlooked and sometimes suppressed, even though the first algorithm was created by a woman, Ada Lovelace, and the calculations performed by Katherine Johnson enabled the United States to win the space race and land on the moon. However, the lack of interest in this part of history and male hegemony contribute to the definition of professional areas in the technology field, resulting, among other factors, in significant female dropout rates in courses associated with this field.

Given this scenario, the present study aimed to understand the possible and main causes of the low number of women in Information Technology and Computer Science courses in institutions of higher education located in Belém and the surrounding region, focusing on female students or professionals in the field. In an attempt to achieve this goal, the socioeconomic profile of the participants was initially outlined as follows: women over 30 years old, single, self-identified as mixed-race, residents of the municipality of Belém, and all engaged in some form of remunerated work. Furthermore, to comprehend the motivations that led these women to enroll in IT and/or computer science courses, it was found that they were motivated by the institution's free tuition, the course curriculum, and having applied for scholarships. Moreover, the reasons for their choice were related to their affinity with the course content, the potential for good remuneration, encouragement from family, friends, and/or teachers, and the issue of female representation, as they knew women studying or working in the field.

Regarding the reasons why these women suspended, abandoned, or dropped out of IT and/or computer science courses, issues related to sexism, sexual harassment, prejudice, discrimination, and questioning of female cognitive capacity or intellect were identified. Many participants expressed feeling isolated due to the scarcity of women in the course and also due to the behavior of male classmates, being uncomfortable with "jokes" made by professors and classmates, and ultimately being targets of prejudice for being women in a predominantly male field, with their sexual orientation sometimes questioned. All of these issues lead many women to internalize the belief that the field of technology is exclusively masculine, as it is often considered a toxic and therefore inhospitable environment for women.

Therefore, it is understood that representation is a fundamental element for overcoming stereotypes and paradigms, as well as encouraging girls to pursue careers in these fields. It demonstrates that women are capable of performing physical work, solving complex mathematical equations, and addressing operational issues within corporations. In this context, strategies that promote the presence of more women are increasingly necessary. These strategies can assist teachers, researchers, and institutions in implementing initiatives that strengthen education and address the issue of women's attrition in these courses. These matters can also serve as subjects for further investigation and actions in university outreach projects within higher education institutions.

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