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HARPIAS - STIMULATING WOMEN TO ENTER AND STAY IN ENGINEERING IN BRAZILIAN AMAZON

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Abstract. *Programs stimulating women's entrance and permanence in Science, Technology, Engineering and Mathematics (STEM) areas are fundamental to reduce the gender gap in those fields. This paper describes actions made by Harpias, an extension program developed at the Federal University of Southern and Southeastern Pará (UNIFESSPA), a university located in the Brazilian Amazon. The project is built by a female coordinator professor of the Mechanical Engineering Faculty and volunteer female students of different engineering courses. Most of the volunteers are black women who entered the university with affirmative actions. Two of them are mothers. Harpias meet once a week. The activities developed in the first semester of 2023 were: 1) Presentation of UNIFESSPA to a public high school. Many high school students did not know that UNIFESSPA was free before the presentation. Boys were less inclined than girls to continue their studies after high school. Girls were less interested in STEM areas than boys. 2) A guided visit of the high school students to UNIFESSPA. Although boys and girls were both invited, only girls went to the visit. The activity was also relevant to the Harpias' volunteers because many have not been in some of the visited laboratories before. 3) Online lecture with the first woman to graduate in mechanical engineering at UNICAMP. 4) Online meeting with STEAMS-UFGA, an extension project situated in Belém, the capital of the state of Pará.*

Keywords: *Women in engineering, university extension, STEM in high school education.*

1. INTRODUCTION

Women are underrepresented in science, engineering, technology and mathematics (STEM): globally, they are 35% of undergraduate students of STEM and 29% of students graduating in Engineering (UNESCO, 2018). This tendency also is observed in Brazil, and the under-representation often is accentuated during college: women tend to evade engineering courses more often than men (Lombardi, 2016).

Oliveira *et al.* (2019) systematized papers about initiatives aimed to stimulate girls to pursue STEM careers. There were elective courses, summer camps, visits to industries, and projects with universities. Those initiatives achieved their goals, but Oliveira *et al.* (2019) reinforced the necessity to accompany the girl's entrance into higher education and their permanence. Quantitative research does not reach social aspects in professional choices, such as the contribution to family budget or the impact of motherhood (Oliveira *et al.*, 2019).

Lombardi (2016) listed the justifications for the gender gap in Brazilian engineering cited in scientific papers, conference proceedings, master dissertations, and Ph.D. thesis published in Brazil between 2000 and 2016. Those were: firstly, the different socialization of boys and girls, which affects their professional choices. Secondly, the pedagogical practices of engineering courses - which reproduce gender inequalities and turn women away due to harassment, feeling of not belonging, and limitations of the type of work developed.

Salminen-Karlsson (2016) attribute the difficulties women face in the academy to homosociality: the bonds that men build between each other and exclude women. Work decisions considered to be only meritocratic run through internalized prejudice, and the exclusion of women from places where the decisions are taken informally (such as pubs and hallway talks) prevents women's career progress.

The debate about socialization and homosociality is also brought by Faulkner (2001), but she opposes the liberal feminist vision that claims that changing socialization would be enough to attract more women to engineering. Faulkner (2001) defends that the cause of the male predominance in engineering is the symbolic association between masculinity, technology, and power. Women believe they do not know how to deal with technology, although they coexist with it. Masculinity is associated with fewer emotions, more objectivity in problem-solving, and better abstract mathematical thinking. Such characteristics also are attributed to engineering. Femininity, on the other hand, is associated with subjectivity, emotion, and more holistic problem-solving. Male engineering stereotypes turn women away at the same time that the abilities re-

quired in the daily activities performed by an engineer may be much more "feminine" than the stereotype supposes (e.g.: linguist ability necessary to programming). Engineering courses use to be based on math problems without social context, which is unreal. Faulkner (2001) reinforces that technology is never only technical or only social and rejects that there is a "male way" or "female way" to be an engineer, but shows that a holistic and empathetic vision - that is usually related to the female - may be really useful to engineering, and that both men and women that try to use those characteristics in engineering tend to be repressed.

Including more women in engineering is important for social justice and innovation. Since most technologies are developed by men, men tend to be considered as standard for humankind, which may result in products and processes that are not suited for women or not standard men. It is important to emphasize that being a woman is not enough to guarantee that the technology developed will attend to women's needs. Both men and women should be educated on gender issues. Also, several other characteristics affect how a person relates and is benefited from technology: race, social class, the presence of a deficiency, and age are examples (Schiebinger and Klinge, 2013).

Costa *et al.* (2021) point that the organization of groups of women students of engineering may create a supporting network between the students and stimulate the development of actions that benefit not only the students but all the university and the community. Sharing experiences with other groups that have activities aimed at gender equality in STEM is part of a strategy to achieve success in this goal (Salminen-Karlsson, 2016). This paper describes the first semester of activity of Harpas, an extension project aimed to stimulate the entrance and permanence of women in engineering at the Federal University of Southern and Southeastern Pará (UNIFESSPA), a university located in the Brazilian Amazon.

2. FEDERAL UNIVERSITY OF SOUTHERN AND SOUTHEASTERN PARÁ

The Federal University of Southern and Southeastern Pará (UNIFESSPA) is a public (therefore free) Brazilian university located in the Brazilian Amazon. It was created in 2013, during a university expansion and interiorization made by the Worker's Party government, from the dismemberment of the Marabá Campus of the Federal University of Pará (UFPA) (Gumiero and Lopes, 2023). UNIFESSPA is committed to regional development since its creation, and it has different types of affirmative policies in its admission processes: like all Brazilian federal universities, 50% of its freshman are selected from public schools, between people of color, indigenous, disabled people, and people with low incomes. Additionally, UNIFESSPA stimulates the ingress of students from the cities nearby its campuses giving 20% bonuses in admission grades for candidates not benefited from other affirmative policies and who studied at least one year of high school in cities that are considered UNIFESSPA's influence zone (UNIFESSPA, 2023c). Although Brazilian superior education has historically been related mostly to the economic elites, 2018 data unveils that UNIFESSPA students predominantly graduated in public high schools. 80% of them had low incomes and 83.2% declared to be people of color (80.1% Black, 2.9% Indigenous and 1.7% Yellow). Brazilian educational divestment between 2018-2022 was particularly harmful to new universities such as UNIFESSPA because permanence aid policies are fundamental to avoid evasion (Gumiero and Lopes, 2023).

UNIFESSPA has a multi campuses structure, as is seen in Fig. 1. UNIFESSPA campuses are located in the cities Marabá (head office), Rondon do Pará, Santana do Araguaia, São Félix do Xingu, and Xinguara, and influence the neighbor cities and states (UNIFESSPA, 2023b). UNIFESSPA has over 40 undergraduate courses. The Harpas project is developed in UNIFESSPA Campus II, Marabá, where most of engineering courses are taught: civil engineering, computer engineering, materials engineering, mining and environmental engineering, electric engineering, mechanical engineering, and chemical engineering. Besides the engineering courses, geology and information system are also taught in UNIFESSPA Campus II (UNIFESSPA, 2023a). A detailed description of the gender demography of UNIFESSPA engineering courses is out of the scope of this work, but there is a general perception in classrooms that women are outnumbered by men in most of the engineering courses.

3. THE HARPIAS PROJECT

3.1 First Version

The Harpas project was created at the end of 2022 by a female professor of UNIFESSPA's Mechanical Engineering Faculty, based on previous personal experience in a feminist collective of engineering students (Costa *et al.*, 2021), and on a similar project developed in UFPA (Mattos *et al.*, 2023). The first version of the project was entirely based on the concept of gendered innovations: a methodology that considers sex and gender in all the phases of technological development (Schiebinger and Klinge, 2013). The general objective was to engage undergraduate engineering female students and high school girls in making gendered innovations, contributing to the dissemination of technological knowledge and the development of sustainable and socially responsible technologies. The specific objectives were to popularize the gender innovation concept and the holistic vision of engineering problems; to engage undergrad engineering students and high school girls in the appropriation and dissemination of technological knowledge, and to increase the number of women that enter and graduate in engineering courses at UNIFESSPA.

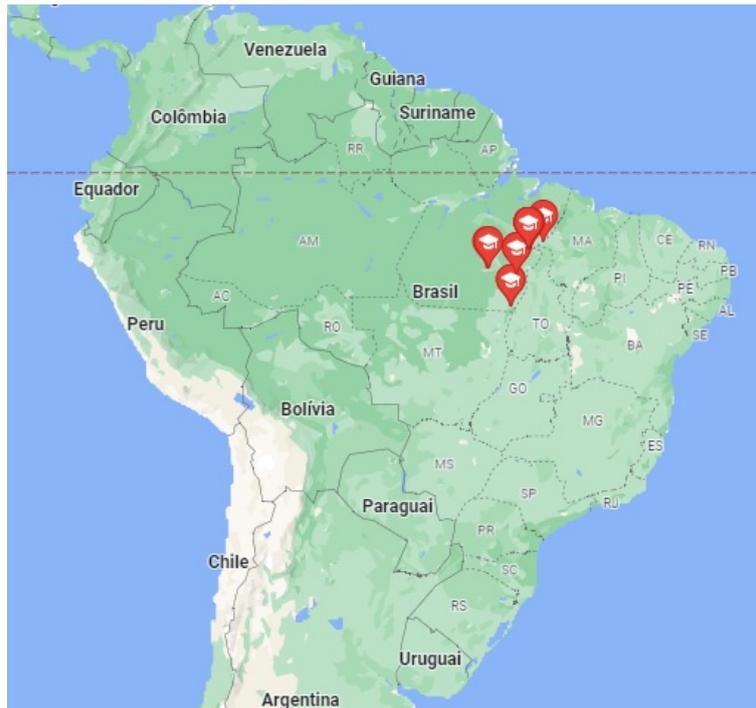


Figure 1. UNIFESSPA campuses (Google, 2023).

The proposed methodology consisted of the selection of 5 to 15 volunteer female engineer students, the selection of a partner public high school, recruiting of 15 to 45 female high school girls, and the implementation itself, which would consist of weekly 3 hour meetings between the high school and undergrad students and the coordinator professor. A roadmap was proposed for the meetings: in the first meeting, students and the coordinator would be invited to introduce themselves and to talk about their relationship with science and technology, and also to think about the science social role and how gender is related to science and technology. For the second meeting, the students would be invited to bring examples of problems that need technological solutions, and inspiring scientific projects. At the same time, the coordinator would present the concept of gender innovations and some examples. Students could divide into teams according to their interests. The third meeting would be brainstorming in which students may think about which technological project they would like to develop. From the fourth meeting on, the projects would start to be made, considering implementation strategies and which knowledge and materials would be necessary for their execution. Students would be stimulated to be independent, at the same time that the coordinator would accompany the evolution of the ideas and enable the theoretical tools for the project's development. An open event to the society would end the year.

The developed project could be of different types, such as:

- Socialization of knowledge: students decide to bring some technical knowledge to groups that usually do not have access to it. E.g.: teach women to fix cars or bikes, and teach housewives to fix house appliances. It is important to reinforce that the students do not need to know previously the knowledge that they want to share: internal workshops could be done before the socialization.
- Socialization of technology: students will help to bring some technology to a group that does not have access to it. E.g.: studies of viability to improve urban public transport, and studies to improve accessibility. Maybe the project could not be implemented during the year, but it should be publicized to not be only theoretical. E.g.: press or municipal councilors could be contacted.
- Technological innovation: students could propose improvements to an existing technology, or the development of a new one. Technology would be developed as much as possible during the year (calculus, project, prototype), and after the students would be stimulated to proceed to work on it in young scientists programs or even graduation.

The original name of the project was *Aplicação de inovações de gênero para estimular ingresso e permanência de mulheres nas engenharias*, that can be translated as "Applications of gendered innovations to stimulate women to enter and stay in engineering". The name was considered too long to be remembered, then the short name Harpias was proposed by the volunteer undergraduate students during a brainstorm in the second weekly meeting. It mean Harpy in Portuguese and is a reference to the large birds that lives in the Amazon and are known to be smart, powerful, and agile.

3.2 First Volunteers' Profile

The project was approved by the Mechanical Engineering Faculty and by the Geosciences and Engineering Institute of UNIFESSPA. In January 2023, the first selection of female engineering student volunteers took place. Ten students applied: 3 of them studied mechanical engineering, 3 studied chemical engineering, 2 studied computer engineering, 1 studied materials engineering, and 1 studied electrical engineering. The different composition of courses suggested that the divulgation of the project, made by posters in classrooms and laboratory buildings and WhatsApp groups, was effective.

The racial/ethnic classification used in the inscription questionnaire was made according to the Brazilian Institute of Geography and Statistics (*Instituto Brasileiro de Geografia e Estatística*, IBGE), that presents the options *preto* (black) and *pardo* (brown) to the self-declaration, but groups both *preto* and *pardo* as black people to develop statistics and public policies. The terminology yellow was used to describe Asian people according to IBGE classification as well (IBGE, 2021). Eight of the students that applied declared to be brown, one declared to be black and one declared to be white. This racial distribution is similar to the general distribution of UNIFESSPA students, where 65.2% of the students are brown, 14.9% are black and 16.6% are white (Gumiero and Lopes, 2023). Two of the candidates are mothers.

90% of the Harpias' candidates entered UNIFESSPA using the 50% places reserved for affirmative actions. Since this was the first selection, it was not possible to determine if this proportion discrepancy was due to natural statistical fluctuations in small samples (there are few female engineering students at UNIFESSPA) or if it is a tendency that should be further analyzed. All the candidates were interviewed. One of them declined the project due to time incompatibility, and the other 9 started the weekly meetings with the coordinator.

3.3 Visit to a Public High School

Besides the weekly meetings, the first activity to be developed by the volunteers was a visit to a high school to recruit girls. A public high school was selected due to its proximity to UNIFESSPA Campus II (600 m). A meeting with the school coordinator unveiled that most of students did not take the Brazilian test used to ingress university, ENEM. This information stimulated a change in the original project plans: instead of only recruiting girls, it was considered important to divulge UNIFESSPA to all the high school students, both boys and girls. Then, a 20 minutes presentation and pamphlets describing UNIFESSPA's courses, admission processes, affirmative policies, extracurricular activities, and scholarships were developed by the students and the coordinator. The pamphlet can be seen in Figure 3.

The selected school only has high school classes at night. Two visits were made to Harpias on two nights to talk with the eight high school classes. Figure 2 is a photo taken in one of the visits.



Figure 2. Harpias presenting UNIFESSPA at high school

A questionnaire was developed to discover students' demographic characteristics and career interests, to evaluate if the presentation had brought the students new information, and to collect names and contacts to schedule a visit of the students to UNIFESSPA. The demographics questions intended to discover some factors related to gender and the relationship with technology: race and the presence or absence of deficiency (Schiebinger and Klinge, 2013). The racial/ethnic classification used followed IBGE (2021). The questions made to evaluate demography and the information received were:

1. Are you () Man () Woman () Other/ I would rather not answer

2. You declare yourself as White Black Brown Indigenous Yellow
3. You are studying 1st year 2nd year 3rd year
4. What do you intend to do after finishing high school? (You can check more than one option)
 Study on college
 Study a technical course
 To work
 Other
5. If you intend to go to college: What major do you intend to study?
6. Have you ever heard about UNIFESSPA before the presentation? Yes No
7. Did you know that UNIFESSPA was free before the presentation? Yes No
8. Before the presentation, did you know that UNIFESSPA gives a bonus in admission grade to people that live in Marabá and the region? Yes No
9. Before the presentation, did you know that UNIFESSPA has programs to help low-income people to maintain themselves during college? Yes No
10. Are you a disabled person? Do you need any support during the visit?

The further questions were about name, e-mail, WhatsApp, and time for the UNIFESSPA visit and to meet Harpias.



Figure 3. Pamphlets distributed in the high school visit.

It was not mandatory for the students to answer the questionnaire. 106 students answered it. Figure 4 presents the proportion between men and women that answered the questionnaire. It unveils that the majority of the answers were obtained from girls. Although it is impossible to prove the reason for this, Harpia's members think that it may have been motivated by the fact that only female undergraduate students made the presentation.

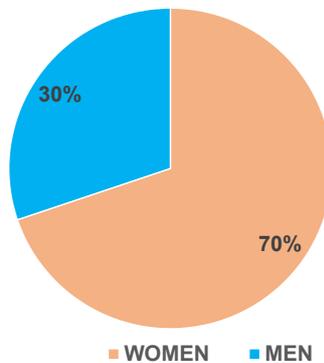


Figure 4. Gender of the high school students who answered the questionnaire

None of the students who answered the questionnaire declared to be disabled. Figure 5 presents the racial declaration of the high school students divided by gender. Most of the high school students who answered the questionnaire are brown (61% of the boys and 59% of the girls), followed by black students (28% of the boys and 21% of the girls), and white students (12% of the girls and 7% of the boys). Indigenous and yellow students correspond to less than 5% of the students who answered the questionnaire. This racial distribution is similar to UNIFESSPA's student racial distribution, presented in subsection 3.2 (Gumiero and Lopes, 2023).

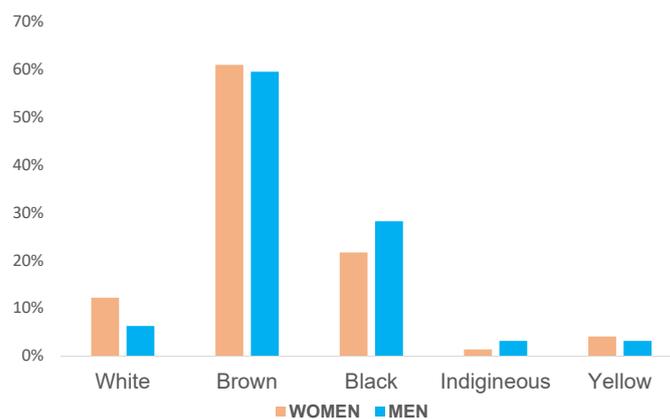


Figure 5. Race and gender of the high school students who answered the questionnaire

67.6% of the girls and only 28.1% of the boys who declared they want to study at college after finishing high school. Considering that the students who answered the questionnaire studied in the same school and have similar racial distribution, further questionnaires would be necessary to understand the reason for the gender discrepancy in college education interest. All the girls who declared that do not want to study at college after high school also declared they wanted to go to a technical course (32.4% of total girls). On the other hand, some boys not interested in college declared that want to go to a technical course (43.8% of total boys), but 28.8% of the boys did not declare interest in further education after high school. 41.9% of girls and 53.1% of boys declared to want to work after high school. Brazilian income increases with schooling. Black and brown men have smaller average-incomes than white women in Brazil (IBGE, 2023). Since most of the schoolboys are black and brown, their choice not to continue on formation can decrease their possibilities of social

ascension. Even though Harpias is a project initially aimed to stimulate girls and women, the participants understand that are several other factors than gender that may exclude people from engineering. Harpias considers important to fight all types of social discrimination.

Several areas of interest were mentioned by the high students who answered the questionnaire: administration, agriculture, visual arts, engineering, architecture, law school, English, psychology, medical school, electromechanics, gastronomy, criminal expertise, physical education, nursery, nutrition, and Federal Road Policy (PRF) Concourse. Not all those areas are college majors, as asked in the questionnaire, but this unfamiliarity with college careers may be justified by the fact that the questionnaire was made in the first months of the school year when the end of school is still far even from the senior students. Also, 80% of the students who answered the questionnaire are not seniors in high school. Figure 6 presents the careers of interest divided by gender.

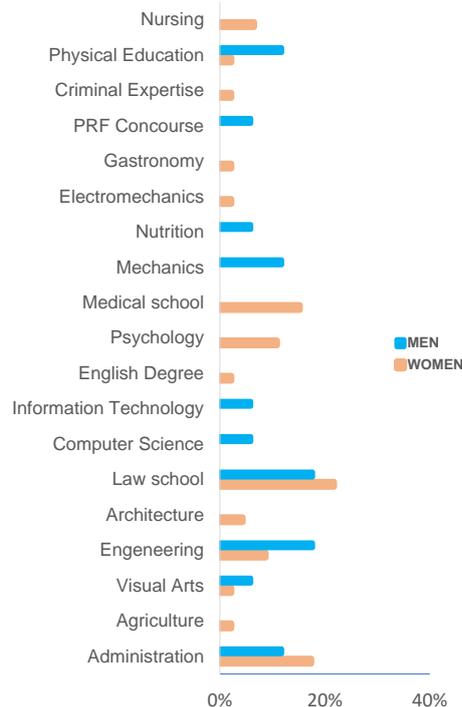


Figure 6. Careers of interest of the high school students who answered the questionnaire, divided by gender.

As can be seen in figure 6, the girls that answered the questionnaire have less interest than the boys to enter in engineering and technological careers. The career choice is not a biological factor, but cultural. As pointed in the introduction, gender equality in STEM areas is important for social justice and innovation (Schiebinger and Klinge, 2013). The relative small interest of the girls who answered the questionnaire reinforce the importance of the existence of programs aimed to stimulus girls to pursuit those careers.

13.5% of girls and 18.8% of boys who answered the questionnaire said they had never heard about UNIFESSPA before. The number is small, but significant if the fact that UNIFESSPA is a free public university located only 600 m away from their school is considered. Most of the students (64.5% of the girls and 68.8% of the boys) did not know that UNIFESSPA is free. The students were also not familiar with affirmative access actions (87.8% of the boys and 84.3% of the girls did not know about the bonus in grade for Marabá students) and with permanence policies (81.5% of the girls and 68.8% of the boys did not know that UNIFESSPA has programs to help low-income people to maintain themselves during college). Those results reinforce the importance of extension projects that divulge public universities.

3.4 Other activities developed and ongoing activities

After the first visit to the school, the high school students were invited to visit UNIFESSPA. Whatsapp numbers were requested in the questionnaires, but several students did not have cellphones, which made the contact harder and highlighted the importance of better knowing the target audience of extension projects. Both boys and girls were interested, but the visit happened on a rainy day and only girls showed. The visit was considered interesting by high school students,

undergraduate students, and even by the project coordinator professor because visits were scheduled in laboratories of several different engineers and it was considered a chance to know different areas. All the volunteers had made part of their graduations during the COVID-19 pandemic and had missed presential activities.

After the first visit, the coordinator professor had to spend two weeks away from the Campus due to other work obligations. During this time, two online activities were developed. The first one was a meeting with the project STEAMS-UFPA, located in Belem, the capital of Pará. Figure 7 is a screenshot of the reunion. This meeting was important to share experiences and to begin a partnership. An online workshop between the two projects is scheduled for the second 2023 semester. STEAM volunteers are going to teach Harpias how to build a biodigester that can be presented in high schools.

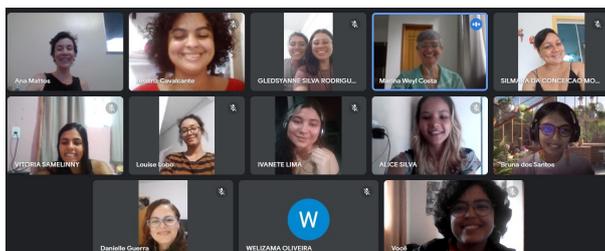


Figure 7. Online meeting between projects: Harpias and STEAMS UFPA.

The second event was a lecture with Prof. Ph.D. Marcia Mantelli, the first woman to graduate in mechanical engineering at UNICAMP and reference in thermosciences. In the lecture, Prof. Mantelli inspired students by telling her personal history and showing her research topics (Mantelli *et al.*, 2023).

After the second visit to the school, Harpias decided not to repeat the visit to UNIFESSPA yet due to construction on campus. This time, the high school girls were invited to join the meetings in UNIFESSPA. Three went to the first meeting, two in the second, and only one in the third. It was evaluated by Harpias members that maintaining weekly meetings with the high school girls would be difficult, and a better approach would be to propose monthly activities. In the meantime, Harpias participated in a career fair in other public school and presented the project and UNIFESSPA (Harpías, 2023).

The summer holidays started in high schools and now Harpias weekly meetings are focusing on readings and talking between undergraduate students. Two books were already read: "*@Descolonizando Saberes. Mulheres Negras na Ciência*" (Pinheiro, 2020) and "*Mulheres na Engenharia: Desafios e Oportunidades no Ensino, Pesquisa e Extensão em STEAM*" (Tonini and Perereira, 2023). The first one (Pinheiro, 2020) presents examples of contributions from black people to STEM and biographies of black scientist women. The second (Tonini and Perereira, 2023) is a collection of successful programs aimed to stimulate women in STEM. The readings increase the academic knowledge of the students and bring ideas to Hapia's actions. Talking is considered important to vent and build bonds. A conversational event between all the female engineering students of UNIFESSPA is being planned.

The number of participants in the project fluctuates around 10 due to new students wanting to join and others having to quit the project due to other commitments. The project got an extension program scholarship and has approved for a related research scientific project to qualify the debate developed and try to get more scholarships in edicts. It was a first semester full of activities and apprenticeships, and the project is still at its beginning.

4. CONCLUSION

This paper presented the first semester of activity of Harpias, an extension project aimed to stimulate the entry and permanence of women in engineering. The original goal of the project was to unite college and high school women to use gendered innovations to build a technology aimed at society. Although the project has not reached its original objective - the adhesion of high school students is still low and the projects involving gendered innovations have not begun yet - the weekly meetings between the female engineering students and the project coordinator, the lecture with a successful female professor and the online meeting with other extension program aimed to stimulus women in STEM made Harpias succeeded in the organization of female engineering students, the building of a support network, and work network between UNIFESSPA students and students and professionals of other universities.

The first two visits to a public high school unveiled that several students do not know that UNIFESSPA is free, that boys may be less inclined than girls to continue studying after high school, and that girls are less interested in STEM areas than boys. This reinforced the importance of projects that stimulate girls to pursue STEM careers, but also of projects that divulge public universities' access and permanence policies and stimulate black and brown boys and girls to enter college.

The apprenticeship of this first semester made Harpias expand their goals, that now are:

1. Create a support network between female students;
2. Promote a professional network between students and women working in industry and academia;

3. Introduce UNIFESSPA to public high school students and encourage girls to study engineering;
4. Disseminate knowledge about gender innovations;
5. Engage secondary and higher education students in the development of technologies aimed at society.

Harpías considers that female protagonism is important and that women's movements may move the world.

5. ACKNOWLEDGEMENTS

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6. REFERENCES

- Costa, M.W., Lopes, P. and Francisco, R.A.A., 2021. "Descortinando cenários de formação, construindo modos de subjetivação: origens e efeitos do coletivo feminista mulheres na engenharia UFSC". In *XII Seminário Internacional Fazendo Gênero*.
- Faulkner, W., 2001. "The technology question in feminism: A view from feminist technology studies". In *Women's studies international forum*. Elsevier, Vol. 24, pp. 79–95.
- Google, 2023. Google Maps, <https://www.google.com.br/maps/search/unifesspa/@-6.493812,-50.9580085,6.25z?entry=ttu>. Accessed 10 June 2023.
- Gumiero, R.G. and Lopes, A.M.T., 2023. "A interiorização do ensino federal superior na Amazônia: os impactos da UNIFESSPA no Sudeste do Pará". *Revista Brasileira de Planejamento e Desenvolvimento*, Vol. 12, No. 2, pp. 587–612.
- Harpías, 2023. "Visitas Harpiás". <https://www.instagram.com/stories/highlights/17935575644663726/>. Accessed 06 July 2023.
- IBGE, 2021. "Desigualdades sociais por cor ou raça no Brasil". <https://www.ibge.gov.br/estatisticas/sociais/populacao/25844-desigualdades-sociais-por-cor-ou-raca.html>. Accessed 28 June 2023.
- IBGE, 2023. "Síntese de indicadores sociais". <https://www.ibge.gov.br/estatisticas/sociais/educacao/9221-sintese-de-indicadores-sociais.html>. Accessed 28 June 2023.
- Lombardi, M.R., 2016. "Por que são tão poucas?": um estado da arte dos estudos em "engenharia e gênero". *Textos Fundação Carlos Chagas, Relatórios Técnicos (49)*, São Paulo, pp. 1–48.
- Mantelli, M., Pereira, I. and Costa, M.W., 2023. "Dos sonhos à profissão - minha trajetória. harpiás convidam profa dra Márcia Mantelli". <https://www.youtube.com/watch?v=atn7QrlrXD0t=4s>. Accessed 06 July 2023.
- Mattos, A.P., Guerra, D.R.S., Silva, M.A.P.S., Silva, R.S., Costa, M.W. and Pereira, A.A., 2023. "Oficinas em STEAM por alunas da UFPA para educação básica e ensino médio: um mecanismo de inclusão e representatividade feminina na engenharia". In *Mulheres na Engenharia: Desafios e Oportunidades no Ensino, Pesquisa e Extensão em STEAM*.
- Oliveira, E.R.B.d., Unbehaum, S. and Gava, T., 2019. "A educação STEM e gênero: Uma contribuição para o debate brasileiro". *Cadernos de Pesquisa*, Vol. 49, pp. 130–159.
- Pinheiro, B.C.S., 2020. @ *Descolonizando saberes: mulheres negras na ciência*. Editora Livraria da Física.
- Salminen-Karlsson, M., 2016. "The FESTA handbook of organizational change: Implementing gender equality in higher education and research organizations".
- Schiebinger, L. and Klinge, I., 2013. "Gendered innovations - how gender analysis contributes to research". *European Commission - Directorate General for Research Innovation*.
- Tonini, A.M. and Perereira, T.R.D.S., 2023. *Mulheres na Engenharia: Desafios e Oportunidades no Ensino, Pesquisa e Extensão em STEAM*. COBENGE.
- UNESCO, 2018. "Decifrar o código: educação de meninas e mulheres em ciências, tecnologia, engenharia e matemática (STEM)".
- UNIFESSPA, 2023a. "Consulta de cursos - graduação". <https://rumoaos10anos.unifesspa.edu.br/component/content/article/63-historia/100-hist%C3%B3rico.html?Itemid=10https://sigaa.unifesspa.edu.br/sigaa/public/curso/lista.jsf?nivel=Gaba=graduacao>. Accessed 10 June 2023.

UNIFESSPA, 2023b. “Histórico”. <https://rumoaos10anos.unifesspa.edu.br/component/content/article/63-historia/100-hist%C3%B3rico.html?Itemid=101>. Accessed 10 June 2023.

UNIFESSPA, 2023c. “Sisu 2023: Confira o cronograma de inscrições e mais informações sobre como concorrer às vagas na unifesspa”. <https://www.unifesspa.edu.br/noticias/6510-sisu-2023-confira-o-cronograma-de-inscricoes-e-mais-informacoes-sobre-como-concorrer-as-vagas-na-unifesspa.html>. Accessed 28 June 2023.

7. RESPONSIBILITY NOTICE

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