

# Promotion of research: A cornerstone of the Latin American open chair Matilda and the women in engineering

Carolina Garvizu<sup>1</sup>, Susana Vargas<sup>2</sup>, Sonia H. Contreras-Ortiz<sup>3</sup> and Silvana Montoya-Noguera<sup>4</sup>

<sup>1</sup> *Centro de Investigación en Agua, Energía y Sostenibilidad - Universidad Católica Boliviana San Pablo, La Paz, Bolivia*

<sup>2</sup> *Universidad Católica Boliviana San Pablo, La Paz, Bolivia*

<sup>3</sup> *Universidad Tecnológica de Bolívar, Cartagena de Indias, Colombia*

<sup>4</sup> *Universidad EAFIT, Medellín, Colombia*

## Abstract

This article addresses the current challenge of promoting the incursion of women in the field of science and technology to achieve gender equality to comply with Sustainable Development Goal 5. In 2020, the Latin American Open Chair Matilda and the Women in Engineering (CAL Matilda, for its acronym in Spanish) was created thanks to a joint initiative of three engineering organizations: the Colombian Association of Faculties of Engineering ACOFI, the Federal Council of Deans of Engineering CONFEDI from Argentina, and the Latin American and Caribbean Consortium of Engineering Institutions LACCEI. CAL Matilda is an academic space that promotes vocations in engineering in girls and female teenagers through the collective construction of knowledge, teaching, research, reflection, and different dynamic activities. Within CAL Matilda, the research committee has impacted the inclusion and visibility of research around the gender perspective in engineering by developing more than fifty academic activities with the collaboration of 23 universities and member institutions. Research serves as an incentive for the future, encouraging the enhancement of capacities among women engaged in the fields of science, technology, engineering, and mathematics (STEM).

## Keywords

Women in STEM, women in research, SDGs, CAL Matilda, Latin America.

## 1. Introduction

The disciplines in STEM areas are key to facing some of the main challenges of the 2030 Agenda for Sustainable Development, from improving health and the fight against climate change to gender equality at all levels (Bello, 2020). Various studies refer to the subrepresentation of women in scientific, technological, engineering, and mathematical careers (Shapiro and Sax, 2011; Smith, 2011; Sáinz, 2017; Reinking and Martin, 2018), which was and will be a global concern that needs to be solved. It is in this sense that Sustainable Development Goal (SDG) 5, "Gender Equality," develops the guidelines for future actions to shorten these gaps.

In 2020, the Latin American Open Chair Matilda and the Women in Engineering (CAL Matilda) was born, from a joint initiative of the Colombian Association of Engineering Faculties ACOFI, the

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EMAIL: vgarvizu@ucb.edu.bo (A. 1); svargas@ucb.edu.bo (A. 2); scontreras@utb.edu.co (A. 3); smontoyan@eafit.edu.co (A. 4)  
ORCID: 0000-0002-4191-0874 (A. 1); 0000-0003-1686-3727 (A. 2); 0000-0003-2461-2100 (A. 3); 0000-0003-2490-9107 (A. 4)  
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Federal Council of Engineering Deans from Argentina CONFEDI and the Latin American and Caribbean Consortium of Engineering Institutions LACCEI, establishing itself as an academic space for debate, reflection, the collective construction of knowledge, teaching, and research, and carrying out dynamic activities to promote equal rights, opportunities, and spaces for women in academic and professional fields and the promotion of vocations for engineering in girls and female teenagers in Latin America and the Caribbean (LAC).

Within its organization, CAL Matilda has six committees: Mentoring, Communication, Vocations, Professional Practice, Education, and Research. Each of the committees, and therefore the chair, has institutional and individual members from different countries in the region, mostly Argentina, Bolivia, Brazil, Colombia, Costa Rica, and Ecuador. The member institutions are public and private universities. This international presence facilitates the union of forces and planning of joint activities in favor of the stated objectives.

The topic that CAL Matilda addresses is complex since it combines a cultural imprint and a contextual paradigm where multiple dimensions and factors sustain the persistence of gender inequality in engineering fields. Consequently, invigorating and promoting changes require the generation of knowledge that provides the bases for the actions to be carried out, the best path being research.

The Research Committee (RC) aims to investigate with scientific rigor topics relevant to CAL-Matilda that allow the visibility and social appropriation of knowledge for equal rights, opportunities, and spaces for women in the academic and professional fields and for the promotion of vocations for engineering. It is in this sense that all the activities of RC are focused on the promotion and visibility of the academic initiatives of women in engineering.

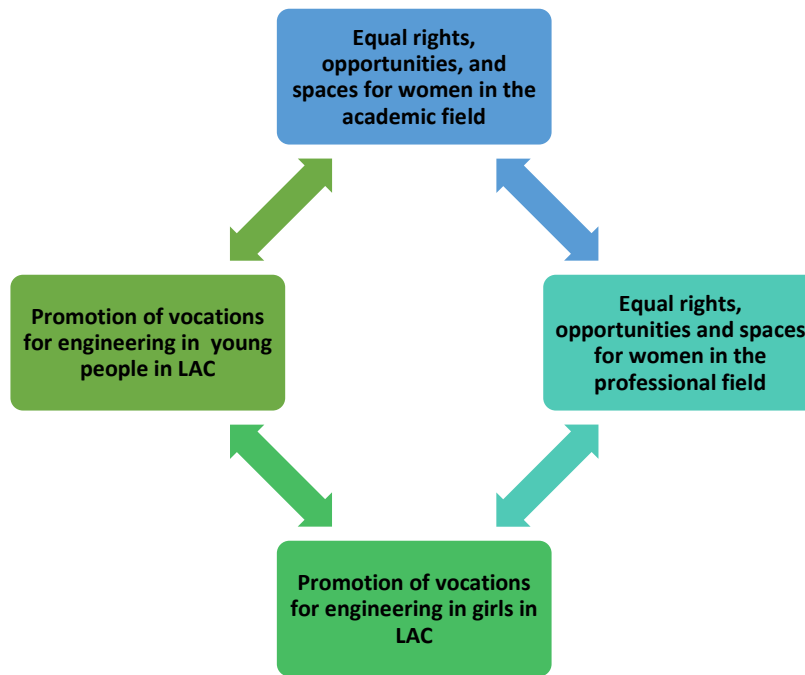
## **2. Methodology**

To focus efforts on promoting research as the central axis of CAL Matilda, RC articulates the following specific objectives:

- To design and implement research projects aligned with the objectives of CAL Matilda.
- To organize and manage the monitoring of research projects carried out by members of CAL Matilda
- To generate spaces for the visibility and social appropriation of knowledge based on the research developed.
- To collaborate and articulate actions with the other committees in the achievement of the objectives of the organization.

These specific objectives are developed based on four strategic axes that are observed in Figure 1, which through their interaction, enhance the impacts of CAL Matilda.

The CI has three coordinators who chair the biweekly meetings to plan and follow up on the activities. Additionally, four leaders promote actions to meet each of the committee's objectives.



**Figura 1:** The RC strategic axes within CAL Matilda

## **2.1. Equal rights, opportunities, and spaces for women in the academic field**

It is well known that in recent years in the global context, actions have increased around being able to improve the education of women and thus generate equal opportunities between both genders. As established by Blat (2012), offering the same education to both sexes is a necessary and sufficient condition for the individual potential of women and men to be stimulated and developed.

That is why RC encourages the generation of scenarios where equal opportunities are promoted in the academic field, convinced that the training and empowerment of women, mainly in engineering, is the path that will strengthen the female presence in these areas.

The RC establishment fosters the creation of these important spaces to encourage women in engineering to consolidate collaborative work as part of a network. Being one of the first steps to achieve equal rights, opportunities, and spaces in each member institution.

## **2.2. Equal rights, opportunities, and spaces for women in the professional field**

Previous studies reveal that even today, women in STEM areas face a large number of challenges in the professional field, being in predominantly male environments such as gender stereotypes, obstacles to ascend to decision-making positions, salary gap, lack of mentors, harassment, bullying, and difficulties balancing work and family life, especially when there are young children, family members with disabilities or older adults in their care. For this reason, it is important to promote inclusion and equality policies in institutions, strengthen women's networks, mentoring programs and make women in engineering visible.

The RC of CAL Matilda establishes spaces to discuss these issues and to be able to generate strategies in the medium and long term, which promotes women in the professional field, highlighting their training and capabilities. It is also important to point out that the RC establishes spaces for the visibility of the trajectory of outstanding female engineers to motivate future generations in the incursion of various engineering specialties.

### **2.3. Promotion of vocations for engineering in girls and young people in LAC**

One of the determinants for career selection in female teenagers is previous experiences related to courses, games, and recreational and extracurricular activities. Cheryan et al. (2017) mentioned that girls usually have less early experience in STEM than boys, and this is one of the causes for them to feel that they are not sufficiently prepared and give up choosing these careers. Within the RC, several university initiatives have been shared to promote engineering in boys and girls, such as courses and workshops related to STEM skills, like programming, science, and robotics. In this way, they contribute to the main objective of the strategic axis related to early motivation for research and development (R&D), fundamental pillars of engineering.

Also, various studies show that as girls grow, they lose interest in STEM. As pointed out by González et al. (2021) in the study STEAM+Gender: A proposal to strengthen initial education with equity. Up to eighth grade, 74% of girls express interest in STEAM areas, but only 0.4% of adolescents choose careers associated with these areas. At present, many studies seek to understand this problem, to propose strategies to increase the representation of women in STEM areas, since greater participation can have a positive impact on the economic and social development of a country. According to Bello (2020), gender equality has a strong impact on gross domestic product per capita, which implies that reducing the gender gap in STEM education could improve the quality of life of people in general. That is why the role of academic institutions is so important when supporting and encouraging initiatives such as CAL Matilda.

## **3. Results**

The CAL Matilda RC established a 2021-2023 Strategic Plan currently being applied. Activities and actions of RC fit with the methodology and objectives of the committee. They can be open to the general public or internal for CAL Matilda. In the RC, an agenda is maintained that allows the generation of spaces to promote research in the CAL institutions. Some of the activities carried out are mentioned below:

**Workshops:** allow the generation of spaces for co-creation among the committee members. Workshops have been held such as: "What are people talking about in #8M in the activities of the Latino America Faculties of Engineering?" and "Design and Co-Creation of pieces for the dissemination of research results."

**Seminars:** In December 2021, the seminar was held: "Matilda investigates and transforms panoramas" in which an overview of the gender gap in engineering programs at Latin American universities and research on equality issues was presented. gender in engineering. Subsequently, work groups were held to address the following question: How is it possible in the academic field of the Faculty of Engineering to articulate university policies to contribute to SDG 5 and train in skills with a gender perspective that promote the participation of women? women in engineering careers? As a tool for collecting ideas, Padlet was used. more than 100 people participated in this event.

Symposiums: In October 2022, the First Latin American Research and Innovation Symposium of Women in Engineering (I SIILMI) was held to generate a space for communication and construction for exchange and articulation around the community of CAL-Matilda actors. and the Faculties of Engineering around research aimed at equal rights, opportunities, and spaces for women in engineering and the promotion of vocations for engineering in girls and young people.

As part of the organizing committee, professionals from STEM and related areas from Argentina, Bolivia, Chile, Colombia, and Mexico participated. The target audience reached by the Symposium included researchers and innovators in the topic "Gender and engineering," teachers of STEM areas and pre-university levels, students belonging to research groups, and CAL Matilda members.

The main topic axes of the SIILMI were: Equity of rights, opportunities, and spaces in the academic and labor field and the promotion of vocations for Engineering in girls and young people of the region. The selected works were presented synchronously and asynchronously using short videos and forums that promoted the interaction of authors and attendees. In addition to keynote lectures, the Symposium included Debate Sessions on Vocations, Professional and Academic topics on its agenda, evidencing that the topic of Women in Engineering is a growing field of study, research, and development in Latin America.

The knowledge generated in the synchronous activities allowed us to know and analyze the situation in the Faculties of Engineering, evidencing the need for: the construction of gender equality policies, the mainstreaming of the gender perspective in competency-based training, and establishing research methodologies on the subject.

One of the main contributions of SIILMI to the committee's work was the identification of institutions that carry out research and innovation on the subject, making this the basis for future joint actions in Latin America and the Caribbean for the benefit of gender equality. in engineering. In the symposium, 38 papers were presented, 259 people registered, 153 people participated in the asynchronous activities, and 201 attended the synchronous activities.

Another activity with interesting results took place in Bolivia at the Faculty of Engineering of the San Pablo Bolivian Catholic University, which consisted of an essay contest called "My path in Engineering," whose target audience was students and former female students of the Faculty. The essays sent by the contestants included experiences from childhood where it was evidenced that the media, advertising, and school are not the main motivators to dream of a career in STEM, but rather families, who, by showing support and trust, encourage them to venture into this field when they are going to start university.

What was expressed by the participants of the contest was used as feedback in the Faculty of Engineering, considering aspects such as the lack of gender equality in the publicity actions of STEM programs. Since it reinforces gender stereotypes that STEM careers are associated with men, it is unlikely that women visualize themselves in these careers, which rules out the possibility of considering doing it for a long time or as a form of work.

In addition to the initiatives described, there were various activities carried out in the member institutions, where the members of the committee participated directly and indirectly, which can be summarized in the following table:

**Tabla N°1**  
2021-2023 Activities

Activity	CI CAL-Matilda Rol	Impact	Quantity
Events	Organization	International audience, professionals, academics and students	4
Courses	Assistants	Strengthening training in W-STEM, SDGs and the gender gap.	8
Workshops	Organization	Products applicable to various institutions	3
Conference presentations	Presenters	Participation in conferences, presentations, talks, symposiums and exhibitions.	13
Projects	Participants	Research, training, extension and other projects.	13
Publications	Authors	Conference proceedings, book chapters, and journal papers	15

**Fuente:** Own elaboration based on the RC management report of CAL Matilda (2023).

The activities carried out show the synergy in the network that summons the CAL Matilda. The collaborative enthusiasm of those who engage and contribute their dedication to this committee enables us to exert influence across the extensive region of Latin America and the Caribbean. Many voices come together in this committee, making a path of mentoring among peers, which through co-creation, allows us to glimpse progress towards the objectives of CAL Matilda.

#### 4. Future actions

Of the forthcoming actions by the RC members, the following four have been recognized as top priority and pertinent:

- Establishment of a diagnosis of the gender gap in universities to identify the current conditions of women's participation in the areas of training, teaching, research and extension in Latin America and the Caribbean.
- Exposure of the real participation or incorporation of women in engineering, both study and professional practice, based on statistical data.
- Diagnosis of institutional policies and strategies to promote safe study and work environments for women.
- Generation of knowledge about the profile of women engineers in Latin America and the Caribbean, using the CAL-Matilda books as an object of study and creating material and events that promote said profiles as references for girls and women concerning STEM vocations.

These tasks address key issues related to gender equality in engineering education and research and will provide information and concrete actions to foster the participation and success of women in this field. By focusing on the gender gap, current conditions, the promotion of lead authors, the real visibility of women engineers, and institutional policies, the foundations will be laid to promote a significant change toward gender equality in engineering.

## 5. Conclusions

The endeavors undertaken by CAL Matilda's Research Committee (RC) have effectively reinforced the cooperative work and initiatives of member institutions, all directed towards amplifying women's presence in STEM fields. This achievement has been facilitated through a common research methodology for the creation of networks and the provision of platforms for sharing and disseminating these actions across member universities in diverse countries, thereby magnifying their specific impacts. Moreover, the strategic identification of high-impact objectives has led to the creation of community forums and opportunities to spotlight women in engineering, paving a promising trajectory for the emergence of upcoming female engineers.

It is also worth highlighting the identified necessity to strengthen motivational activities aimed at young girls and female teenagers in primary and secondary school to cultivate their STEM skills. This imperative arises from the overarching goal of enhancing the education of both young boys and girls in gender equity, with a focus on showcasing their proficiency in attaining equal opportunities.

From the start, the RC members have engaged in a wide range of activities with an international focus, totaling over 40 initiatives as part of the 2021-2023 strategic plan. These efforts have made a significant impact, reaching the university communities of all member institutions within CAL Matilda.

While the efforts aimed at fostering research-related activities have yielded noteworthy results, the potential to reinforce and broaden the collaborative network with other committees of CAL Matilda remains a challenge.

## 6. Acknowledgments

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Gratitude is extended to all the institutions of the Chair for embracing the essential task of promoting research with a gender perspective, supporting the initiatives of the CAL Matilda Research Committee.

Furthermore, sincere appreciation is directed towards every woman who ventures on the path of Engineering, serving as a compelling role model for young girls and female teenagers across Latin America and the Caribbean.

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