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**Social vulnerability and gender inequality in professions:
reflections on extension actions for specific audiences**

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Abstract. This article reflects on social vulnerability and gender inequality in Brazil, in general and in Exact Sciences professions, based on data from the Atlas of Violence in Brazil, research on the workforce in the area of Information and Communication Technology, and bibliographic survey on gender research in relation to the Exact area professions. From these data, the aims of Goiás Federal Institute (IFG) regarding the extension actions are described and a proposal for women in vulnerable situation and the professional area of Computing is presented. Partial results from the Women in Informatics course are also described. Despite having opened 50 vacancies, only 28 were filled. The course is in its fourth month of execution and has 20 students. The initial follow-up shows that although there are many women that need reintegration in the labor market, it is still necessary to develop strategies for their interest and maintenance in a computer course. It is noteworthy that, the Extension is the dimension of work in the higher institution, that has the potential to dialogue with the external community, meeting the demands of specific groups through short-term training, enables the human and technical training of collaborating university students, and also works with institutional disclosure.

Keywords: social vulnerability; Gender inequalities; Information and Communication Technology Profession; Extension Courses; Ongoing Courses.

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**Гендерное неравенство и социальная уязвимость
в трудовой деятельности: анализ усилий по расширению
для конкретных профессий**

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Аннотация. Статья посвящена вопросам социальной уязвимости и гендерного неравенства в Бразилии в целом, и, в частности, в сфере занятости в области точных наук. Для анализа взяты данные «Атласа насилия в Бразилии», исследований трудовых ресурсов в области информационных и коммуникационных технологий и библиографических обзоров по гендерным исследованиям профессий, относящимся к научно-техническим областям. На основе этих данных описаны цели Федерального института Гояс (IFG) по поддержке таких работников в целом и, в частности, меры по усилению защищённости женщин, занятых в области компьютерно-коммуникационных технологий. Такая поддержка создаёт для высших учебных заведений новые возможности в сфере взаимодействия с обществом, обеспечивает краткосрочный тренинг отдельных социальных групп, а также общественную и техническую подготовку студентов университета, создавая при этом большую открытость вуза.

Ключевые слова: социальная уязвимость; гендерное неравенство; профессии в области информационных и коммуникационных технологий; курсы повышения квалификации; текущие курсы.

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Social Vulnerability and Inequalities. Brazil, despite the intense period of economic development between 2004 and 2012, in which educational and welfare policies were expanded in order to improve the possibilities of the lower classes to have access to training services, from 2014 the country began to stagnate and recession that in terms of social

vulnerability have led to the return of worrying indices.

Although social vulnerability indices (SVI) in Brazil showed significant improvements between 2000 and 2010, after 2012, they started to stagnate and, in 2014, increased again (Rocha, Cury, Marguti, Costa, 2015; Rocha, Cury, Marguti, Costa, 2017). This

scenario indicates that it is necessary to maintain and expand social policies and programs related to this theme, aiming at the social improvement of groups living in extreme poverty in Brazil:

Even with significant advances, by disaggregating this information, we can observe the latent inequalities between black and white, women and men, or individuals living in rural or urban areas, indicating the different faces of inequalities to different extracts of our society (Rocha, Cury, Marguti, Costa, 2017: 19).

Differences in color, gender and geographical occupation lead to worse indices in some cases. For example, it is known that the rates of pregnancy among women, family mothers and adolescents between 10 and 17 years old are still high (7%) in Brazil (Rocha, Cury, Marguti, Costa, 2015). In addition, we highlight the 8% illiteracy of people over 15 years and 9% of people between 15 and 24 years who do not study or work, and have a per capita household income equal to or less than half the minimum wage.

In the case of Brazilian women, from 2000 to 2010, SVI for women decreased by 28% from high to medium vulnerability (Rocha, Cury, Marguti, Costa, 2017). From 2010, these indices improved in the Center-South of Brazil and the country began to integrate the category of low vulnerability. However, when specifically analyzing the Income and Work dimension, it is observed that there is a gradual increase in the female presence in the world of work, but without the guarantee of equitable gender equality in professional environments. These data reveal “the persistent inequality among men and women in the labor market and, consequently, at still significant levels of women's vulnerability in Brazil” (Rocha, Cury, Marguti, Costa, 2015: 89).

In addition, data from the Atlas of Violence in Brazil show that in ten years (2006-2016) the rate of women slaughter, that is, feminicídio, increased 6.4% and the state of Goiás is among the three federal units with the highest rates in the country. The relationship of

social vulnerability to fatal violent acts can be seen in the fact that “a fatal victim has often been the victim of a number of other gender-based violence, for example psychological, property, physical or sexual violence. That is, many deaths could be prevented, preventing the fatal outcome if women had had concrete options and support to get out of a cycle of violence”¹.

To deal with situations of violence and female social vulnerability, it is necessary to go beyond to the expansion of social assistance and support programs for women, the proposition of “life alternatives for women”, which surely includes training and professionalization. For this reason, we highlight Objective 4 of the violence prevention agenda in Brazil: “To ensure a qualified and an equitable inclusive education, and to promote lifelong learning opportunities for all”² can collaborate with the formation of women and their restart in a professional and a life alternative.

Considering the need for training that could give employability conditions to women in vulnerable situations, a survey was made about the professional areas that have less participation of women and, at the same time, have a growing demand for professionals. In this survey, there is much gender inequality in the professions related to information and communication technologies (ICT). Thus, the next section discusses gender inequality in the professions in general and in the area of ICT.

Gender inequality in the professions.

Regarding the importance of Digital Information and Communication Technologies (DICT) for current and future professional areas, we can mention the BNCC (Common National Curriculum Base) which, by recognizing its relevance, indicates DICT knowledge as essential competences to be

¹ IPEA. Institute of Applied Economic Research. Atlas of Violence in Brazil. Brazilian Security Forum in Brazil. 2018. Brazil

² IPEA. Institute of Applied Economic Research. Atlas of Violence in Brazil. Brazilian Security Forum in Brazil. 2018. Brazil

learned since Basic Education, that is, twelve years of study:

Understand, use and create digital information and communication technologies in a critical, meaningful, reflective and ethical way in various social practices (including school) in order to communicate, access and disseminate information, produce knowledge, solve problems and exercise protagonism and authorship in life personal and collective³.

The importance of DICT is increasing worldwide, as their scientific and technological advances have led to changes in people's way of life, and in social and work relations. More and more activities as well as many professions demand digital technology knowledge to accomplish something. In Brazilian society, after the 1990s, DICT had their importance in professional, citizenship and even leisure terms distinguished because the Brazilian government put in place various incentives for these specific purposes. On the other hand, the more digital production requires more professionals in the field. Currently, there is already a serious shortage of professionals in this area around the world and this is expected to worsen due to the low numbers of undergraduates in the ICT area, despite the fact that economy of information is growing (Laudon, K.C., Laudon, J.P., 2006)⁴. Therefore, there are actions around the world encouraging the participation of women in ICT and engineering. It is known that the male demand itself for these courses will not be able to meet the professional demand that is in

intense advance due to the rapid technological development of the digital area.

When analyzing the problems of gender inequality, female social vulnerability and the demand for professionals in the use of ICT, the situation is very bad, because women are historically stigmatized as those who have lower intelligence to work in this area. It is known that the number of women in the labor market has increased⁵, but their performance in the area of Exacts is still small. Such a situation can be seen within IFG campus Inhumas itself: there are only 3 female students all over the 80 undergraduates distributed in the eight groups for the Bachelor of Information Systems. Some research. (Chassot, 2011; Barreto, 2014; Bolzani, 2017; Cunha, Peres, Giordan, Bertoldo, Marques, Duncke, 2014) show that the strongest reasons for that situation are social, historical and cultural, which makes feasible the development of strategies that can collaborate with the change of prejudiced thinking regarding to women working in these areas.

Regarding the scientist profession, the researchers represent almost half of the CNPq records, however, when the evaluation is by areas, the Human and Biological Sciences concentrate around 74% of them, leaving around 26% in the Exact Sciences (Chassot, 2011; Barreto, 2014; Bolzani, 2017; Cunha, Peres, Giordan, Bertoldo, Marques, Duncke, 2014). This phenomenon is repeated in North America and Europe, but over the years in those continents the number of women has exceeded that of men in some areas, while it has remained way below in the Exact Sciences.

The causes of this gender-related inequality in professional practice may be associated with a number of reasons, but it is noteworthy that women have not been encouraged to study and work long ago, and even less so in areas which deal with instruments or calculations, for example. There are cultural factors that have long separated girl

³ Brazil. MEC. Ministry of Education. Common National Curriculum Base (BNCC). Approved on December 20, 2017. Brazil <http://basenacionalcomum.mec.gov.br/a-base/> (accessed on March 08, 2018)

⁴ Softex. Association for Promoting Excellence in Brazilian Software. Observatory Thematic Notebooks: Labor Market and IT Training. 2013a. Brazil.s <https://www.softex.br/inteligencia/#cadernostematicos> (accessed on December 18, 2018); Softex. Association for Promoting Excellence in Brazilian Software. Observatory Thematic Notebooks: Information Economy and Internet. 2013b. Brazil <https://www.softex.br/inteligencia/#cadernostematicos> (accessed on December 18, 2018)

⁵ IBGE. Brazilian Institute of Geography and Statistics. Central Business Register Statistics. Rio de Janeiro. 2017. Brazil

and boy activities, exercises and toys, creating stereotypes and prejudices. (Cunha et al Cunha, Peres, Giordan, Bertoldo, Marques, Duncke, 2014: 408) explain that while boys receive more stimulus to deal with instruments associated with the male world, such as tools, cars, machines, computers and others, girls go through a differentiated socialization process and are more encouraged to deal with issues concerning health, education and well-being, which end up becoming part of their future interests.

For Chassot (Chassot, 2011), it is the historical and cultural process of humanity with limiting interests for women that hasn't offered them freedom of expression and performance, which has had religion as the root for these limits. Another reason that cannot be ruled out, according to this same author, is the biological one - maternity, because it involves specifically feminine tasks such as pregnancy and lactation, for example, can prevent women from work for a long period, making it difficult for her return and her integration. Given historical, cultural and biological reasons, the fact is that stigmas of women's inability to deal with mathematics, space issues, and exact science subjects in general have been consolidated throughout human history, making it even today women believe in this insufficiency, which influences their choices during life.

Aires et al (Aires, Mattos, Oliveira, Britto, Aragão, Alves, Coelho, Moreira, 2018) pointed out that high school girls considered the following barriers for choosing Exact Science courses: chauvinism and the belief that women are unable to deal with technology. In addition, Macedo et al (Macedo, Mattos, Vasconcelos, Martinazzo, Lopes, 2018) showed that women present far more arguments against the Exact Science area when compared to men and their choice for college education is influenced by the opinions of friends and family, that is, they are concerned with the opinion of society.

Surveys taken by IAB⁶ and ISACA⁷, which are specific to the IT sector, showed that female labor is less than 25% of the total. ISACA data also highlight the difficulty of companies to hire qualified professionals for this area.

Other researches in the area of IT (Santos, Canever, Frotta, 2011; Maquiné, 2017; Macedo, Mattos, Vasconcelos, Martinazzo, Lopes, 2018) corroborate the strength of historical influences and also show the various types of discrimination, illegitimation and humiliation that exist specifically to mark or hinder the tasks performed by women's. For example, there is gaslighting, which uses allegations of madness to devalue work done by women, and bropropriating, which simply dismisses work because it was performed by women (Aires, Mattos, Oliveira, Britto, Aragão, Alves, Coelho, Moreira, 2018).

These data demonstrate that working on the theme of women with professional practice in the Exact Sciences is a need beyond the market once it may help develop not only a less prejudiced society but also a more respectful one toward social welfare, which is directly linked to feelings that also fuel violence against women.

Given the scenario presented, gender inequalities in Exact Sciences become more relevant. Not only for the profession of scientist, but for the world of work in general, the absence of skilled labor affects the overall development of a society. The non-participation of women in these areas contributes to the lack of intelligence and innovation in the corresponding sector, contributing to the stagnation and decline of

⁶ IAB. Interactive Advertising Bureau Brazil. Alpha leadership and IT companies in the female universe. 2015. Brazil. <http://iabbrasil.com.br/a-lideranca-alfa-e-as-empresas-de-ti-no-universo-feminino/> (accessed on May 24, 2017)

⁷ ISACA. Information Systems Audit and Control Association. The future tech workforce: breaking gender barriers. 2016. United States of America. <http://www.isaca.org/info/2017-women-in-technology-survey/index.html> (accessed on May 25, 2019)

companies⁸. Women's participation in these areas can therefore lead to social and economic transformations, as they can contribute to their knowledge and even their different positions.

Besides the economic need, but not least, the struggle to reduce gender inequality in professional areas must continue to reduce prejudice and stigma in order to give women the right to participate and choose, to foster social inclusion and the diversity of ideas, surpassing choices based on biological gender or social pressure. If this is done in a way that is intertwined to social problems such as the number of women in vulnerable situations, one can collaborate with the mitigation of both problems. For this reason, the next section describes some actions of the Federal Institute of Goiás (IFG) due to the problems discussed above.

Federal Institute of Goiás (IFG) extension actions. The IFG aims at offering training for specific demands needed by the community through actions known as Extension Courses. These demands may come from public or private companies, associations and institutions, philanthropic or not. Extension courses have the prerogative of serving the community outside the IFG, through demands identified after discussing with the regional institutions. These courses are characterized as extension ones once their public comes from the external community and their demands.

IFG's current Institutional Development Plan (IDP) confirms its interest in pursuing the inseparability of teaching, research and extension policies and restates "institutional commitments to policies, programs, events and activities regarding inclusive education and also the respect for diversity". In addition, the IDP / IFG document attests to its goals the commitment to the society that surround its campuses. That includes everyone, not only its regular students in higher education:

– Developing extension activities in accordance with the principles and purposes of vocational and technological education, in articulation with the world of work and social segments, with emphasis on the production, development and dissemination of scientific, technological, environmental and cultural knowledge; (...)

– Maintaining constant dialogue with local productive, social and cultural arrangements through the institutionalization of teaching, research and extension projects, with the aim of training people allied with communities in the development of science and technology for social emancipation⁹.

Given the above mentioned IFG institutional objectives, around 22 extension courses have been or are being offered from 2014 to 2019 on the Inhumas campus. These actions have a workload of 41 to 160 hours of duration for diverse audiences and are mainly linked to the areas of Literature, Writing, English Language, Music, Information Literacy and Informatics. All these courses are free and have no cost to the population. Among all the courses, the one regarding women in vulnerable situations will be described as follow.

The extension course "Women in Computing". By considering the context of female social vulnerability and the high demand for IT professionals, some extension actions in IFG were offered specifically for the female public. Among all the courses, one of these actions was planned after the Social Promotion Secretary, one of the city hall departments, showed us their needs.

Regarding the knowledge related to Digital Information and Communication Technologies (DICT), it is known that they are demanded by different professions (Laudon, K.C., Laudon, J.P., 2006), that is, even if the women participating in the project do not choose to deepen their skills in such

⁸ ISACA. Information Systems Audit and Control Association. The future tech workforce: breaking gender barriers. 2016. United States of America. <http://www.isaca.org/info/2017-women-in-technology-survey/index.html> (accessed on May 25, 2019)

⁹ IFG. Goiás Federal Institute. Institutional Development Plan – IDP. 2018b. Brazil <http://www.ifg.edu.br/documentos/62-ifg/a-instituicao/11546-plano-de-desenvolvimento-institucional-2019-2023> (accessed on February 19, 2019)

professional area, they will have learned important knowledge and tools that will help them in any professional area.

After the delimitation of DICT as the main axis of the training, the course was planned within the conception of articulation between technical and human formation, aiming at the integral development of the students, which is aligned with the formative guidelines of the federal institutes¹⁰: Training “with a firm commitment to the integral development of the working citizen”. In this sense, the course project of the extension course called “Women in Informatics” was organized in 160 hours, distributed over ten months, with creative basic computer content, entrepreneurship, website creation and female empowerment. Creative basic computer science comprises the technical contents of the office package with interdisciplinary contextualized exercises whose themes highlight the technical relationships with society: a) Disposal of electronic waste; b) Digital crimes (cyberbullying, illegal sharing, etc.); c) Diseases due to overuse of DICT (nomophobia, digital nausea, addictions, etc.). The content of entrepreneurship, website creation and female empowerment deals with the professional interests of each student, encourages them to think about their professional reintegration and also relies on readings of themes that critically reflect the relationship between DICT and society.

The conception of formation that guides the teaching methodology of the course in question is the Historical-Cultural Theory (Luria, 2008; Vygotsky, 1998; Vygotsky, 1931; Vygotsky, Luria, 2007), which explains that human intelligence is not natural and this will be discussed with the participating women in order to give them motivation and strength for their own social transformation. According to Vygotsky (Vygotsky, 1931: 21), “(...) cultural development overlaps the child's processes of

growth, maturation and organic development, forming a whole with it. They are, in fact, a unique process of biological and social formation”. This means that the quality of education makes a difference in the overall development of the human being, as it may or may not develop one area or another. The author states that “teaching is not development, but the correctly organized teaching leads a child’s intellectual development by giving rise to processes that would be impossible outside of the education” (Guseva, Solomonovich, 2017: 776). L. Vygotsky explains that “natural processes are a function determined by artificial procedures. Natural processes apply where no artificial procedures exist and are employed to facilitate their use”¹¹.

Vygotsky (Vygotsky, 1998; Vygotsky, 1931) and Luria (Luria, 2008; Akhutina, 2013) explain that intellectual development is not born ready and also never stops: Formal instruction, which radically alters the nature of cognitive activity, greatly facilitates the transition from practical to theoretical operations. As people acquire formal instruction, they increasingly use categorization to express ideas that objectively reflect reality. The significance of schooling lies not only in the acquisition of new knowledge, but also in the creation of new motives and formal modes of verbal, discursive, and logical thinking divorced from immediate practical experience (Luria, 2008: 133, 178).

Formal instruction refers to schooling processes. It is through the appropriation of systematized knowledge, in activity, that man develops intellectual and motor capacities. This means that “the boost of intellectual actions takes place through the process of appropriation-interiorization of cultural mediators and their internal action modes which, when appropriated by the subject in activity, become internal means of mediation

¹⁰ Brazil. A new model of professional and technological education: Conceptions and guidelines. 2010. Brazil http://portal.mec.gov.br/index.php?gid=6691&option=com_docman&task=doc_download (accessed on February 19, 2019)

¹¹ Softex. Association for Promoting Excellence in Brazilian Software. Observatory Thematic Notebooks: Information Economy and Internet. 2013b. Brazil <https://www.softex.br/inteligencia/#cadernostematicos> (accessed on December 18, 2018)

between the subject and the world” (Costa, 2015). Research in Vygotsky’s social psychology thus proves that the frightening mathematical intelligence is not natural, but rather developed according to cultural participation. Thus, the technical and humanistic formation are critically and creatively contemplated.

The meetings of the course that work on female empowerment integrate actions such as lectures making the participating women aware that their intelligence can be developed throughout their lives, as they seek this type of study and training action. Such meetings also include dynamics with the campus social worker to help the female audience rethink their situation, their decision-making power. The course, Women in Computing, had 50 places available, but only 28 were filled. The follow-up during the course shows that although there are many women with reintegration needs in the market, it is still necessary to develop strategies for their interest and maintenance in a course in the area of Informatics. The most diagnosed problems are related to the vulnerable situation, such as single mothers, mothers with young children and no place to leave the child. More than half of those enrolled, 55%, are between 22 and 39 years old and had completed, at most, until high school. Internet every day via cell phone. In addition, 76% stated their interest in the areas of Human or Biological.

It is also noteworthy that the extension courses provide significant impacts on the formation of IFG students who participate in them as fellows. The IFG encourages the protagonism of the students of the baccalaureate, undergraduate and technical courses supporting the extension actions, because in these actions, they have the opportunity to consolidate technical-scientific knowledge learned in their original course, as well as to have contact with social issues, local and global manifestations in your region. Thus, Extension is understood as an educational principle that enriches the education of university students, while broadening the ways of serving the local society and reaffirming the

institution's purposes as open to the needs of its surroundings. In the last two years, 15% of extension students sought higher education courses to continue their education at the institution. This collaborates with the area of the course and shows that it served as dissemination of the other training offered by the institution.

Final considerations. Considering the relationships between violence, gender inequality, social vulnerability¹² (Rocha, Cury, Marguti, Costa, 2015; Rocha, Cury, Marguti, Costa, 2017) and the importance of DICT¹³ (Laudon, K.C., Laudon, J.P., 2006), for professional inclusion in any area, as well as the IT workforce deficit in the world, the extension action presented during this text contributes to the training and formation of young women in poverty situations and to the articulation with the world of job. As for training to be specific to a group of women in vulnerable situations, in the case of the State of Goiás, it is a relevant action, given to the fact that it is one of the Brazilian states that presents the most violence against women. In this sense, the importance of this type of action is evident for the general development of students and local transformation. Moreover, the specific focus of this action contributes to the deconstruction of the prejudices and myths that have consolidated throughout human history regarding the inferiority of female intelligence.

Another important benefit that should be highlighted is the dissemination of institutional actions through extension action, which brings credibility to the community and opens space for future projects in partnership with other institutions. Finally, the analysis of the data presented proves the need not to abandon, in Brazil, investments in social assistance policies and public education, at all levels, since there is

¹² IPEA. Institute of Applied Economic Research. Atlas of Violence in Brazil. Brazilian Security Forum in Brazil. 2018. Brazil

¹³ ISACA. Information Systems Audit and Control Association. The future tech workforce: breaking gender barriers. 2016. United States of America. <http://www.isaca.org/info/2017-women-in-technology-survey/index.html> (accessed on May 25, 2019)

a large portion of the population that needs this kind of assistance, including for improving their qualification and support their reintegration into the labor market. Moreover, investments in education are a sine qua non condition for social relocation, consequently, influencing the rates of development and violence in the country.

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