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PRACTICE INSIGHTS

Action learning workshops for scientists: science communication for public engagement skills for the VLIR-Teams Active Parks research group

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Abstract

Universities and funding agencies are increasingly expecting research teams to include initiatives promoting public engagement, which often require public science communication. However, developing science communication skills can be challenging for researchers due to the limited availability of training opportunities. This practice insight documents the experiences of researchers participating in action-learning science communication workshops developed for the VLIR-Teams Active Parks research group in Cuenca, Ecuador. Through learning activities, researchers developed interdisciplinary science communication skills, including self-reflexivity, crafting speeches, and content creation for social media, to effectively communicate their study's outcomes on public park usage to stakeholders and various community audiences. The workshops proved effective in building public engagement skills and developing self-reflexivity, enabling researchers to create impactful, audience-centered initiatives that fostered meaningful connections with the community.

Keywords

Professionalism, professional development and training in science communication; Science communication teaching; Diversity, equity, inclusion and accessibility in science communication

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1 ▪ Science communication education

Effective science communication training is essential for researchers engaged in various social research and participatory science scenarios. Throughout this section, we use science communication education to refer to formal, credit-bearing academic programs (e.g., baccalaureate, master's, doctoral tracks), and science communication training to refer to short, often non-credit courses and workshops designed to build specific professional skills in active researchers.

Studies involving non-scientific audiences require researchers to establish trust with participants for recruitment and participation [Parrella et al., 2022]. Researchers in areas such as public health [Irwin, 2021] or climate change [Maibach et al., 2023] may need to implement outreach initiatives to share research findings with specific public-oriented goals, for instance: promoting behavior change or raising awareness about public interest issues [Kearns, 2021]. Conversely, science communication for public engagement focuses on developing initiatives that communicate research findings to the public audiences and open participatory spaces for discussion around societal issues [Du et al., 2024].

Currently, science communication educators and trainers alike grapple with balancing theoretical knowledge and practical skills [Trench, 2023]. Such a balance would enable researchers to develop science communication initiatives that foster science-society discussions while also ensuring they gain practical skills in writing, public speaking, and multimedia content creation that meet the needs of their audiences [Parrella et al., 2022].

Formal science communication education courses are offered through universities from undergraduate to postgraduate levels, integrating theory and practice over multiple semesters [Trench, 2023]. In the context of the short-course and workshop training, researchers also need rapid, competency-based modules that connect theory to practice in interdisciplinary competencies that foster collaboration [Gumusoglu et al., 2022; Trench, 2023]. Societies face complex issues, requiring trans-science solutions; thus, researchers must possess solid interdisciplinary collaboration skills to engage and cooperate with various stakeholders [Wood, 2023]. For instance, climate change studies might require researchers to collaborate with policymakers, non-profit organizations, and laypeople. Therefore, science communication training could focus on interdisciplinary collaboration skills, such as cultural competence, dialogue, and conflict resolution [Brenes-Alfaro & Carrasco-Palma, 2024].

Despite growing awareness of the complexity of science communication efforts, science communication education and short-course training remain scarce in Latin American and North American universities [De Cruz, 2022; Dudo et al., 2021]. Particularly in Latin America, few science communication training courses are offered; instead universities mainly offer master level programs, restricting opportunities for researchers to acquire practical science communication skills [Massarani et al., 2023]. Consequently, researchers struggle to implement science communication initiatives that engage publics in their research [Peters, 2021].

Practical science communication skills include crafting engaging speeches and messages for non-scientific audiences [Fähnrich et al., 2021] and developing public engagement initiatives through in-person [Mehlenbacher, 2019] and online formats [National Academies of Sciences, Engineering, and Medicine, 2017]. Another highly effective science communication initiative for promoting interdisciplinary collaboration is citizen science [Cooper, 2016], which offers capacity-building opportunities and activities involving researchers and non-scientific audiences in collaborative data collection, analysis, and discussions [Beck et al., 2025]. To ensure these competencies are not only taught but truly mastered, training programs require systematic evaluation.

2 ▪ Science communication education and training evaluation

To assess the success of science communication training and education, and identify necessary program adjustments, evaluators use measures and criteria [Barel-Ben David & Baram-Tsabari, 2019]. Quantitative assessments of science communication program effectiveness often apply scales and measures. For example, the Science Communication Training Effectiveness Scale (SCTE) [Rodgers et al., 2020] has been found to be effective for STEM initiatives because it assesses criteria including motivation, self-efficacy, cognition, affect, and behavior [Rodgers et al., 2020].

Alternatively, some studies suggest that science communication educational program evaluation should focus on specific learning goals, such as acquiring or improving science communication skills [Pilt & Himma-Kadakas, 2023; Trench, 2023]. Baram-Tsabari and Lewenstein [2017] proposed learning science communication in informal environments, including affective issues, content knowledge, methods, reflection, participation, and identity. In this practice insight, we examine how researchers were trained through two workshops focused on specific skills, and how we evaluated the learning outcomes using an action learning approach suitable for short-course science communication training.

3 ▪ VLIR Teams-Active Parks science communication workshops

The VLIR Teams Active Parks workshops brought together twelve researchers from public health, urban planning, education, and communication to explore ways to enhance the design of public spaces in the Andean city of Cuenca, Ecuador. Science communication training scholarship shows that targeted modules boost interdisciplinary teams' psychological safety and self-efficacy skills when connecting to non-scientific audiences [Abu-Rish Blakeney et al., 2021]. In Latin America, short in-person workshops in Brazil have empowered early-career scientists with outreach and design thinking skills [Oliveira et al., 2019]. Online formats deliver comparable benefits: a Spanish-language MOOC for youth Latino researchers to counter misinformation [Colón Carrión et al., 2024]. Another study documented the effectiveness of fully virtual, asynchronous workshops for training researchers on message framing skills [Oliveira et al., 2021]. Alternatively, the VLIR Teams workshops proposed a hybrid modality that combined in-person assisted learning with online lectures to enhance skill development, which can better support interdisciplinary teams in self-reflexivity, creating social media content, and crafting speeches.

Two science communication workshops, facilitated by the co-authors of this practice insight, were part of a grant-funded research project supported by the VLIR-UOS Team Grant (Vlaamse Interuniversitaire Raad Interuniversity). The project focused on developing skills in self-reflexivity, crafting scientific presentations for public audiences, and creating social media content. The project included four research teams examining the involvement of youth (males and females, ages 12–17) in public parks and promenades, their physical activity habits, and how gender intersects with perceived access and safety factors. The VLIR Active Parks project used a combination of quantitative, qualitative, and participatory action research methodologies to gather data and engage youth. Therefore, the research process involved recruiting participants, building trust, and collaborating with community stakeholders and local authorities. Thus, science communication skills were essential for engaging people from these groups and effectively communicating the project's research findings.

4 ▪ Methodology

The workshops followed an action learning pedagogy [Rogers & Gronseth, 2021] adapted to the research team's work environment. Action learning, rooted in participatory pedagogy, employs practical action to resolve existing problems. In this way, instructors facilitated the sessions, providing resources and learning activities that supported trainees in developing projects that address work-related issues. Meanwhile, trainees apply the knowledge and skills they have gained [O'Siochru et al., 2021].

Through the science communication workshop's learning activities, researchers were able to:

1. Apply audience-centered public engagement practices to build ethical community relationships with research participants.
2. Improve their science communication skills to engage effectively with non-scientific audiences using non-scientific speeches and social media.

The workshops utilized a hybrid format, combining in-person and online training sessions to promote active learning and provide researchers with flexible scheduling options [Rogers & Gronseth, 2021]. Each four-hour workshop led by the two instructors included lectures and assisted learning activities, previously designed by on one of the instructors, a university professor with a background in science communication (see Table 1). The other instructor, an educational psychology professor, co-facilitated the sections on self-reflexivity and inclusion during the first workshop, while two students assisted with social media training and the qualitative evaluation of the workshops.

Table 1. Details of workshop topics and learning activities.

Training session	*Topic*	*Activities*	*Learning outcomes*
Workshop 1	Self-reflexivity and privilege management	Privilege walk Self-reflexivity journaling	■ Raising researchers' self-awareness in reference to research team members. ■ Developing individual and group commitments for managing privilege with audiences/stakeholders.
Workshop 2	Science communication speech and social media tools	Message Box Elevator pitch video Social media for content creation	■ Crafting a science communication speech for non-scientists. ■ Creating of a short video speech for non-scientists. ■ Creating content for Facebook, Instagram and TikTok in static and video formats.

Note: developed by the authors.

4.1 ▪ *Workshop 1. Self-reflexivity and privilege management*

The first workshop took place during the research project's pre-planning stages before researchers approached their target populations for recruitment. The primary goal of the workshop was to equip researchers with skills to build ethical relationships with participants and stakeholders. The inclusion of self-reflexivity was driven by the need to foster ethical, inclusive, and culturally responsive science communication practices.

From a pedagogical perspective, self-reflexivity is essential for identifying and questioning researchers' assumptions, privileges, and power dynamics when engaging with non-scientific audiences [Smith, 2013] with the ultimate aim of promoting ethical and inclusive communication [Nderitu & Kamaara, 2018]. However, applying self-reflexivity to science communication aims to deepen the understanding of how power dynamics influence the way science is communicated and perceived by different audiences.

Particularly in science communication, participatory research, and public engagement initiatives, self-reflexivity practices help shift communicators from a unidirectional communication model for dissemination to dialogical two-way forms of communication. Practicing self-reflexivity fosters more equitable and collaborative relationships between researchers and publics. Thus, the goals were not to train participants in communication techniques and to encourage them to reflect on how they communicate and create an open space for audience interaction. Moreover, recognizing the researcher's positionality is critical for cultivating community trust and meaningful engagement in science communication efforts [Díaz-Arévalo, 2022; Freire, 2000].

Thus, the educational psychology professor focused on training researchers to understand and better appreciate the ethical guidelines to follow when engaging with non-scientific audiences. The learning activities aimed to raise awareness about the researchers' privilege in relation to the study participants and co-workers. The privilege walk and journaling for self-reflexivity allowed researchers to reflect on their current practices and establish more ethical and inclusive practices for interacting with non-scientists in dialogue, participation, and collaboration for effective engagement [Bowater & Yeoman, 2012; Kearns, 2021; Miller & Fahy, 2009].

4.1.1 ▪ *The privilege walk*

This learning activity aimed to create rapport among researchers by considering their demographic and psychographic characteristics and raising self-awareness about layers of privilege among colleagues and participants before communicating with others. Through this activity, researchers can understand their social, cultural, and personal contexts to develop effective privilege management strategies to establish equity in collaboration.

Here is how the walk unfolded:

Researchers stood in a horizontal row, looking ahead, and then covered their eyes with a blindfold. Then, the instructor read questions related to privilege which were:

1. *Do I have a job with a fixed monthly salary?*
2. *Have I had the opportunity to complete a graduate program?*

3. *When I get home, will my family be waiting for me with a meal?*
4. *Have I traveled abroad for my vacations?*
5. *Do I have an assistant to support me in my work?*

The researchers were instructed to step forward if the question was answered positively. In the case of a negative answer, participants remained in their position. After presenting all questions, the instructor asked them to stay in their positions, remove their blindfolds, and observe the positions where each other ended.

Later, researchers engaged in a discussion about how to strategize about privilege management and equitable practices in the research project and how to approach participants and build relationships with the community. Here, how to avoid practices that treat individuals merely as research informants was discussed and how this can lead to harmful research practices [Archibald et al., 2019]. Specifically, the discussion analyzed how, in science communication, researchers are often unaware of audiences' interests, needs, cultures, and disparities, along with individuals' disengagement and disinterest in participating in research projects and science outreach initiatives. To further enhance the analysis, the team was introduced to the activity of self-reflexive journaling.

4.1.2 ▪ *Self-reflexive journaling*

This activity focused on researchers' self-reflexivity before developing a science communication initiative. Researchers reflected on their motivations for communicating their research, their assumptions about their research participants, and the stakeholders surrounding their study as audiences for science communication initiatives. To achieve this, we applied concepts drawn from decolonial pedagogies, such as self-reflexivity and dialogue, to develop equitable science communication projects [Díaz-Arévalo, 2022; Freire, 2000; Vásquez-Guevara, 2021].

- *First writing prompt*. Researchers individually wrote for 15 minutes, reflecting on their experience by using prompts from the privilege walk.
- *Second writing prompt*. Researchers reflected on their impact on peers and research audiences through the following prompt questions:
    1. Do I hold any privilege or power dynamics over my coworkers in the research group?
    2. *How can I address power imbalances with research participants while promoting inclusiveness?*
    3. *How do I usually convey my research projects? Does my communication effectively engage my community? How can I improve this?*

After journaling, facilitators introduced the de-colonial concepts of desire-centered versus damage-centered research [Tuck, 2009] and their impact on science communication. The primary goal was to raise awareness of how researchers' agendas, focused on the one-way dissemination of research findings, fail to provide solutions for people by merely reporting data through scientific conferences or research papers. This damage-centered science communication leads to audience disengagement by emphasizing problems without proposing solutions. Alternatively, desire-centered science communication proposes dialogical, two-way science communication strategies that empower non-scientific audiences by enabling them to discuss social issues that are important for them using evidence-based data, thereby facilitating actionable initiatives.

After the individual write-ups, researchers gathered in two groups to develop ethical guidelines for communicating with their audiences. Their goal was to establish audience-centered science communication practices that communicate their research through engaging strategies.

4.2 ▪ *Workshop 2. Science communication speech and social media tools*

This workshop trained researchers in science communication speech skills and social media content creation to present their research in engaging formats and attract audience interest. The training built upon dialogical models of science communication to foster stronger science-society relations through interactions between researchers and non-scientific audiences, in person [Bowater & Yeoman, 2012; Metcalfe, 2020] and online, using social media [Roedema et al., 2021].

As part of the VLIR Teams Active Parks project, researchers needed to engage with two main groups of people as part of their outreach initiatives: 1) youth as research participants to study public space use and perceptions in Cuenca, and 2) influential stakeholders (including the neighborhood watch groups, city council representatives, and members of grassroots organizations). The workshop included the following learning activities and tools.

4.2.1 ▪ *The Message Box*

Compass's Message Box [2020] is a speech design tool that presents research topics to non-scientific audiences. For this learning activity, researchers wrote a science communication speech for non-scientific audiences, emphasizing the findings and related benefits of the Active Parks study.

The Message Box comprises the following sections:

- *Issue*. Addresses the central theme of the research.
- *Problem*. Addresses the specific complexities of the issue or related challenges the research addresses.
- *Benefits*: outlines the research's advantages, including suggested solutions showing how society can use scientific data to address specific challenges.
- *Solutions*: outlines the alternatives to address the research problems/issues.
- *So what?* Considers why the audience should care? Explains the impact of the researchand describes possible scenarios, problems, and consequences related to the problem/issue.

4.2.2 ▪ *Science elevator pitch*

The second activity, the science elevator pitch, is frequently used in business and entrepreneurial environments to present ideas using persuasive and storytelling techniques

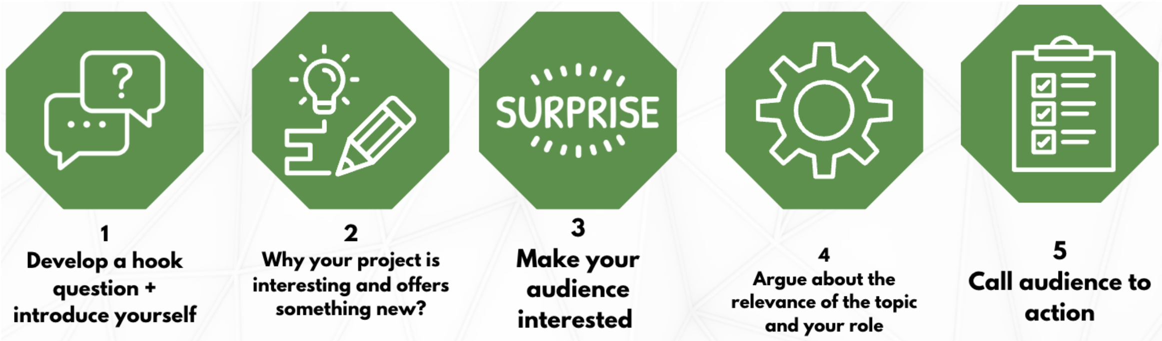

Figure 1. Science elevator pitch adapted.

[Turner, 2023]. Researchers created a three-minute elevator pitch video to present key information about their research to an audience in written communication or in-person conversation formats. The elevator pitch structure for STEM professionals was used [Morgan & Wright, 2021], framed around the five criteria illustrated in Figure 1.

4.2.3 ▪ *Scientific content creation for social media*

It has been noted that researchers who have used social media have demonstrated success in capturing the interest of non-scientific audiences in their studies [Stofer et al., 2020]. However, many researchers often lack training in content creation, which hinders their ability to effectively communicate their work through social media [Dahlstrom, 2014; Papa et al., 2000]. These activities addressed the gap by helping researchers develop practical skills for creating effective social media content.

The introductory training included a mini-lecture on content creation and engagement on Facebook, Instagram, and TikTok, drawing upon studies of successful audience engagement. The revised topics were:

- *Copywriting techniques*. Writing captions using hook questions, calls to action, emojis, Q&A, and hashtags [Hwong et al., 2017].
- *Layouts and resources*. Creating infographics to convey complex data [Velarde-Camaqui et al., 2024].
- *Reliable sources*. Utilizing reliable news outlets to provide relevant and trustworthy information on studies related to broader social issues [Velarde-Camaqui et al., 2024].
- *Eye-catching visuals*. Using visual elements, such as titles, captions, and icons in videos or posts [Wang et al., 2022].

Researchers received four step-by-step video tutorials on content creation and the specific functions of each social media platform (see Figure 2). Studies suggest that video tutorials, as instructional materials, enhance the learning of technological skills [Maziriri et al., 2020; Welbourne & Grant, 2016]. Additionally, researchers engaged in a two-hour session led by the science communication professor and two student researchers, where they practiced smartphone photography and content creation using in-app social media platforms, video and photo editing tools, as well as other editing apps such as *Canva* and *RecordIt*. Finally,

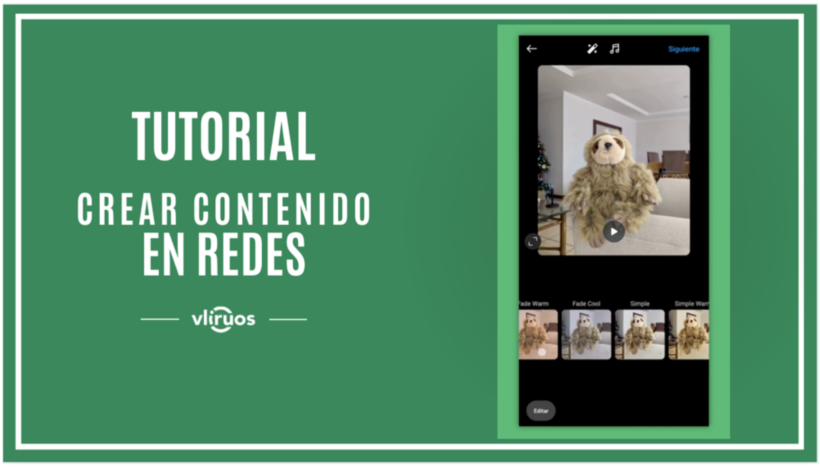

Figure 2. Video tutorials for content creation.

researchers created a static post and a video post on a chosen platform to consolidate their learning.

4.3 ▪ *Workshops evaluation*

To assess the achievement of learning outcomes (Table 1), we combined qualitative in-depth interviews, an evaluation of the learning activities, and a quantitative survey assessing self-perception of mastery and perceived usefulness of the learning activities [Cormier & Langlois, 2022].

Student researchers conducted twelve in-depth interviews with the researchers using an open-ended questionnaire [Dunwoodie et al., 2023]. The questions explored researchers' learning experiences, focusing on the effectiveness of the workshops' lectures, learning activities, and resources to gain science communication skills. Interviews were recorded and transcribed for analysis using open coding [Saldaña, 2020].

Additionally, the workshop instructors evaluated the learning activities through an anonymous survey administered after the second workshop. Using a five-point Likert scale, researchers rated their self-perceived mastery of science communication skills (*1 = Little to no mastery* to *5 = Complete mastery*) and the usefulness of the learning activities (*1 = Not at all helpful* to *5 = Crucial for science communication*). Results were analyzed for reliability using Cronbach's alpha [1951] to measure shared variance, or co-variance.

Results show that 9 of the 12 researchers felt the workshops enabled them to achieve an average mastery of science communication skills. Additionally, comparing this result with the learning activities assessment revealed that 10 out of 12 researchers developed science communication materials by applying skills including self-reflexivity, science communication speech design, and social media content creation. Additionally, 97% of researchers found all activities helpful for acquiring science communication skills. Notably, 11 of the 12 researchers identified social media training as the most beneficial, while 8 of the 12 researchers rated the Message Box and the Science Elevator Pitch as extremely helpful.

In interviews, all researchers agreed that practicing self-reflexivity before engaging with target audiences enhanced their self-awareness about privilege and how to manage it.

A female PI mentioned: "*Practicing self-reflexivity helped us examine our personal biases and how these affect people when science communication is one-sided, merely informing them rather than fostering meaningful discussions with them*".

Another researcher noted: "*…we learned how to manage our knowledge as a way of privilege and leveraged it to advocate for safer parks in Cuenca*".

Researchers developed strategies to support youth and the community by collaborating with organizations and local authorities to highlight safety and well-being challenges. They used their findings to create social media posts emphasizing why people avoid public parks due to safety concerns.

The action-learning approach helped researchers develop science communication skills while working on their project. They used the Message Box tool to craft engaging speeches for non-scientific audiences and the elevator pitch to improve their presentation skills with hook questions, calls to action, and safety tips. Finally, they created a science communication initiative combining social media and workshops to share research findings and promote safer parks in Cuenca through collaboration with the public, grassroots organizations, and the City Council.

On the other hand, one challenge researchers faced was using a linear tone in pitches that failed to engage the audience. Another significant challenge was a gap in researchers' technological literacy skills, which was especially evident when they were self-recording videos. Thus, a workshop section was added to cover smartphone video recording. Researchers then created short video posts using engagement prompts, such as calls to action, and feedback requests.

Researchers achieved learning outcomes by developing a science communication initiative that used audience-centered engagement practices to cultivate ethical relationships with research participants. They also created online and in-person tactics to shared research findings with the public and stakeholders.

5 ▪ Discussion

Science communication skills are essential for researchers developing community-engaged research. Scholarship highlights the importance of social and academic development in Latin America's science communication education and underscores the need to produce and communicate knowledge to promote social change [Canchanya Ayala, 2023; Rocha et al., 2017]. However, researchers face challenges in implementing science communication initiatives due to: (1) bureaucratic academic processes [Calice et al., 2022], and (2) science communication's time-consuming, underfunded initiatives [Bucchi & Trench, 2021]. Still, science communication initiatives promote trust-based community relationships, supporting public outreach and collaborative research [Kuehne et al., 2014].

We recommend adopting an action learning pedagogy to develop researchers' science communication skills, primarily through their research projects. Studies show that science communication education is most effective when researchers can apply their skills to communicating their findings effectively [Mercer-Mapstone & Kuchel, 2017]. At the same time, action learning workshops support interdisciplinary science communication by involving diverse stakeholders and audiences, expanding opportunities, and participatory science communication initiatives on high-impact public issues [Rootman-le Grange & Retief, 2018].

6 ▪ Conclusions

The science communication workshops offered meaningful opportunities for researchers to develop initiatives for communicating with research participants and community stakeholders. Moreover, researchers established partnerships for further collaborative projects.

The action learning approach successfully established a productive learning method for researchers based on active peer and instructor feedback. Swords et al. [2023] found that skill training is an effective pedagogical strategy for teaching science communication skills to researchers, thereby improving community engagement. Through action learning, instructors facilitated a dynamic learning environment where researchers could learn and practice their science communication skills by engaging with content and collaborating with peers to develop a science communication initiative for their project.

Future science communication training may support undergraduate and graduate students in research. Strengthening science communication skills in early-career researchers improves science communication and public engagement. Additionally, integrating social media communication skills can enhance science communication effectiveness initiatives.

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Ethics statement
This training has been approved by an IRB under the authorization CEISH-UC-2023-205.

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