W-STEM: Building the future of Latin America: engaging women into STEM

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W-STEM International Leadership Summit World Café Report

Cartagena de Indias, Colombia, November 26th, 2O19

W-STEM Consortium

Amendment History

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1. Introduction

In the scope of W-STEM [1-6] ERASMUS + Capacity-building in Higher Education European Project (Ref. 598923-EPP-1-2018-1-ES-EPPKA2-CBHE-JP), the W-STEM International Leadership Summit was celebrated in Cartagena de Indias, Colombia on November 25-26, 2019.

One of the developed activities was a World Café with the primary goal of stimulating a collective brainstorming for suggesting for institutional strategies and actions for the next stage of the Erasmus+ W-STEM project.

The World Café conversation [7] is an intentional and structured way of creating a living network of conversation around key issues. It is a creative process methodology that leads to a collaborative dialogue, where knowledge is shared, and possibilities for collective action are created.

For the developed conversation, four tables were organized:

1. Public policies and institutional initiatives to promote the participation of women in STEM (Science, Technology, Engineering and Mathematics) fields [8], leaded by Alessandro Bello.
2. Institutional policies and strategies to promote the participation of women in STEM fields, leaded by Francisco José García-Peñalvo.
3. Strategies and mechanisms of ATTRACTION and ACCESS of young women to STEM careers, leaded by Rosaura M. Romero Chacón.
4. Strategies and mechanisms of GUIDANCE, RETENTION, AND PROMOTION of the scientific career for women, leaded by Ángeles Domínguez.

The general procedure for the development of the conversations was:

- The duration of the overall activity was two hours.
- Four groups of ten people were composed.
- Each table had questions to guide discussions. The facilitator was able to determine whether to expand some or add new dimensions.
- All the participants must contribute to all the tables. In the end, all must have passed through all the groups.
- The rotation was given every twenty minutes to make the table change.
- In the end, each facilitator had five minutes to share the main conclusions of his/her table.

The following sections wrap-up the most outstanding conclusions of each table.

2. Table 1: Public policies and institutional initiatives

This table was devoted to the public policies oriented to promote the participation of women in STEM fields and was leaded by Alessandro Bello (see Figure 1).

Figure 1. W-STEM World Café Table 1

This table conversed around four main questions:

1. Which are the key stakeholders to build public policies to support the participation of women in STEM?
2. What kind of bridges from public policies could support the work of the university?
3. How can universities feedback into public policies?
4. What are good examples of public policies that have had a good impact?

2.1. Which are the key stakeholders to build public policies to support the participation of women in STEM?

The different groups highlighted the need for a new paradigm and a more systemic approach to achieve structural changes and promote and achieve gender equality in STEM.

Different actors from governments to private sectors play an essential role in reducing the gender gap in STEM and in elaborating and influencing public policies, among them:

- Various government sectors, such as ministries of education, women's affairs or gender equality, science, technology and innovation, labour and agriculture.
- Governmental institutions at the local level.
- Research centres, both private and public.
- Universities (public and private) and schools from primary to tertiary.
- Industries, enterprises and the private sector.

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- NGOs (Non-Governmental Organizations) and other organizations of the civil society.
- International organizations, which, through incentives and norms, can have a direct impact on the government's policies and in influencing their agenda.
- Mass media and social networks, which play an important role also in changing social norms and stereotypes towards women in STEM and also support in increasing visibility of women scientists.

The group highlighted the importance of collaboration with multiple institutions at different levels. Thus, to ensure the effective implementation of policies and instruments, coordination between actors should be strengthened.

Long term plans and policies are crucial.

The use of enabling platforms could also support transforming policy into actions.

2.2. What kind of bridges from public policies could support the work of the university?

Governments through laws can support reducing the gender gap in universities and research centres. They can also support universities through resources to implement new programmes, reinforce the structure by creating offices in charge of gender equality in each institution as well as support universities through specific incentives.

Governments could impose universities the development of specific internal instruments and affirmative actions to reduce the gender gap in STEM, such as:

- Quotas (though this instrument should be implemented just during a transition phase).
- Additional points are given to women for stimulating the insertion of women in STEM.
- Link specific funds to the elaboration of gender equality plans.

2.3. How can universities feedback into public policies?

Universities can/should collaborate with governments to evaluate the impact of policies. They should also, through quantitate and qualitative research on the different facets of inequalities and on the benefits of reducing the gender gap in STEM, provide evidence to governments for building evidence-informed policies.

Strengthening collaboration among universities is also vital to have a more significant impact on policies and move forward towards the achievement of the SDGs (Sustainable Development Goals).

The elaboration of national policies on science, technology and gender equality is critical in a country, and universities play a central role in contributing to its development.

Universities should lobby to push for the implementation of specific laws focused on addressing the gender gap in STEM.

The offices in charge of gender equality should put pressure on rectors and deans so that they can advocate for changing to policymakers.

Universities can implement workshops for leaders so to generate awareness on the importance of addressing inequalities in STEM topic.

Universities also have the responsibility of training and coaching future leaders so that they are aware of the importance of the topic.

2.4. What are good examples of public policies that have had a good impact?

Advancement in the last decade, but there is still a long way to go. Just a few examples of good policies and instruments ongoing in countries, such as:

- Specific science clubs for women in science.
- Talent schools for women in science.
- Quotas.
- Protocols on harassments and violence.
- A couple of countries (Chile and Costa Rica) have specific national policies on addressing the gender gap in science and innovation.

Proper assessments and mapping, but there is a need for more specific policies and instruments.

Education policies should be revised to include a gender and STEM component.

Need for more awards and specific scholarships and long-term policies.

2.5. Working products

Figures 2-4 reflect the discussions and conversations of the four groups that participated in the public policies and institutional initiatives table.
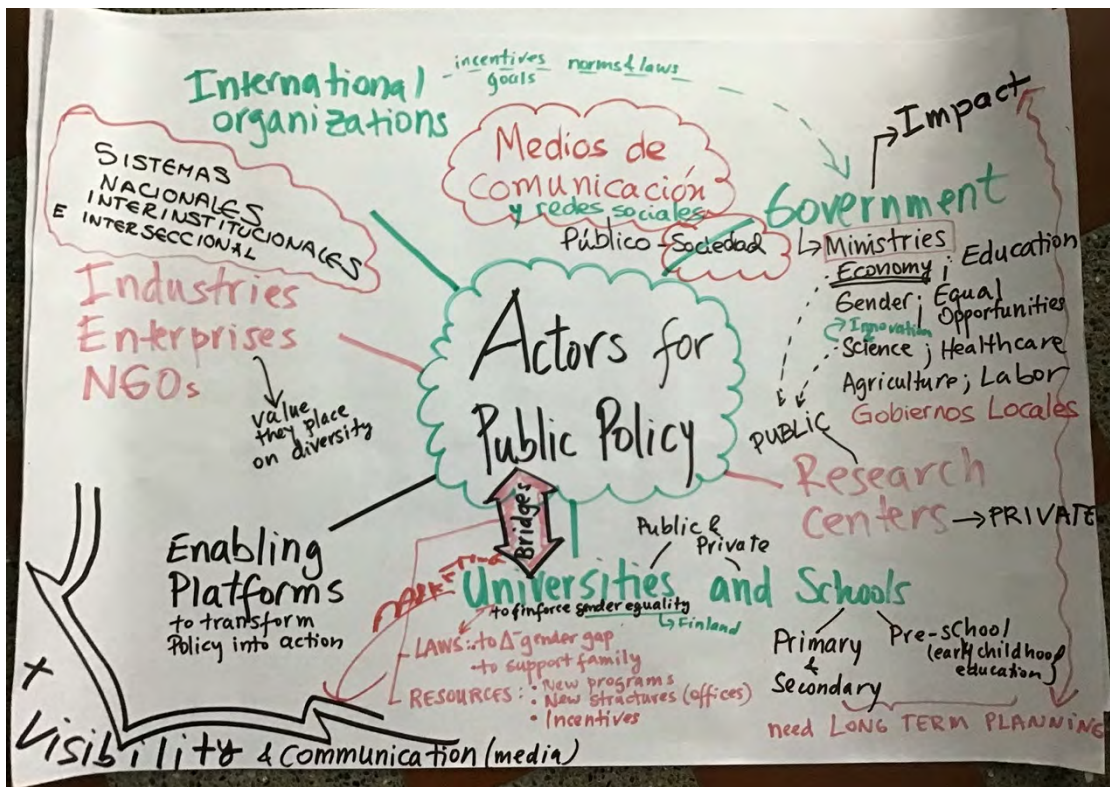
Figure 2. Table 1 working products (1/3)

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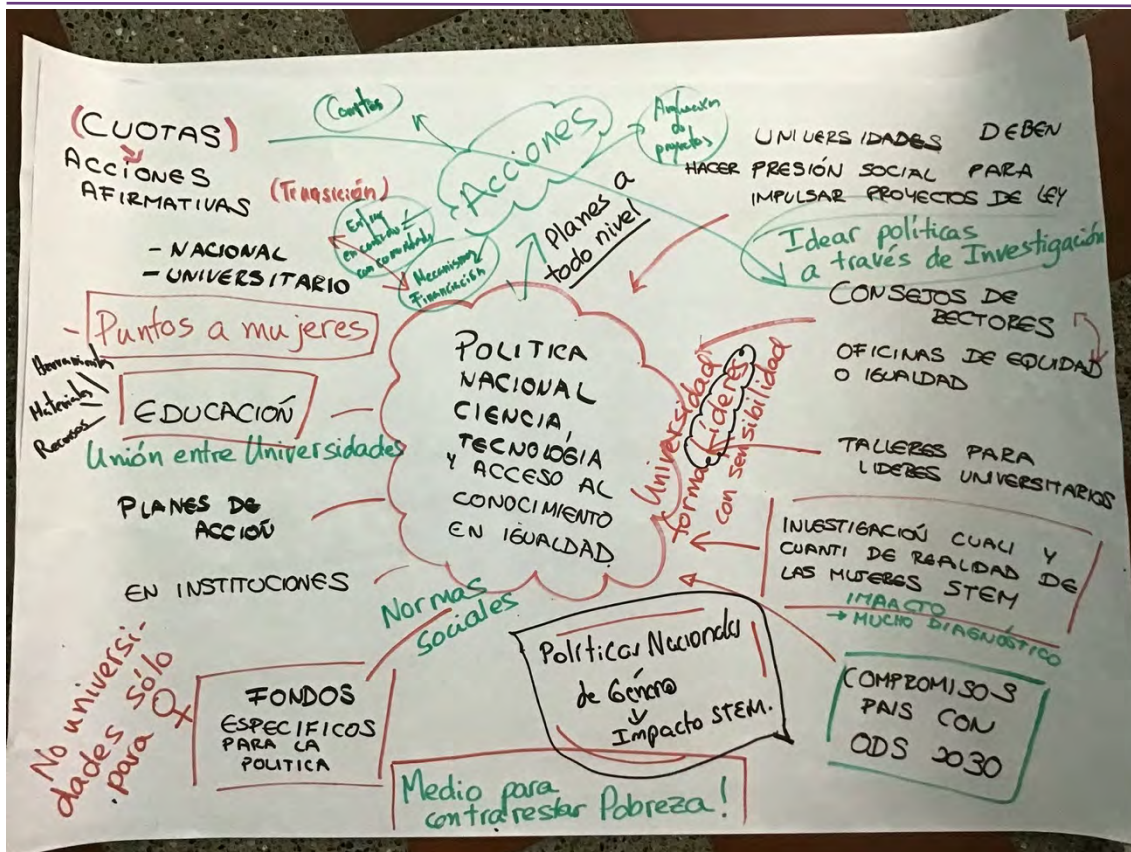
Figure 3. Table 1 working products (2/3)

Figure 4. Table 1 working products (3/3)

2.6. Mindmap

Wrapping-up the table 1 conversations, a mindmap was created (see Figure 5).

Figure 5. Table 2 mindmap

Figure 6 presents a word-cloud representation of the most used topic in the conversations.

Figure 6. Table 1 word-cloud

3. Table 2: Institutional policies and strategies

This table was devoted to the institutional policies and strategies oriented to promote the participation of women in STEM fields and was leaded by Francisco José García-Peñalvo (see Figure 7).

Figure 7. W-STEM World Café Table 2

This table conversed around four main questions:

1. Which strategies within the University would promote effective participation of women specifically in STEM?
2. How to impact teaching to avoid bias in STEM programs: language, bibliography, resources, curriculum, examples, teaching, referents, etc.?
3. Which internal actors should participate in the promotion and application of these policies/strategies?
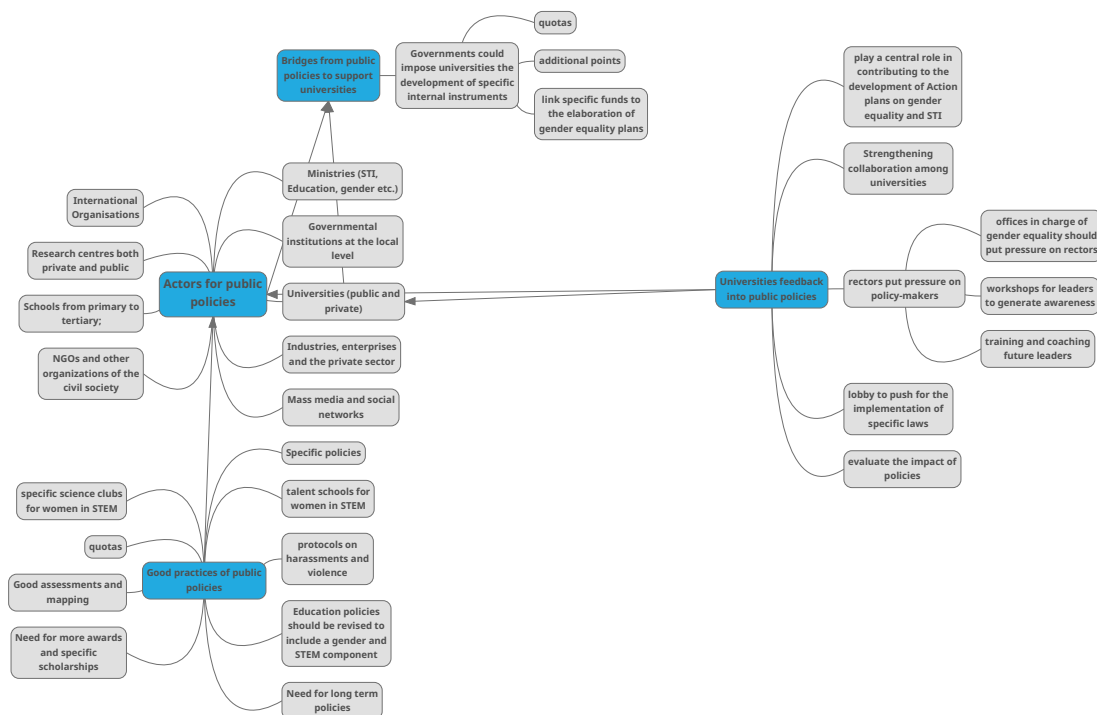4. How to prevent written policies without implementation? From strategy to concrete actions.

3.1. Which strategies within the University would promote effective participation of women specifically in STEM?

From a strategic perspective, the action plan about gender equality must be based on the institutional strategic plan, which should derive in a set of specific commitments, defined with dates, that combine both short-term and long-term objectives, underlining the issues about academic progression and the creation of new offices with new organisational structures.

The gender equality policies developed so far in universities suffer from being defined as silos compartments, so that actions are not permeable between different units and services, causing mutual ignorance or duplication of actions that end up overwhelming the most receptive public and feeding those who oppose these policies. Thus, a cross-cutting approach is needed to define these policies and strategies.

Transparency must be one of the pillars for monitoring the proposed action plans. To achieve this, a new set of indicators should be established, aligned with a robust

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technological ecosystem [9, 10] that allows the data flows can be easily processed and visualised for decision-making procedures.

Moreover, it is crucial to disseminate these policies and strategies to all the stakeholders, both inside and outside of the universities. This needs communication channels and discourses adapted to the different kind of audiences.

These gender equality policies are valid for all the disciplines presented in a specific university to define a common framework of principles in which one more STEM-oriented actions might be established.

3.2. How to impact teaching to avoid bias in STEM programs: language, bibliography, resources, curriculum, examples, teaching, referents, etc.?

The solution is to introduce gender equality within the usual teaching activities in every subject of the university. This means to develop a co-education policy based on training plans for the faculty to facilitate these teachers introduce the gender equality in their lectures to disseminate the principles to the student jointly with the knowledge.

Throughout this approach, empowerment of the gender equality policies will be achieved by all the involved stakeholders, injunction with the dissemination strategy.

3.3. Which internal actors should participate in the promotion and application of these policies/strategies?

Taking into account the transparency premise, more open-wall universities are required. The university people should go and collaborate with pre-university institutions and society in general. Nevertheless, this does not refer only to the faculty but to all the different roles, with a special mention to the STEM students who should be ambassadors of this discipline. Besides, University must be involved in the promotion of the computational thinking skills [11, 12] from the early ages [13, 14].

3.4. How to prevent written policies without implementation?

The organisational knowledge should flow both the institutional government to the faculty, the students, and service staff in a top-down orientation, which means that the strategy and policies defined in a top-level arrive at the people that should implement them. However, the bottom-up flows also must be taken into account to (re)-define the policies and evaluate their impact. This implies more complex knowledge management systems [15, 16] that reflect the complexity of the new learning and social ecologies [17].

3.5. Working products

Figures 8-10 reflect the discussions and conversations of the four groups that participated in the institutional policies and strategies table.

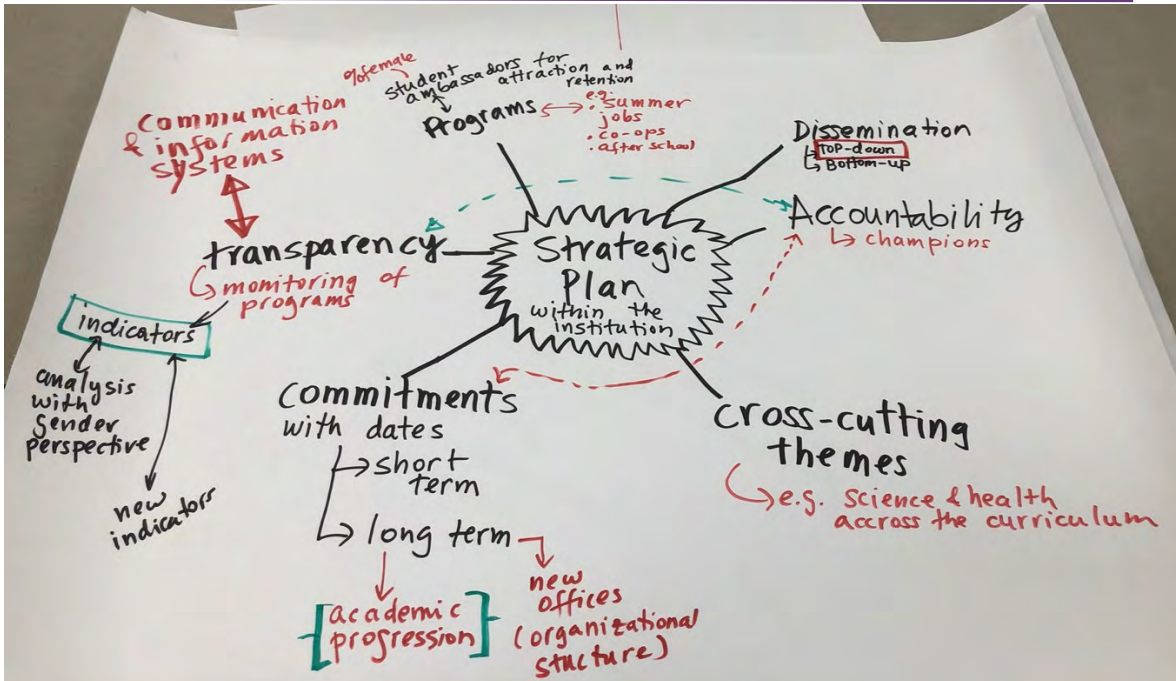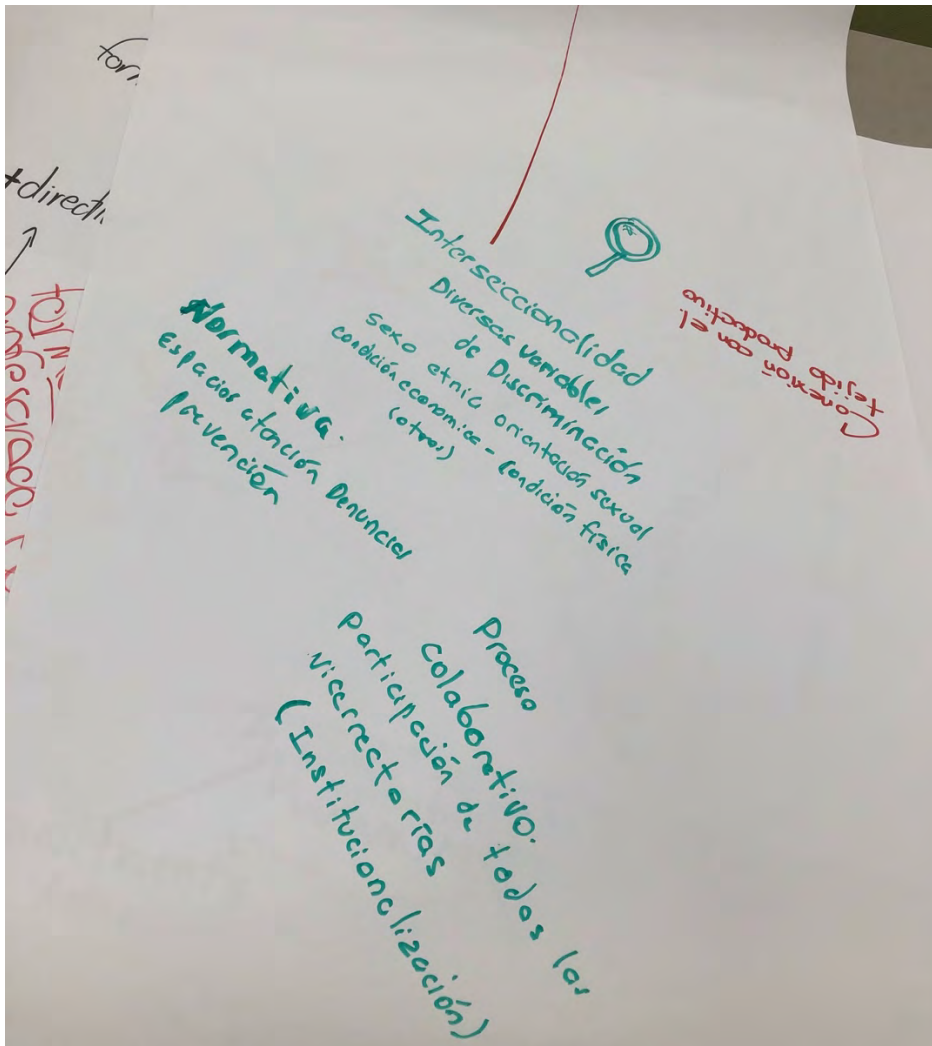**Figure 8. Table 2 working products (1/3)**

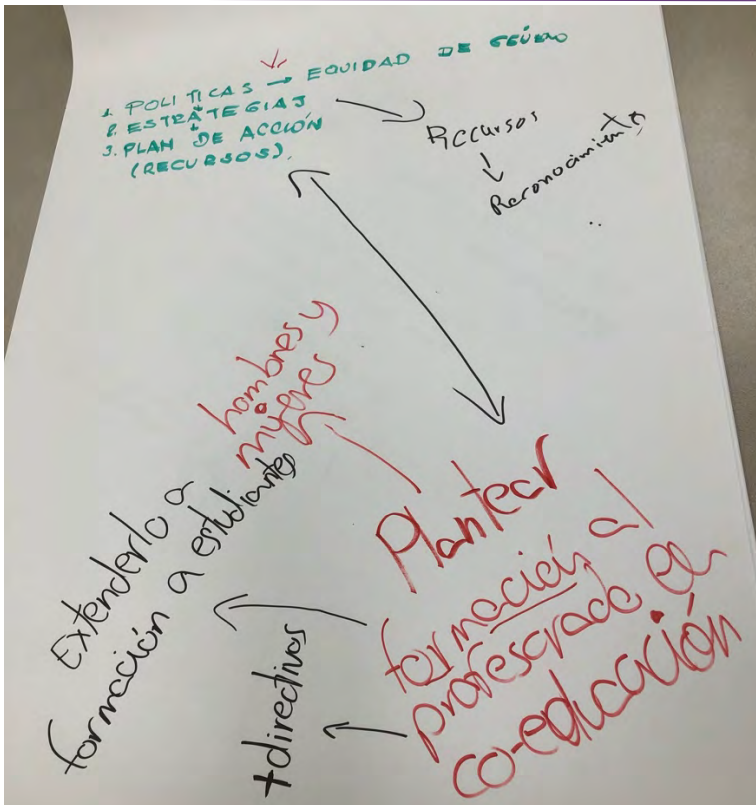**Figure 9. Table 2 working products (2/3)**

Figure 10. Table 2 working products (3/3)

3.6. Mindmap

Wrapping-up the table 2 conversations, a mindmap was created (see Figure 11).
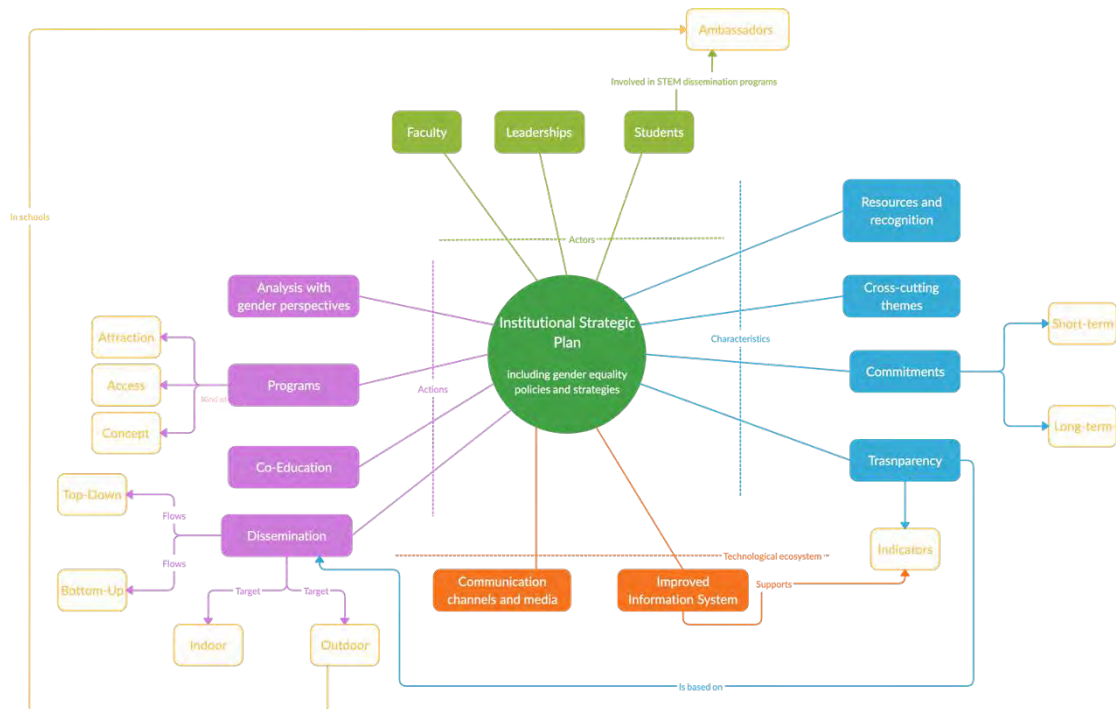
Figure 9. Table 11 mindmap

4. Table 3: Strategies and mechanisms of attraction and access of young women to STEM careers

This table was devoted to defining strategies for attraction and improving the access of young women to STEM studies at the universities. This table was leaded by Rosaura M. Romero Chacón (see Figure 12).

Figure 12. W-STEM World Café Table 3

This table conversed around three main questions:

1. What types of strategies and actions could be focused to give good results in attracting and accessing STEM careers for girls and young women?
2. With which actors inside and outside the university is it key to work to establish sustainable attraction and access mechanisms?
3. How can attraction be turned into effective enrolment? From attraction to recruitment.

4.1. What types of strategies and actions could be focused to give good results in attracting and accessing STEM careers for girls and young women?

When thinking about strategies and actions, it should be clear which groups to focus on. For this reason, it is essential to define them. Apart from elementary and middle school students, pre-schoolers must be included, given that children start to develop an understanding of gender from a young age. Also, teachers and family play a key role. They must be included in activities to promote women in STEM, eliminate stereotypes and the perception that STEM is a male domain.

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On the other hand, any activity that is planned must always be evaluated to measure its impact and if it is adequate for the group to which it is directed. Also, the use of social networks is significant, to reach the most considerable number of people and that any action or strategy is thought, analysed and executed with gender perspectives, and that also integrates professionals who can ensure its most significant impact.

Even though many actions may be applied, every institution must think which are more suitable for each one.

4.2. With which actors inside and outside the university is it key to work to establish sustainable attraction and access mechanisms?

Actors are many. Industries, professional associations, Ministries of Education, communities and, of course, schools and colleges and institutions of higher education can contribute much for the attraction to STEM careers.

The key actors, when thinking about access, are higher education institutions and secondary schools, which must maintain two-way communication to have sustainable access to STEM careers.

4.3. How can attraction be turned into effective enrolment?

In the case of the conversion of the attraction to an effective enrolment, some aspects should be considered, both with an economic and emotional nature. Therefore, it is crucial to carry out pre-university courses so that students have the minimum necessary knowledge required in the different careers, the guidance or mentoring necessary to clarify doubts and support students during critical moments of admission, enrolment and permanence in careers and financial support for those who require it.

4.4. Working products

Figures 13-14 reflect the discussions and conversations of the four groups that participated in the attraction and access table.
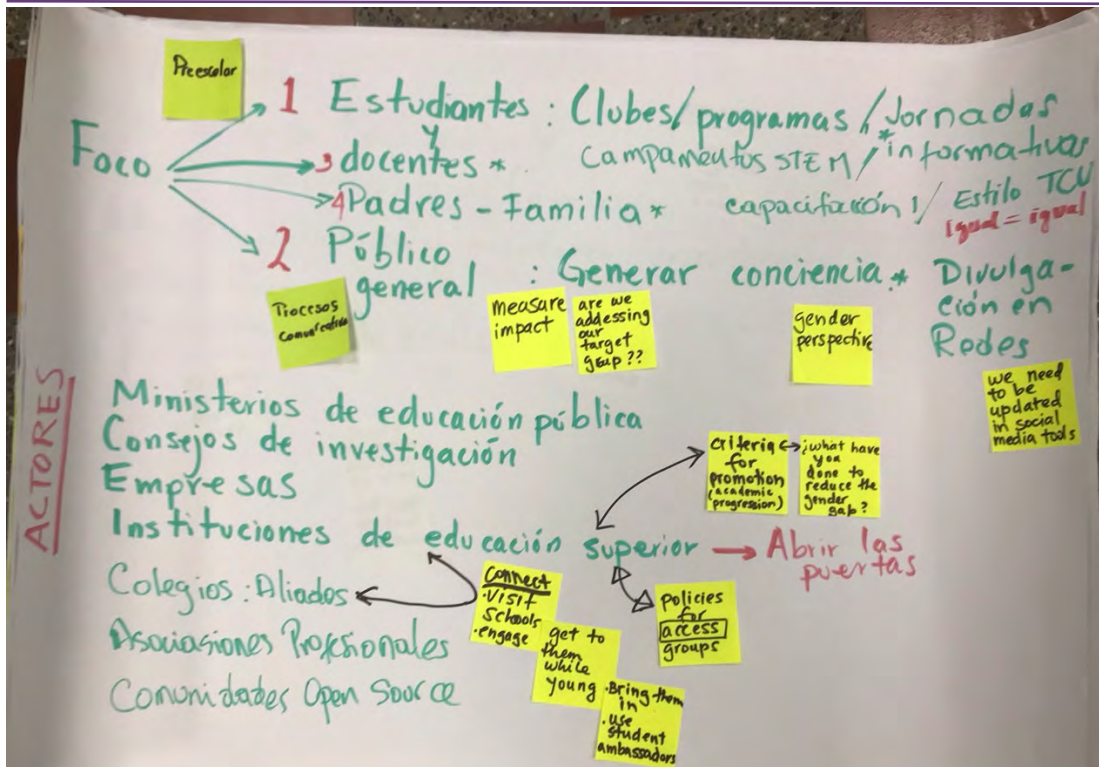
Figure 13. Table 3 working products (1/2)
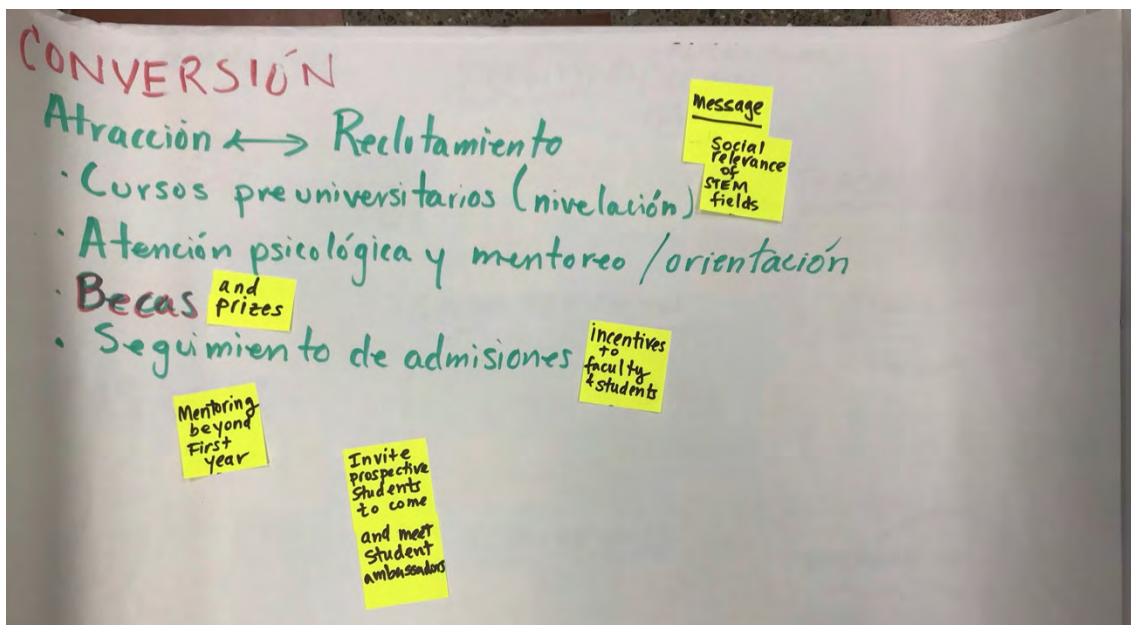
Figure 14. Table 3 working products (2/2)

4.5. Mindmap

Wrapping-up the table 3 conversations, a mindmap was created (see Figure 15).
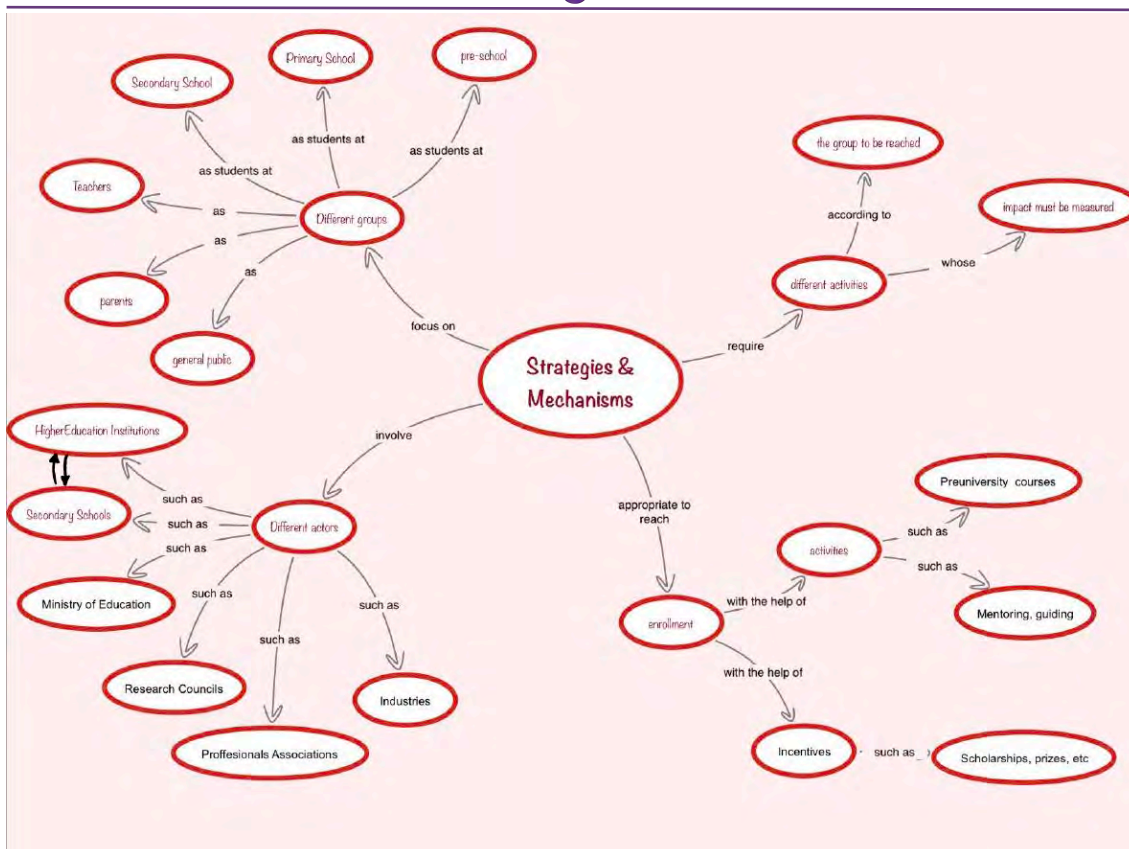
Figure 15. Table 3 mindmap

5. Table 4: Strategies and mechanisms of guidance, retention, and promotion of the scientific career for women

This table was devoted to defining strategies for guidance, retention and promotion of the STEM women's scientific careers. This table was leaded by Ángeles Domínguez (see Figure 16).

Figure 16. W-STEM World Café Table 4

This table conversed around four main questions:

1. What strategies would allow women's talent to be retained in the early years of study?
2. How to stimulate the participation of women in other links of the STEM career: master's degrees, doctorates, scientific careers, scientific-academic leadership positions?
3. What types of incentives can be stimulated?
4. Which actors can play a crucial role in this challenge?

5.1. What strategies would allow women's talent to be retained in the early years of study?

- Gender perspectives. Inclusion of policies, regulations and institutional actions that promote the gender perspective.
- Teaching practices. Implementation of gender-sensitive pedagogical methodologies, levelling workshops and academic support sessions. Training for the faculty to raise awareness about the use of language, contexts, examples that promote gender equity inclusion.

5.2. How to stimulate the participation of women in other links of the STEM career: master's degrees, doctorates, scientific careers, scientific-academic leadership positions?

- Groups/communities. Creation of women's support groups at STEM where seminars, talks, gender awareness meetings are held.

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- Social issues. Campaigns to raise awareness of the gender perspective, psychological support to improve self-esteem, events leading to a change in culture, breaking stereotypes, etc.
- Undergraduate bridge. Creation of bridges both from professional to postgraduate (to promote academic development) and from professional to work practice (to facilitate insertion into working life).

5.3. What types of incentives can be stimulated?

- Scholarship. Offer scholarships, awards, and payment flexibility to encourage and support young women at STEM.
- Support. Support with kindergartens, listening to needs, social security spaces.

5.4. Which actors can play a crucial role in this challenge?

- Mentorship. Support for young women through mentoring can be between peers of students, teachers who accompany them continuously throughout the career.

5.5. Working products

Figure 17 reflects the discussions and conversations of the four groups that participated in the retention and promotion table.

Figure 17. Table 4 working products

5.6. Mindmap

Wrapping-up the table 4 conversations, a mindmap was created (see Figure 18).

Figure 18. Table 4 mindmap

Quantitatively, the frequency of topics was as follows in Table 1.

Table1. Frequency of topics that appeared in table 4 conversations

Categories	Frequency
Gender perspectives	11
Groups/communities	12
Mentorship	16
Scholarship	13
Social issues	17
Support	15
Teaching practices	10
Undergraduate bridge (to job/to grad studies)	16
Grand Total	**110**

Figure 19 presents a word-cloud representation of the most used topic in the conversations (it must be considered that most of the participants used Spanish as conversation language. Thus, this graphics translates all the terms into Spanish).

Figure 19. Table 4 word-cloud

6. Conclusions

The W-STEM World Café has been very significant to discuss and propose a draft of principles, strategies, and actions to be taken into account in the Latin-American partners' action plans to attract, make more accessible the access, retain, and guide women to the STEM disciplines and professional development.

Tables 1 and 2 has been defined from a higher institutional perspective. Thus, the conversations were about policies and strategies where gender equality has more presence than the STEM specific issues due to that these general policies include STEM also.

Tables 3 and 4 were more focused on specific actions to promote the three basic processes taken into account in W-STEM project (attraction, access and retention/guidance).

The collaborative reflections derived from this World Café are wrapped up in this report that will be one of the inputs for the definition of the specific action plans for the W-STEM consortium to be implemented and developed in the next steps of this project.

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