



Promoting STEM Vocations | www.provoca.org

PROVOCA is an AUI/NRAO initiative.

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In partnership with the scientific community, the National Radio Astronomy Observatory (NRAO):

- provides world leading telescopes, instrumentation, data and expertise;
- trains the next generation of scientists and engineers;
- advances broader, equitable, inclusive participation in science and engineering;
- and promotes astronomy to foster a more scientifically literate society.

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PROVOCA



Promoting STEM Vocations

What is PROVOCA?

PROVOCA is an initiative to promote STEM vocations among underrepresented minorities. The initiative focuses on girls and women as the largest and most obvious underserved group. Despite hosting many world-leading observatories, Chile lags behind most OECD and Latin American countries in female representation and retention in STEM careers.



The exceptional conditions of the northern skies in Chile have attracted some of the largest and most advanced astronomical projects, including NSF-funded big facilities such as the Atacama Large Millimeter/submillimeter Array (ALMA), managed by AUI/NRAO on behalf of North America.

In recent years Chile has become the astronomical capital of the world. To fully seize this opportunity it must attract a diverse pool of STEM talent.

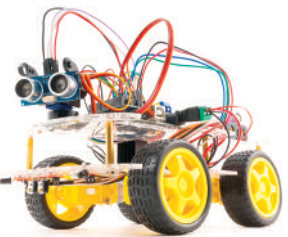
PROVOCA mentors Bárbara Sepúlveda, Liza Videla and Andrea Araya at ALMA Observatory. Photo Credit: C. Padilla, AUI/NRAO

STEM Representation Problem

Latin America and the Caribbean

12.7%

Chile has the lowest percentage of women with an academic degree in information and communication technologies. (12.7%)*



17.7%

Chile ranks third lowest for women with an academic degree in engineering, manufacturing and construction careers. (17.7%)*

46.5%

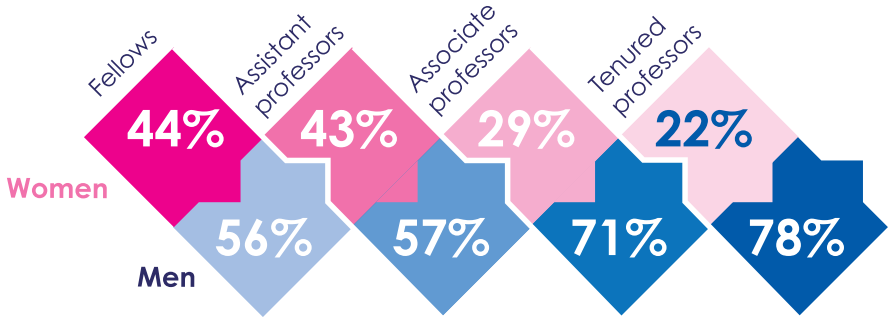
Chile ranks fourth lowest for women with an academic degree in natural sciences, mathematics and statistics. (46.5%)*



*Women in STEM in the Latin American and Caribbean Region. UN Women, 2020.

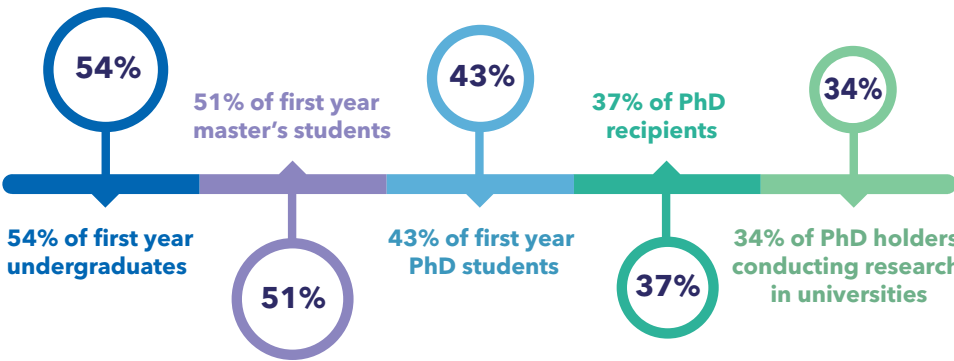
STEM Retention Challenge

In academia, the percentage of women decreases as careers advance**



**Radiografía de género en ciencia, tecnología, conocimiento e innovación. Chilean Ministry of Science, December 2020.

In higher education, the percentage of women decreases as studies and research progress***



***Radiografía de género en ciencia, tecnología, conocimiento e innovación. Chilean Ministry of Science, April 2022.

Promoting Awareness and Change

Role Models, Seeing is Believing

PROVOCA began in Chile but has motivations and messages that are universal in their appeal. The acronym is a play on words ("pro"-mote "voca"-tions), as well as an invitation to "provoke" awareness and cultural change.

PROVOCA addresses this challenge by raising the visibility of female role models, using different strategies and communication tools (workshops, talks, television and radio interviews, social media, etc.). This is crucial for girls to imagine themselves in STEM.

Although the initiative is centered on girls and women, it also acknowledges the importance of other dimensions of underrepresentation such as social and economic background, geographic location, migrant status and disabilities.



From Inspiration to Long Term Impact

Even though role models are important for inspiration, they are insufficient to sustain STEM vocations and retain women in the long-run. Underrepresented minorities in STEM face important challenges. Common barriers include impostor syndrome, micro-aggressions, stereotype threat, and low levels of self-efficacy and sense of belonging. All this undermines chances for engagement, retention and success.

Mentoring is needed to help students persevere in STEM careers. PROVOCA mentors help to discover and strengthen STEM vocations, guiding and accompanying students to gain knowledge, develop key skills and create networks.



PROVOCA mentors Bárbara Sepúlveda, Liza Videla and Andrea Araya at ALMA Observatory.
Photo Credit: C. Padilla, AUI/NRAO

PROVOCA Timeline



October 2018 “Speed dating”
AUI/NRAO organized a round-robin experience where 8 STEM professionals met 62 students from underrepresented communities. PROVOCA is born out of this role model activity.

2018

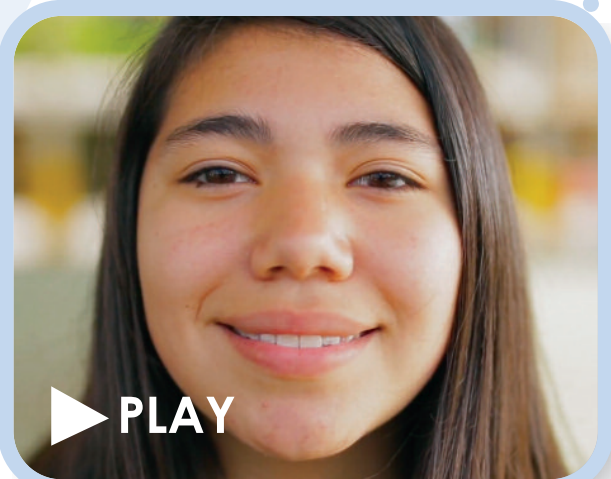


2019 PROVOCA web series
Stories of female STEM professionals and students were part of a high-impact communications campaign to raise the visibility of role models (CNN Chile and social media).

2019



Scan QRC
to view the
web series.



2022 First cohort of PROVOCA mentees
24 mentors accompanied 48 students from 12 out of 16 regions in Chile.

2022



2021 First generation of PROVOCA mentors
28 STEM professionals were prepared to guide mentees and certified as mentors after a year-long program.

2021

2023 Simultaneous training of mentors and mentoring of students
23 new mentors and 40 new students enrolled from 14 out of 16 regions in Chile.

2023

PROVOCA Mentorship Curriculum

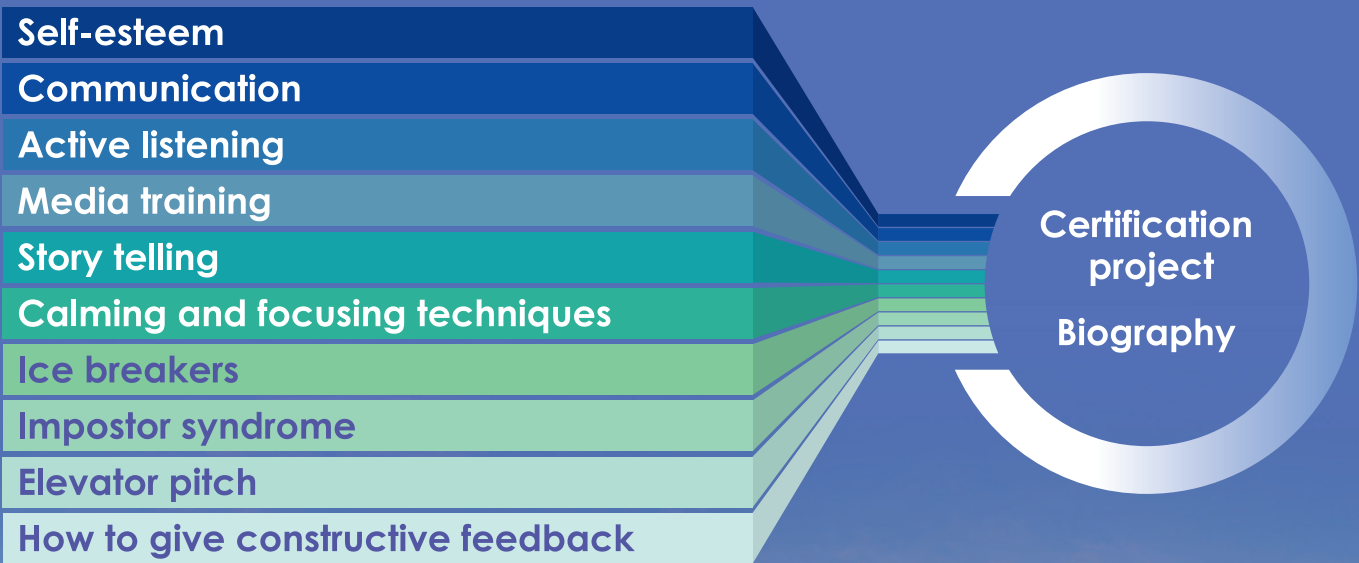
Scan QRC to view the PROVOCA
“impostor syndrome” series



The training of mentors and mentoring of students address some of the most common difficulties confronted by women in science, including the impostor syndrome and effective communication, among others.

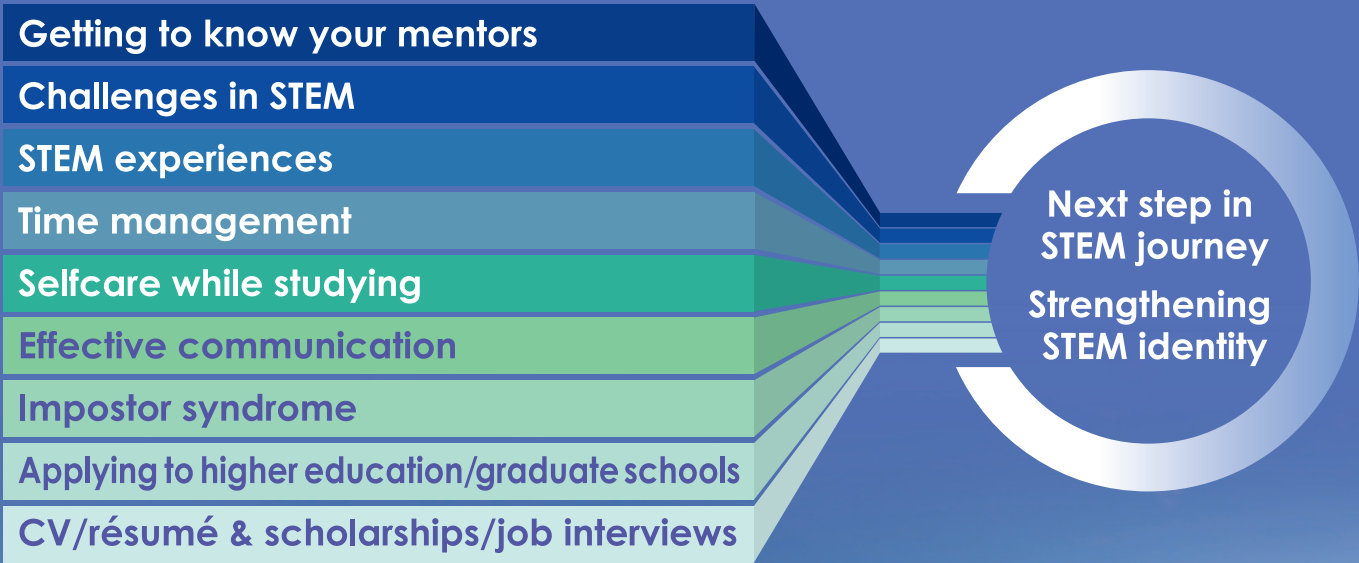
The training and mentoring are year-long programs. Extensive feedback at the end of both allows reflection on the experience and identifies areas for improvement.

Mentors are trained through an innovative curriculum



In addition to the curriculum above, PROVOCA organizes complementary workshops on team building, effective networks, and how to make the best use of the PROVOCA methodology.

High school and college mentees are guided through the following curriculum



The Three Pillars of PROVOCA Mentorship



PROVOCA uses hybrid activities to broaden the reach of the program.

1

1. KNOWLEDGE

- Getting to know several STEM careers through mentors
- Exploring academic and professional paths
- Planning next steps in STEM journey
- Understanding how to apply to graduate studies and/or jobs

2

2. SKILLS

- Honing communication skills
- Identifying and addressing impostor syndrome
- Increasing awareness of challenges and ways to confront them
- Improving ability to work in groups and collaborate

3

3. NETWORKS

- Creating sense of belonging
- Facilitating team building
- Fostering communication among mentors and mentees
- Strengthening STEM identity

STORIES

PROVOCA Mentors

OF EMPOWERMENT

"PROVOCA has been a great help in getting to know other realities. I thought I had grown up having fewer possibilities than other girls, but there are women in more difficult situations in other corners of the country. In PROVOCA we can speak freely and without fear, in a safe space where we feel understood and supported."

—Javiera Toro, PROVOCA Mentor

"If the first time you do not succeed, it doesn't matter, find out what went wrong and always try again."

—Soledad Fuica
PROVOCA Mentor

"The biggest surprise of being a mentor was the effect it had on myself, how much I feel I have grown from sharing my experiences with the students and learning about their struggles."

—Andrea Araya
PROVOCA Mentor

"As a mentor, PROVOCA helped me find purpose again. Talking to the students and to my co-mentor allowed me to connect back with that initial curiosity that made me fall in love with STEM in the first place."

—Alexandra Suárez
PROVOCA Mentor

Andrea Araya
PROVOCA mentor



Soledad Fuica
PROVOCA mentor



Javiera Toro
PROVOCA mentor

Alexandra Suárez
PROVOCA mentor



Agustina González
PROVOCA mentee



Camila Quezada
PROVOCA mentee



Carola Pino
PROVOCA mentee



Diana Arrué
PROVOCA mentee



STORIES OF GROWTH

PROVOCA
Mentees

"When I started this program I didn't know how much I needed this kind of space and network of women. To girls like me, who are interested in STEM, I would tell them to challenge themselves and trust that they can always go farther with the help of other women."

—Camila Quezada
PROVOCA Mentee

"I wish I had an option like this when I was younger. I left school thinking that women only studied careers in the humanities. At 32, I decided to study engineering. We need more women in STEM, together we can make a difference!"

—Diana Arrué, PROVOCA Mentee

"I entered the program in search of a community, since in my family and in my group of friends there is no one from the STEM world. In PROVOCA I found more people like me and I felt very supported and accompanied."

—Agustina González
PROVOCA Mentee

"With PROVOCA, I learned to seize opportunities. In the past, I shied away from challenges. Now I know that I only need to trust myself."

—Carola Pino
PROVOCA Mentee

STORIES

PROVOCA Mentors

OF WOMEN IN STEM

Tatiana López is an aerospace engineering student. She is also the only Latin American woman to participate in the Asclepios II Mission, a Switzerland-based analog space program that required two years of training, followed by 15 days in an underground Moon simulation at the former Gotthard Massif military fortress in the Alps.

Her training as a PROVOCA mentor allowed her to strengthen skills that turned out to be key during the mission, such as active listening, teamwork, critical thinking and leadership. As mission communications

officer for Asclepios II, Tatiana was responsible for remotely accompanying her colleagues on their field trips and supporting them in difficult situations. "I think that my training as a mentor prepared me to pay attention to all the elements involved in communication, both spoken and unspoken, enabling me to interpret the emotions and attitudes my colleagues were facing in each experiment."

One of the most extreme experiences she faced was the simulation of a solar flare that woke her up at three in the morning with a warning alarm. After the alarm was triggered, everyone had to run to

protect their equipment and lock themselves in a safe room, waiting for instructions from the mission control room.

During her spare time, Tatiana enjoyed drawing and painting, activities that helped her relax and manage anxiety, and incidentally decorated the walls of the ship, something her colleagues were grateful for.

Tatiana López serving as mission communications officer for the Asclepios II mission.
Photo Credit: Courtesy Tatiana López, Asclepios II/EPFL



Claudia Gaete and her daughter Fernanda, are currently thriving and enjoying their time together.

Claudia Gaete is a civil engineer in computer science. She joined PROVOCA during the pandemic. In 2021, a thyroid problem during her pregnancy led to the premature birth of her daughter. Baby Fernanda would face three long months in the hospital's neonatal intensive care before going home. "I remember feeling alienated as I watched the world turn. During that time, I would connect to my mentor training sessions, and they gradually became the only space that was completely mine, where I reconnected with others. PROVOCA played a decisive role in that period of my life," says Claudia.

"The program gave me the chance to network with amazing women, who encouraged me through dark moments. I realized that I am not alone. This

may not seem a fundamental part of a mentoring program for women in STEM, but for me it is one of its most significant contributions. Many people assume that we are geniuses or super-powerful women, who do not face obstacles. I experienced one of the most painful moments in a woman's life, and without this support space it would have been harder to overcome."

"Before, I was one of those people who walks through life with blinders on, very focused on my own problems. PROVOCA taught me to become aware of others. I learned to listen and stop judging. There are millions of other realities, the important thing is to decide to connect with people and help."

Building Networks for Support and Retention

Networks are crucial for career growth and advancement. Research shows that this is a particular challenge for underrepresented minorities in STEM. With this in mind, PROVOCA strives to create social capital through personal and professional networks. These networks span a diversity of disciplines, age groups and geographical locations.

Chile is a skinny stretch of land (as long as the United States is wide) where economic activity and power are centralized in the capital, Santiago, and a few other cities. This means that rural areas and regions in the rest of the country are at a disadvantage in terms of access to information and opportunities. PROVOCA helps to bridge this divide.

Our mentors bring a diversity of perspectives that enrich the experience for other mentors and students. They include college students, academics and professionals in all stages of their careers in areas such as astronomy, biology, chemistry, computing, engineering, mathematics, mining, physics, telecommunications and technical areas in science and industry.

PROVOCA participants come from 14 out of the 16 regions of Chile.

To promote the creation and strengthening of these support networks, we facilitate interactions inside the 2+4 mentoring groups (two mentors and four students) as well as within and between cohorts. This is accomplished through face-to-face meetings, in addition to virtual and hybrid trainings and activities. Messaging applications and social media are used for practical information sharing, but also for informal exchanges that keep communications fresh and relevant. The members of the PROVOCA network share a feeling of belonging and connect-edness, which is key for persistence and retention of female talent in STEM.



Team building activities for the 2022 PROVOCA cohort.

The Future of PROVOCA



Official PROVOCA 2022 group picture.

As a Federally Funded Research and Development Center, the NRAO (managed by AUI) is committed to the NSF mission of broadening participation in STEM. Therefore, PROVOCA is interested in collaborating with organizations who want to replicate this initiative and have a bigger impact in Chile and abroad. To this end, in coming years the AUI/NRAO Office of Chilean Affairs will systematize the materials and methodology of PROVOCA and make them available in Spanish and English.

As of 2023, PROVOCA has started its first collaboration in another Latin American country, working with the mentoring program for women scientists at the University of Cuenca in Ecuador. The aim of this collaboration is to strengthen their program and foster the participation of the Ecuadorian Network of Women Scientists and the Organization for Women in Science in the Developing World (UNESCO program), in the creation of initiatives like PROVOCA.

Organizations interested in finding out more about the program and potential collaborations should email contact@provoca.org.