

Experience of the I Workshop Women in Tech Occidente-Costa Rica (WITO 2019): a study of undergraduate students

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Abstract—The Information and Communications Technologies’ market has been growing, and organizations around the world have been joining the great concern about the women’s under-representation in programs related with science, technology, engineering and mathematics areas. This situation has led to the proposal of initiatives in distinct institutions to promote an increase in the participation of women. This article describes the experience of carrying out the I Workshop Women in Tech Occidente-Costa Rica (WITO 2019), which was attended by the fourth-year undergraduate female students of the bachelor’s degree program in Informática Empresarial from the Sede de Occidente of the Universidad de Costa Rica. This workshop was focused on identifying: student fears, skills, interests and how the program and university services could be improved. Main results showed that: (i) students do not feel completely prepared for the office environment, (ii) the university must improve the support provided to students in topics such as sexual harassment, ergonomics labs and complementary services, and (iii) participants consider that stereotypes should disappear, and gender equality can generate better results for organizations. Finally, this kind of activity encourages the empowerment of female students and it also inspires them to be role models.

Index Terms—women, STEM, gender equality, undergraduate students, role model, workshop

I. INTRODUCTION

Researchers from different areas and disciplines around the world [1], [10], [30], have been studying not only the women representation in careers related to science, technology, engineering and mathematics (STEM) [5], but also analyzing the women’s participation in research in Ibero-America [2]. Nearly two decades ago, the women participation panorama in computer science

program reflected a decrease in the number of women graduating from a Bachelor’s degree program [6].

Nowadays, the scenario reflects that women’s under-representation in STEM fields continues, while there is a call to strongly encourage higher education institutions, private companies, non-profit organizations, and governments to develop and consolidate strategies that allow more women to access and actively participate in disciplines such as computing science [26].

Institutions have joined that call and have directed efforts to reduce the gender gap. For example, the World Economic Forum (WEF) since 2006 has published the Global Gender Gap Report. In the 2018 edition, this report evidenced the existing gap in Artificial Intelligence (AI) skills, as well as the need to reduce the gap with more specialization in STEM areas. [13].

Similarly, in 2015 different countries around the world adopted the well-known 2030 Agenda for Sustainable Development [28]. This agenda presents 17 Sustainable Development Goals. The goal 5 indicates “Achieving gender equality and empowering all women and girls.” Therefore, it seeks to eliminate situations that negatively affect the integrity of women, and also to promote and increase their participation and access to Information and Communications Technologies (ICT).

The Ministerio de Ciencia, Tecnología y Telecomunicaciones de Costa Rica (Ministry of Science, Technology and Telecommunications of Costa Rica, MICIT) has created a *National Policy for promoting equality between men and women for the development, employment and appropriation of Science, Technology, Telecommunications, and Innovation* [24]. This study provides a pre-

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liminary diagnosis about the inequality in the women participation in science and technology areas compared to men. MICIT also provides support to the strategies for equality at school, family, and work environment [24].

In Costa Rica, studies have been carried out with the goal of knowing the situation of women participation in programs related to computer science in public universities in this country [23]. The obtained results agree in the need to promote actions that increase the participation of women, seeking to prevent them from not participating in these programs, a phenomenon also discussed by [21], [22].

The student work expectations of the Computer Science program at Universidad de Costa Rica (UCR) have also been studied [27]. Meanwhile, in [7] the labor expectations of men and women were identified, and the main factors for selecting Informática Empresarial program were determined. This study was conducted at Sede Regional de Occidente of the UCR, where the results showed that the percentage of graduated women (68.94%) was higher than that of men (57.64%), during the first 12 years of this millennium [7].

In the same Sede de Occidente (Recinto de Grecia), a study was carried out to find out why only a few women enroll in Informática Empresarial program [25]. In this study there was participation of students from high schools located near the Recinto. The results showed that female students are more interested in health related programs, they have no knowledge of their engineering skills, and do not know the benefits of studying an engineering program [25]. On the other hand, male students have inclination for engineering programs [25].

Several studies concluded that activities for under-graduated women stimulated, inspired, decreased feelings of isolation and renewed the commitment to study programs related to computer science [9], [17]. Therefore, it has been decided to carry out the I Workshop Women in Tech Occidente (WITO) at Sede de Occidente to offer an activity aimed at female students of the Informática Empresarial program. The objective of this workshop is to share experiences, show role models, motivate and empower the participants.

In this paper, we aim to present the method and the results obtained by carrying out I WITO 2019. In this workshop, the participants were female students of the bachelor's degree in Informática Empresarial (IE) from the Recinto de San Ramón and the Recinto de Grecia, who are in their last year of program. The workshop was focused in 4 main issues: (1) know women who have been role models, (2) identifying fears, concerns and bewilderment about work environment, (3) determine

their skills to contribute in a teamwork, and (4) provide suggestions to improve the services that are offered to the female students in both the program and the university.

The rest of this paper is organized as follows. A brief explanation of the University of Costa Rica is presented in Section II. Section III explains the proposed method to develop the workshop. Section IV presents the results obtained and the analysis. In Section V, discussion is presented. Finally, Section VI concludes the paper and define future research topics.

II. UNIVERSIDAD DE COSTA RICA

The UCR was created in 1940 through Law No. 8098, and it is one of the five public universities of Costa Rica. The UCR is the oldest, largest and most distinguished institution in Costa Rica according to international standards, such as QS Latin America University Rankings 2018¹ and Webometrics Ranking of World Universities². The main campus of the UCR is the Ciudad Universitaria Rodrigo Facio, which is located in San Pedro de Montes de Oca, in the Capital City.

The UCR has six regional campus distributed in different country regions. These campuses are: Sede Regional de Occidente (Recinto de San Ramón and Recinto de Grecia, also know as Recinto de Tacaes), Sede del Atlántico (Recinto de Turrialba, Recinto de Paraíso and Recinto de Guápiles), Sede de Guanacaste (Recinto de Liberia and Recinto de Santa Cruz), Sede del Caribe, Sede del Pacífico, and the Sede Interuniversitaria de Alajuela. In addition, it is in the process of incorporating the Recinto de Golfo Dulce as Sede Regional del Sur, according to the Consejo de Área de Sedes Regionales agreement CASR-11-2019 (March 1, 2019). All the aforementioned campus are located in distinct Costa Rica's regional territories, as can be seen in Figure 1.

This article focuses on the Sede de Occidente (Occidente campus), considering women studying the bachelor's degree in Informática Empresarial, including its both "Recintos" (Recinto de San Ramón and Recinto de Grecia).

III. METHOD

A. Participants

The workshop involved 12 undergraduated female students (average = 23 years). These students were invited by email. Out of 13 invited students, 12 confirmed their attendance, 6 from Recinto de San Ramón and 6 from Recinto de Grecia. 10 out of 12 students live in the

¹www.topuniversities.com

²www.webometrics.info/en/Latin_America



Figure. 1: Campuses of the Universidad de Costa Rica. Source: Ibux Sánchez

Occidente zone of Costa Rica, another one in the Pacífico zone (who lives in the Occidente zone while studying) and one lives in the capital city: San José (who travels every day to the Occidente zone).

B. Methodology of the workshop

The workshop was held on Saturday, March 30, 2019 at Recinto de Grecia from 1:00 pm to 5:30 pm. A large room that allowed working in groups was used. The room had work tables, chairs, bluetooth speakers and a projector. Additionally, posters were put on the walls with messages from extraordinary women e.g. Lydia Huayllas, Rigoberta Menchú, Ann Makosinski, Grace Hopper, among others. The students of Recinto de San Ramón had to move to Recinto de Grecia, by means of official university transportation to attend I WITO 2019.

The workshop consisted of 6 activities:

- 1) **Welcome and lunch:** in this activity, a welcome greeting was given by the authors, the objectives of the workshop were explained and the different activities to be carried out were commented. Next, the lunch was served and each one of the participants introduced herself (1 hour).
- 2) **Current status of STEM women in the world and Costa Rica:** the following activity included two presentations about the status of women in STEM-related programs (30 minutes). The first presentation given by three students spoke about status of women in STEM programs and their participation in other activities for women. The second presentation focused on data and general statistics on women in STEAM around world. Finally, a video was shown to participants with a

welcome message from 4 women from other countries (Argentina, Bolivia, England and Finland).

- 3) **Creative activity (group):** 4 groups with 3 members were created (each group had members from Recinto de San Ramón and Recinto de Grecia). A theme was given to each group so they could develop it based on their experience. A name was assigned to each group by the members. The topics were:

- a) Fears, anxieties and bewilderment that they feel about work environment (name: Poder femenino - power girl).
- b) Suggestions to improve the services of the university and IE program (name= girasoles - sunflowers).
- c) Capacities that you can contribute in a work-group (Valkirias - Valkyries).
- d) Women who have motivated them to realize their dreams or aspirations (name: Fénix - Phoenix).

In the creative activity each group created a poster to transmit the message that they wanted to utter. The groups used physical materials e.g. colored paper, scissors, colored markers, rules, gum, Post-it, among others. Each group had 1:15 hour and the poster had to be designed in an original way. The Figure 2 shows the participants working in the design and creation of the poster.



Figure. 2: During the creation of the poster.

Also, during this activity the other groups wrote their comments and/or experiences of the topics

of the other groups, by means of a large sheet of paper placed on a wall (see Figure 3).

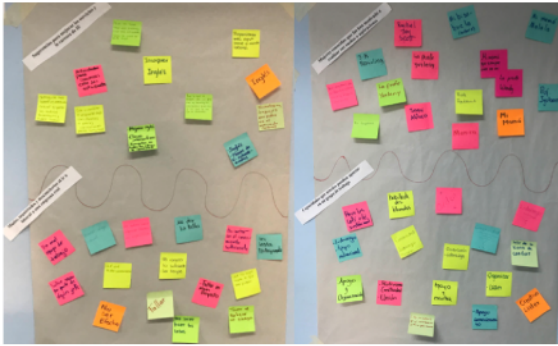


Figure 3: Other groups' opinions

- 4) **Presentation of the themes:** each group had 15 minutes to present their topic to other groups (see Figure 4). Also, during the presentation, the other groups could provide comments and ask questions (1 hour).



Figure 4: Presentations of the topics.

- 5) **what's next?:** this activity showed different Latin American women's activities related to STEM, such as "meninas" in Brazil and Latinity. Additionally, the experience of attending the Grace Hopper celebration in USA (biggest Celebration of STEM women in the world) was presented. Likewise, they were motivated to attend to each of these activities, and also to know the scholarships and opportunities for their participation. Finally, a video was shown (see Figure 5) with a motivational message from 4 Costa Rican women living in foreign countries (Switzerland, USA and Ireland), who are currently working or studying in computer related areas (30 minutes).



Figure 5: Video with a motivational message.

- 6) **Group photo and closing:** each of the participants was given a paper sheet to write who they are and what they wish to transmit to the world (see Figure 6). Finally, the group photo was taken showing the message of each one (15 minutes).

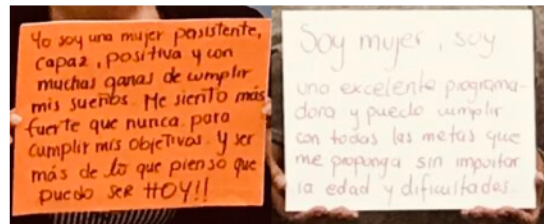


Figure 6: Messages.

The researchers took note during the distinct workshop activities.

C. Analysis

The information obtained from the posters, the presentations and the notes taken by the researchers was analyzed to identify common subtopics that emerged from each of the main topics assigned to the groups, following a methodology of thematic analysis [4].

IV. FINDINGS

The most important findings for each of the topics are presented in the following subsections.

A. Fears, anxieties and bewilderment that they feel about work environment

The issues that stood out were: *ignorance of the office environment, lack of knowledge, English and inequality.* Which are detailed below:

- 1) **Ignorance of the office environment:** they are afraid of not understanding how is the day to day

in a company, especially in the first months, where they can make mistakes or feel misplaced.

- 2) **Lack of knowledge:** one of the fears is not having the required knowledge to perform assigned tasks or not being capable to answer questions from other co-workers.
- 3) **English:** they believe that their English skills are not adequate, therefore, they may have problems to do their work.
- 4) **Inequality:** this issue is one of the most worrying to them, since they feel that can be discriminated against in their condition of being a "woman" e.g. companies would prefer to hire a man instead of a woman. In addition, they are afraid of having misogynist co-workers, as in college.

The poster had a drawing of a trash can (see Figure 7), the members of the group explained that it was to throw away their fears, anxieties and bewilderment.



Figure. 7: Poster of the Power-Girl group.

B. Suggestions to improve the services of the university and the IE program

The students named several situations that they consider to be against them when studying the IE program (see Figure 8). The students mentioned that due to the workload of the program, it is difficult for them to carry out sports activities. These activities can help them with their well-being, as well as allow them to reduce the stress produced by the program.

One of the aspects that worries students the most, is the lack of ergonomic equipment in computer labs, since they spend many hours in sit position and current equipment does not meet the optimal conditions to work properly e.g. they have waist pain.

Another issue is the low probability of winning a scholarship to study English, since UCR offers English programs with international agreements. The students

mentioned that their grade point average (GPA) is low because the program's requirements, and they must compete against the students of other programs, then they are disadvantaged. Also, although English is very important in STEM programs, the IE program only has two English courses. Therefore, students feel that they have weakness in their English level and few opportunities to improve it.

Finally, the students commented that there have been cases of lecturers harassment towards the students. Also, they do not know the process to report these cases and they do not feel support from university authorities.

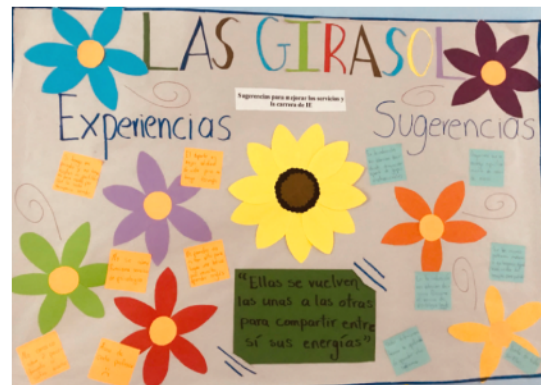


Figure. 8: Poster of the Sunflowers group.

With respect to the services of the university, the following deficiencies are presented: (1) The students do not get sanitary pads or pills for menstrual pain, either in the services of the university or in the commercial establishments within the university. The public commercial establishments near "Recintos" are at a long distance. (2) The process to access the psychological services offered by the university is not known.

C. Capacities that you can contribute in a working group

This group commented that women have a lot to contribute to work-groups such as creativity, communication skills and they are more compressing (see Figure 9). Another issue is that sometimes men are very competitive, and lose the work goal by wanting to "win", otherwise women rather try to improve the work environment. Likewise, it was indicated that there are no differences between the capacities of men and women to perform any task.

Finally, they indicated that in some courses, lecturers say comments to put women and men against each other. In other cases, offensive comments towards women are

said by lecturers. A female student mentioned that she keeps track of the offensive messages of a lecturer in a notebook.



Figure. 9: Poster of the Valkyries group.

D. Women who have motivated them to realize their dreams or aspirations

The mothers and grandmothers of the participants are sources of inspiration for their tenacity, encouragement, examples of life and support in their aspirations. Each of the participants shared a small story of that woman who fought for their dreams and goals, although it was not easy e.g. an indigenous woman who was orphaned when she was a little girl, and despite being alone and working since she was 5 years, she created a family. These stories filled the atmosphere with gratitude, dignity and pride.

On the other hand, participants also mentioned women who have inspired them, but who do not know. These women are: J.K Rowling, Frida Khalo, Ada Lovelance and survivors women from the Nazi Germany. Finally, they mentioned their desire to be a role model in the future. The poster of this group (see Figure 10), had the characteristic of being interactive, since each of the stories were hidden in flowers or in messages. Some students mentioned that computing female lecturers have also inspired them.

E. Opinions after the WITO 2019

An online survey was conducted in June 2019 to know the participants' perception of WITO 2019.

First, we want to identify if participating in the Workshop Women in Tech Occidente has influenced the personal, academic and/or social life of the participants. The 12 participants voted that it was positive and the main ways in which the workshop influenced were:

- 1) **Confidence in myself:** several participants mentioned that this activity increased their value in



Figure. 10: Poster of the Phoenix group.

themselves: *“it increased my self-confidence, my self-worth, to know myself better and to lose my fear of the workplace.”*

- 2) **Empowerment in the workplace:** the workshop stimulated the participants to feel motivated to face the work environment: *“Confidence in seeking an internship, and that I can achieve my goals ... and we learn more by leaving the comfort zone”*.
- 3) **My place in the STEM area:** the participants commented that sometimes they felt diminished in the area of technology, but that the workshop helped to believe in them as technological women: *“in giving me my place as a competent woman in the area of technology and that I can dream big even though sometimes I think I'm not completely prepared.”* In addition, the participants mentioned that they can support each other. One participant mentioned *“valuing female companionship ...”* and another said *“knowing that there are women who think in a similar way”*.

Out of 12 participants, 7 mentioned that they have increased their network of contacts after the workshop, and 11 participants felt inspired to participate in activities similar to WITO.

Finally, the participants mentioned that this type of activity should be carried out with whole female population by the students of Informática Empresarial program. Likewise, they were excited to meet successful women in the area of technology, one participant said *“it was an excellent opportunity, since I did not know that in my area of study there were many successful women, and it was beautiful to hear their messages of encouragement and overcoming.”*

V. DISCUSSION

We have developed the I workshop of women in Tech Occidente (I WITO 2019) to identify distinct aspects such as: fears, skills, services enhancements, and role models. These results can be used to improve the conditions and opportunities of the female students who study Informática Empresarial program, and who study other programs in the university as well. A discussion of the obtained results is presented below.

Regarding the first topic (fears, anxieties and bewilderment), students feel fear by facing the work/office environment, since they are going to go to an internship in 4 months. Also, they have concerns about not having enough skills to perform their job. It would be interesting to conduct a study to analyze if these fears are also felt by the male population.

Participants believe that they could be discriminated because companies prefer to hire men. Many companies are modifying their standards to have a gender equality policy such as having equality in terms of the amount of men and women working in companies (50/50 representation) [14], and legislation reforms to reduce the gender gap pay [29], are news that can motivate women to overcome these fears.

The results show that the level of English, which students have at the end of the program, is not the level required by companies related to STEM areas. Therefore, they feel that will be at a disadvantage to perform their work tasks. The literature mentions that English courses are essential in STEM programs, because it offers communication skills that are fundamental to success in any profession e.g. a job candidate with spelling and grammatical errors is perceived as careless [3]. Likewise, non-native English speakers present barriers with reading instruction materials, books, technical communication, reading and writing codes [15], and the ability to communicate effectively that will determine professional advancement and the potential for success [3]. Then, it is understandable that students feel weak in English communication skills, since they are not native speakers and only have two English courses in the program. It is important that the university provides the necessary skills, so that they can compete in the labour market without disadvantages.

The University of Costa Rica has the Centro de Investigación en Estudios de la Mujer (Center for Research in Women's Studies, CIEM³) founded 20 years ago. It is an interdisciplinary, action and reflection instance, to promote knowledge, with an integral gender perspective.

³<http://www.ciem.ucr.ac.cr>

Additionally, CIEM carries out activities to eradicate behaviors that may affect women, such as violence, sexual harassment, non-sexist language, inclusive curriculum and respect for women's diversity and human rights. However, the students of the Sede de Occidente mentioned that the university does not offer suitable support as female students, and in many cases they feel excluded. We believe that the role of CIEM is fundamental and very significant within society and the university. We also believe that its efforts should be directed and visualized to the Sedes of the Universidad de Costa Rica to offer its services to this student population.

Regarding the suggestions to improve the services of the university and the IE program, important aspects should be considered to increase gender equality in the study place. Recommended initiatives are including but not limited to the following ones:

- Removing barriers that prevent women from participating equally in the study place. Students feel that women are discriminated against by men (e.g. work teams), and occasionally, by women themselves.
- Changing study place culture to embrace gender equality. Workshops that include male students and lecturers should be carried out to raise awareness about gender equality.
- A comprehensive Ergonomic Injury Prevention program should be designed, disseminated and used. Occupational health and safety staff should prevent ergonomics disorders. Also, to promote employee and student health by reducing ergonomic risk factors, through the implementation of best practices.
- Sports activities and recreational programs must be extended, to contribute to an overall mental and physical health of the students [16]. It is recommended to incorporate these activities into classroom methodologies and promoting recreational services in the IE program.
- Procedures for reporting sexual harassment and accessing other university services must be strengthened. Despite the existence of an university regulation against sexual harassment [8], strategies must be put in place that provide clearer guidance about which steps the students should take in situations of sexual harassment. In addition, access to essential university services (e.g., counseling, psychology, or health) must be improved and disseminated.

In STEM programs, the vast majority of lecturers are men, invited speakers tend to be men and the role models tend to be men [9], but women respond better to female role models [20] and the absence of such models has

proven to be a discouraging element [17]. In our case, the students put only a female role model related to computing (Ada Lovelance), which suggests that they have a lack of knowledge of women in the area of STEM, their role and achievements. Some students mentioned that few female lecturers have encouraged them in college. Therefore, lecturers must visualize the work of women in STEM, make women's empowerment activities and dispel computing-career myths and stereotypes.

A positive issue is the support that they receive from a female member of their family to study computing. In 2001, three types of barriers faced by women to promote the area of technology were identified [19]. One of the barriers was *the educational problems and family characteristics*, because young girls are driven to be caregivers. However, this barrier is being minimized in our country, as mothers and grandmothers are encouraging women of their families to study programs unrelated to care. In addition, the students are proud of their mothers and grandmothers, who have had to fight for their dreams, overcome obstacles and who have transmitted empowerment to them.

Female students emphasize as a part of their interests that they have qualities that make them stand out and that they can be used not only at the academic but also at the business level, such as: way of thinking, emotional support, creativity, communication, organization, leadership, goal oriented, teamwork, among others. This could also be related to the aspiration that women also have to perform in high organizational positions [11].

Nevertheless, the focus on entrepreneurship and starting their own business, this was something missing in the student point of view. This aspect attracts special attention because the female involvement in entrepreneurial activity has been an important source of employment for women in different countries [18]. However, the obtained insight in our study is consistent with [12], where the participation of women in entrepreneurial engineering programs remains quite low.

VI. CONCLUSIONS AND FUTURE WORK

In this paper we have presented the results obtained in the I Workshop Women in Tech Occidente (WITO 2019). The results show that the UCR must provide better support to students regarding harassment and inappropriate comments from lecturers, as well as provide better guidance and adapt ergonomic equipment laboratories. In addition, it must encourage activities to the empowerment of female students. Also, the teaching-learning methodology should include more physical activities.

Lecturers must transmit to their female students support and the achievements of women in computing to be role models. Currently, one positive issue, is that a female member of the family had encouraged to students to study STEM-related programs. Finally, women have capacities that benefit work-groups, but the number of women is very low in the companies.

Carrying out a women activity motivated our female students to be future role models, to be confident, to express their opinion and to support each other. In this paper, we explained the workshop step by step, and encourage this activity to be replicated in other institutions and/or countries.

Our evaluation has several limitations that we would like to acknowledge. First, it is limited by its small size of participants. Second, the results cannot be generalized to the wider population, because the workshop was held in a specific region in Costa Rica. As future work, we first want to disseminate and raise awareness through showing the workshop's results. In addition, based on the results of this first workshop, we want to prepare II WITO 2020, including whole female students who study Informática Empresarial program at Sede de Occidente of Universidad de Costa Rica.

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