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ARTICLE

Exploring the role of partnerships in enabling public engagement by Long-Term Ecological Research programs

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Abstract

This study explores how organizations that conduct scientific research support communication activities, including activities aimed at fostering public engagement. It uses qualitative, thematic analyses of semi-structured interviews to propose an initial partnership categorization based on the degree to which communication support is embedded within or external to the organization, as well as the degree to which engagement resources are pooled across funding sources. It then discusses how different categorizations might be associated with several different metrics of public engagement quality. Findings suggest that partnerships with external groups that have shared goals can enhance engagement efforts in situations where the organization lacks the resources to build internal engagement teams and programs. These findings challenge past work focused on the value of internal communication infrastructure. However, the potential benefits and limitations of different approaches to within-organization versus external-to-organization communication support need further research.

Keywords

Environmental communication; Bridging research, practice and teaching; Public engagement with science and technology

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1 ▪ Introduction

Scientists who want to communicate effectively, efficiently, and ethically must make a series of choices before they ever talk or touch a keyboard. One type of choice scientists could make is how to gain access to people and processes — support infrastructure — that could help them communicate effectively. Private and public sector executives typically have access to such infrastructure in the form of communication teams hired or contracted to help them strategize, execute, and evaluate their communication. Strategic communication efforts in such organizations would typically flow from organizational strategy around priority goals [Wilson et al., 2023] related to clear desired outcomes such as increasing sales, securing votes, garnering donations, or obtaining input to improve decision-making. Unfortunately, academic scientists often lack such support and face additional challenges related to the difficulty of communicating in the context of science [Entradas et al., 2023; Schäfer & Fähnrich, 2020]. Specifically, this study is premised on a concern that many scientists lack the support needed to build the relationships with societal actors that can enable the fruitful, two-way sharing of ideas that is central to contemporary discussions of meaningful science communication as public engagement.

This manuscript specifically explores variations in how one specific group of scientific organizations in the United States are finding ways to provide communication support to research teams. While focused on a specific type of organization, we ultimately argue that the scientific community could benefit from increased scholarly and practical attention on how to ensure scientists have access to communication support. It puts particular focus on how partnerships might provide such support in cases where internal support is not feasible. As is discussed below, past work focused on improving communication has tended to focus on how to improve individual communication skills [e.g., Rodgers et al., 2020] or the value of internal leadership and in-house communication teams [e.g., Besley et al., 2021] rather than infrastructure.

Communication staff at American universities appear to focus largely on communication goals related to student and faculty recruitment, reputation, and fundraising and report to university administrators [e.g., American Marketing Association, 2023; Public Relations Society of America, 2025]. They appear less likely to focus on scientists' goals related to ensuring that key societal actors consider scientific evidence when making decisions or ensuring a strong role for science in society [Besley et al., 2020]. Put differently, professional communicators in the sciences go by many names — outreach, public engagement, public relations, community engagement, etc. — and often help with tasks such as sharing research that makes the university look good in the media in the hopes of improving reputation to attract students and funding [Entradas et al., 2023]. Other roles exist [e.g., Sataøen et al., 2024] but, in general, we know little about the extent to which academic scientists are receiving help from communicators to achieve *their* goals.

Scientists' goals can be distinguished from university administrators' goals inasmuch as scientists' goals typically focus on ensuring that scientific insights are considered in public and private decision-making and that scientists have opportunities to integrate societal insights into science [Besley et al., 2020]. Recent research has therefore turned to exploring the role that meso-level organizations such as university research institutes and centres play in facilitating scientists' engagement efforts, given limited budgets and staff [e.g., Entradas, 2022]. A central purpose of the current study is thus to draw on American scientists' and

practitioners' experiences with communication support (or lack thereof) to try to provide insight into how science-focused academic organizations within the field of ecology use different partnership structures (i.e., explicit or formalized collaborations) to facilitate their public engagement efforts. The expectation is that other types of scientific organizations may also benefit from the findings when planning their own engagement infrastructures.

The study uses interview data ($n = 37$) collected as part of a broader project aimed at helping a group of United States-based long-term ecological research programs explore the potential value of strategic planning in their communication efforts. Initial open coding of the data and notes taken during the interview process highlighted the role of partnerships as a topic that might benefit from additional attention from scholars and practitioners interested in improving science communication practice.

We will first introduce the context of LTER programs and provide a relatively brief literature review focused on identifying concepts from theory and past research [Bowen, 2006] that drove our inductive effort to use thematic analysis [Braun & Clarke, 2022] to understand interview subjects' perspectives. We specifically focus on how scientists and communication practitioners within LTER programs discuss (i.e., socially construct) their experiences with different partnership structures and what these experiences may mean for their efforts to engage with others. As qualitative research, the goal is not to suggest that the experience of LTER programs can be statistically generalized to other types of organizations, but we do seek to identify a set of ideas that future discussion and research could draw upon [Braun & Clarke, 2022]. The discussion section specifically discusses potential future directions and highlights additional literature on partnerships from adjacent areas of study that might be relevant to future work focused on partnerships.

2 ▪ Literature review

2.1 ▪ *What is a Long-Term Ecological Research (LTER) program*

Since 1980, the United States' National Science Foundation (NSF) has supported an effort to systematically track the ecologies of a diverse set of research sites [Waide & Kingsland, 2021]. There were 27 active LTER programs across the country and in Antarctica and the Pacific Ocean at the time of research in 2024 [LTER Network, 2025a]. Each LTER program receives similar base funding from the NSF but vary in how they are organized. Some are stand-alone programs with principal investigators based in universities distant from the physical research site whereas others are embedded in organizations such as field stations that serve multiple research programs with varied sources of government and foundation funding. NSF established the first set of six LTER programs in 1980 and established its most recent site in 2021 meaning that the sites also have different histories [LTER Network, 2025b]. LTER-like program also exist in other countries and regions [e.g., DEIMS-SDR, 2025; eLTER, 2025].

NSF's only communication-related requirement to LTER programs is that they spend a set portion of their funding on K-12 education activities. In practice, however, most programs do more than the minimum-required communication. This often includes participation in a range of non-youth-focused efforts to engage with various communities who might find their research useful or from whom they might garner insight that could improve the research or

its impact. The similarities and variations in LTER approaches make them an ideal context for research on how scientific organizations can approach public engagement, although we also recognize that their long-term nature and ecological focus (among other things) mean that we must be careful in over-generalizing from their experiences.

2.2 ▪ *What do we know about partnerships in the context of public engagement quality and science?*

Past research on public engagement at two American ecological research programs pointed to the importance of leadership and communication professionals — not partnerships — as a key potential driver of public engagement quality at an organizational level [Besley et al., 2021]. That study spoke to the potential value of looking at the "excellence" literature in public relations as a source for insight into improving engagement quality. Excellence Theory highlights the value of having strong connections between an organizations' overall leadership team and the person in the organization responsible for managing communication, especially communication focused on external relationship building and maintenance [Dozier et al., 1995; Grunig & Grunig, 2008]. This literature also notes that 'excellence' is more likely when the top communication manager has a responsibility for thinking strategically (i.e., matching communication activities to overall organizational goals, ensuring outside voices are heard by the organization) and is not primarily charged with technical aspects of communication (e.g., writing, design, event-planning, etc.) [Dozier & Broom, 2006]. Consistent with the excellence literature, Besley et al. [2020] found that the scientists at the two study sites relied heavily on the support of their internal communication managers and wanted these actors to continue to play a central role in their programs' communication efforts. The study suggested that the science communication community should reconsider whether it makes sense to put so much focus on improving communication quality on training meant to improve the technical skills of individual scientists [Dudo et al., 2021; Rodgers et al., 2020; Rubega et al., 2021]. In contrast, Besley et al. [2020] suggested that more attention needs to be put on understanding the organizational factors that enable quality communication [see also Koivumäki & Wilkinson, 2020; Rödder, 2020].

The current study, however, diverges from Besley et al. [2020] in that it became apparent during the current interviews and subsequent open coding that the two study programs included in Besley et al. [2020] may not have been reasonable proxies for other LTER sites because the two original sites were both relatively well-resourced and well-established. What became noteworthy and the focus of the current study is that a lack of internal resources (i.e., staff, funding) did not always mean a lack of engagement effort or quality at the other programs. Instead, the results described below suggest that partnerships between LTER programs and external organizations may be allowing some of the ecological research sites studied — and potentially other scientific organizations — to gain access to the type of higher-level communication guidance that Excellence Theory suggests should be embedded within an organization [Toth, 2007]. As will be discussed in more detail, we understand partnerships as the sharing of resources with organizations such as a museum, non-profit, or government office to achieve shared priorities. Put differently, the study speaks to whether hiring an internal team of communication professionals or hiring outside help in the form of a communication agency or firm are the only routes to high-quality engagement. Our goal is not to specifically critique Excellence Theory, but to explore the potential value of future research aimed at further understanding the unique experiences of scientists in trying to

succeed in their communication efforts in resource-constrained contexts through the careful use of external partnerships.

Partnerships were not the initial focal topic of the project underlying this study, but the authors devoted time to exploring this topic after the initial open coding, but before completing the coding process. This exploration suggested that there does not appear to be substantial literature focused on understanding how to use partnerships to enable high-quality public engagement related to science. Instead, what appears to exist are individual case study-like reports that focus on how particular partnerships were used to accomplish tasks [e.g., Samanta et al., 2020; Maibach et al., 2024; Hall-Wallace & Regens, 2003]. These types of studies seem to point to at least two types of science communication partnerships; partnerships in which a scientific organization cooperates with an external partner on specific activities (e.g., to bring scientists into classrooms) and partnerships in which scientific organizations join with other societal actors to share knowledge. Initial data from the interviews suggest that these were not especially helpful in understanding what was heard in the interviews thus one research question we try to answer below is whether it is possible to use the experiences described by scientists and communicators to create a plausible categorization of the LTER programs' approaches to partnerships that could help guide future research and practice both within ecological and non-ecological contexts.

RQ1: How could LTER programs' partnership approaches be categorized?

2.3 ▪ *How do we understand the idea of public engagement quality?*

Deriving utility from our effort to categorize different partnership approaches requires a concurrent effort to assess how scientists and associated communicators are thinking about public engagement. Fortunately, the broader project underlying this study is grounded in the idea that high-quality public engagement related to science can be understood as communication efforts that are strategic, cumulative, reciprocal, reflexive, equitable, and evidence-based [Garlick et al., 2025]. This 'SCRREE' framework is specifically meant to provide a set of principles that the scientific community can use to prioritize and design communication efforts and goes beyond equating engagement with 'meaningful two-way dialogue that enables mutual learning' [e.g., American Association for the Advancement of Science, 2019]. For the current study, the SCRREE principles thus provided concepts that helped us explore how partnerships enable more high-quality engagement. Specifically, the SCRREE framework suggests the following.

- Achieving the principle of being *strategic* means prioritizing communication efforts around identifying and achieving appropriate audience-specific behavioural goals [Besley & Dudo, 2022a, 2022b]. For the current interviews, this principle suggested attending to how interviewees talked about strategy, the degree to which they identify clear goals, and their work with professional communicators, as well as their discussions of how they manage/find resources.
- Communication efforts should reflect the reality that the effects of communication are often *cumulative* [Brossard & Dudo, 2012] and thus require sustained efforts to engage all communication participants (including scientists). One-off efforts and efforts that take advantage of peoples' tendency to use heuristic cues (i.e., cognitive biases) are less likely to be effective, in the long term [Petty & Cacioppo, 1986] and are more

ethically fraught [Thaler & Sunstein, 2008]. For the current project, the 'cumulative' principle suggested attending to the degree to which interviewees sustained efforts to maintain relationships and the degree to which they talked about communication as one-off, ad-hoc activities, or activities that were the focus of single individuals rather than a collective effort.

- The inclusion of *reflexivity* as a principle of quality engagement reflects the value of encouraging scientists and associated science communicators to put effort into thinking about past and future engagement choices [Chilvers, 2013; Peterman et al., 2021]. This will often require organizations to engage in substantive internal and external dialogue, as well as formal evaluation. At the individual level, it may also require efforts to think deeply about personal priorities and opportunities [Risien & Storksdieck, 2018]. For the current project, this principle suggested that it could be important to pay attention to how interviewees talked about how their LTER program makes engagement decisions.
- *Reciprocity* represents a criterion for engagement quality inasmuch as scientific organizations should seek to ensure that societal actors — and not just scientists — benefit from communication (and science). Societal interactions can help scientists identify ideas and opportunities, in addition to providing opportunities to share insights. A key idea is that there is nothing inherently wrong with communication activities meant to share results (i.e., outreach), but that scientists also need to look for deeper interaction and opportunities for mutual benefit [Garlick & Fallon, 2023; Nadkarni et al., 2019]. For the current project, this principle suggested attending to how interviewees talked about what goals they seek to achieve through their communication efforts, especially goals that benefit society and derive from other societal actors.
- The inclusion of *equity* as a principle of high-quality engagement reflects the idea that the scientific community will benefit in the long term if scientists and their organisations take active efforts to ensure that the scientific enterprise is inclusive and addresses current and past inequities [Canfield & Menezes, 2020; Dawson, 2019]. For the current project, this largely meant attending to how respondents talked about justice, diversity, equity, and inclusion (JEDI) efforts for their programs and how they talked about their relationships with historically marginalized groups.
- Finally, the SCRREE framework includes the principle that public engagement activities should build on formal (e.g. social science, evaluation) and informal (e.g., experience) research about what works [Besley & Dudo, 2022b]. For the current project, paying attention to the degree to which engagement efforts are *evidence-based* meant paying attention to how respondents talked about how research and experience was reflected in their engagement choices (in practice, this principle seemed to overlap with being strategic and reflexive).

Together, these sensitizing concepts helped the authors think about what the different partnership structures that interviewees seemed to be using might mean for the nature of the engagement. One could describe these principles as themes that we are looking for in the interviews.

RQ2: What are the potential connections between how scientists and communication professionals at LTER programs think about partnership and how they enacted their engagement activities?

3 ▪ Methods

3.1 ▪ *Research population*

Our study population consisted of senior scientists (principal investigators, or co-principal investigators) and relevant communication professionals at LTER programs. We chose this group because they have a key role in making engagement decisions for their LTER programs. We contacted potential interviewees through email and ultimately interviewed 20 senior scientists and 17 communication professionals. Interviewees from 24 of 27 LTER programs are included. The number discrepancy is because there were some programs where we interviewed only a scientist or a communicator, some communicators work for more than one program, and we excluded three of 27 programs because they took part in a separate part of the project. The average age of the scientists was about 57 and almost all identified as white, non-Hispanic. About two-thirds were men. The average age of the communication professionals was about 50, almost all identified as white, non-Hispanic women.

3.2 ▪ *Analyses and reporting*

All interviews were conducted via online video-conference software, transcribed by Otter.AI, and then cleaned by the second author. Most interviews took place during the Winter and Spring of 2024 and lasted about 30–45 minutes. The authors frequently discussed and made personal notes as the interviews were occurring and discussed what they were hearing within the broader project team during biweekly meetings.

All coding was done using NVivo qualitative analysis software. Consistent with a reflexive thematic approach [Braun & Clarke, 2022], the first author initiated the formal coding process with inductive open-coding meant to enable a re-immersion into the interviews, followed by additional reviewing of the codes with a focus on consolidating similar codes, ensuring that code use was consistent. The initial coding was largely 'topic' or 'descriptive' coding [Saldaña, 2021] (see Table 1) informed by the sensitizing ideas discussed above, while the more targeted coding involved an additional, iterative effort to refine the codes for use in answering RQ2. The second round of (re)coding was built around ensuring that we felt comfortable making plausible statements about how issues of engagement quality or depth are associated with the different approaches to partnership that the interviewees discussed ensuring we had codes capturing key ideas from the SCRREE framework described above to answer RQ2 (see Table 1 for underlying coding sheet). These topic codes — while not a primary focus here due to length limitations — were then used to qualitatively explore potential differences in how different types of programs think about engagement.

The themes we identify (RQ1) reflect the categories that we believe represent the primary ways that LTER programs are organizing and thinking about engagement-related partnerships. The first author conducted the primary coding while the second author discussed and reviewed the coding while using their familiarity with the source content to assess the plausibility interpretations provided in the results. Additional colleagues familiar with the project and LTER programs also looked at drafts of the study. Institutional Review Board confidentiality rules precluded their use of raw interview data.

One thing to note about the coding used in this analysis is that, as with many other qualitative studies [Dawson, 2014; Loroño-Leturiondo & Davies, 2018], we do not attempt to

Table 1. Key topic codes relevant to the SCRREE criteria and underlying the focus on connecting partnership categories (i.e., themes, RQ1) and engagement quality (RQ2).

Strategic/Evidence-based	*Code description* Code was used when respondents…	*Additional information*
Strategy	… discussed a connection between goals/desired outcomes and activities.	This code is not meant to suggest anything about the quality of a strategy; just that the respondent said something relevant to strategy. This code arose to some extent in most, but not all interviews.
Professional communicators	… indicated a role for a professional communicator in planning, implementing, or evaluating communication efforts. [Note:	Having access to a professional communicator does not make something inherently strategic (i.e., goal-oriented). This code was used in about half of the interviews.
Low resources	… indicated limited access to resources.	This code was used frequently and coded in almost all interviews.
Environmental protection/restoration	… indicated that their research/ engagement had a goal related to environmental protection or restoration.	This code was used for about half of the interviews and was the primary goal for most engagement efforts that were not focused on K-12 education. This code might also fit under the 'reciprocal' criteria inasmuch as the focus is on helping communities protect their environment.
Cumulative		
Individualism/	… indicated something that suggested that they were opportunistic in seeking engagement opportunities.	This set code was used in a little more than half of the interviews.
Ad-hoc	… indicated something indicated that an engagement activity was the responsibility of single actors (rather than an organization-led activity.)	This set code was used in about half of the interviews.
Relationships	… indicated that they prioritized building and maintaining relationships with people and organizations outside of LTER program/host site.	About half of the interview noted relationship building/maintenance as a priority.
Reflexive		
Engagement talk	… described opportunities/contexts in which they had opportunities to talk about engagement activities.	Almost all interviews included some element of this; about half specifically mentioned working groups and half mentioned the importance of the LTER renewal process. This code might also have been group with the 'strategic' criteria above.
Reciprocal		
Better research/Co-production	… described a desire/effort to use engagement activities to identify additional research opportunities or ideas, as well as mentions of efforts to explore co-production of research	This combined code was used in a bit more than half of the interviews.

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Strategic/Evidence-based	*Code description* Code was used when respondents…	*Additional information*
Equitable		
JEDI	… discussed the role of justice, equity, diversity, or inclusion.	This code was noted in about a third of interviews.
Minority Audience	… discussed a specific traditional marginalized group that was a priority audience/interlocutor for engagement efforts.	Just less half of the interviews noted Indigenous/Native American groups as a priority and about a quarter noted other minority groups

Notes: The initial open coding identified a range of additional topic codes not discussed in the current study but that informed the development of the categories discussed (RQ1) and underlie the discussion of how partnership types may be associated with engagement quality (RQ2).

make numerical estimates of how often a specific code was used. Instead, we treated coding and codes as building blocks in the analysis [Braun & Clarke, 2022, p. 229], and we put the focus on using the coding process to organize text in a way that let us identify themes (i.e., partnership categorizations, in our case) relevant to our research questions. We also wrote short internal memos about each program summarizing how the interviewees talked about the ways they organize themselves to conduct engagement efforts and the nature of that engagement. Interview notes and ongoing discussion during the coding process were also key to shaping our thinking.

As qualitative researchers, we value the inherent subjectivity of the work and seek to establish validity through thick description, including direct quotation of interview subjects. We also sought to ensure validity (i.e., credibility or trustworthiness) by frequently discussing the emerging results with a working group of scientists and communication professionals at some of the LTER programs (i.e., member checks). In terms of positionality, the underlying project included a range of scholars and practitioners with deep histories in science communication research, informal science education, and in specific long-term ecological research communities with whom tentative results could be triangulated [Golafshani, 2003]. Some of the value of the current work, in this regard, came from the opportunity to look broadly across multiple LTER programs using a range of lenses.

It is also worth noting that there were topics that arose in almost all interviews, regardless of where they fit within our categorization and that we do not discuss in the current study in any substantial way. Primary among these was the sense that there are not enough resources available to do public engagement as well as programs might like and that most programs recognized that they could be more strategic in their efforts.

4 ▪ Results

The primary themes that we identified and emphasize here are the broad categories that seem to capture how the interviewees describe their LTER programs' partnership approaches (RQ1). We treat these categories as 'themes' because the categorizations also represent a "central organizing concept" [Braun & Clarke, 2022, p. 296] that helped us make sense of what we believe we heard in the interviews. We suggest three main categories of LTER

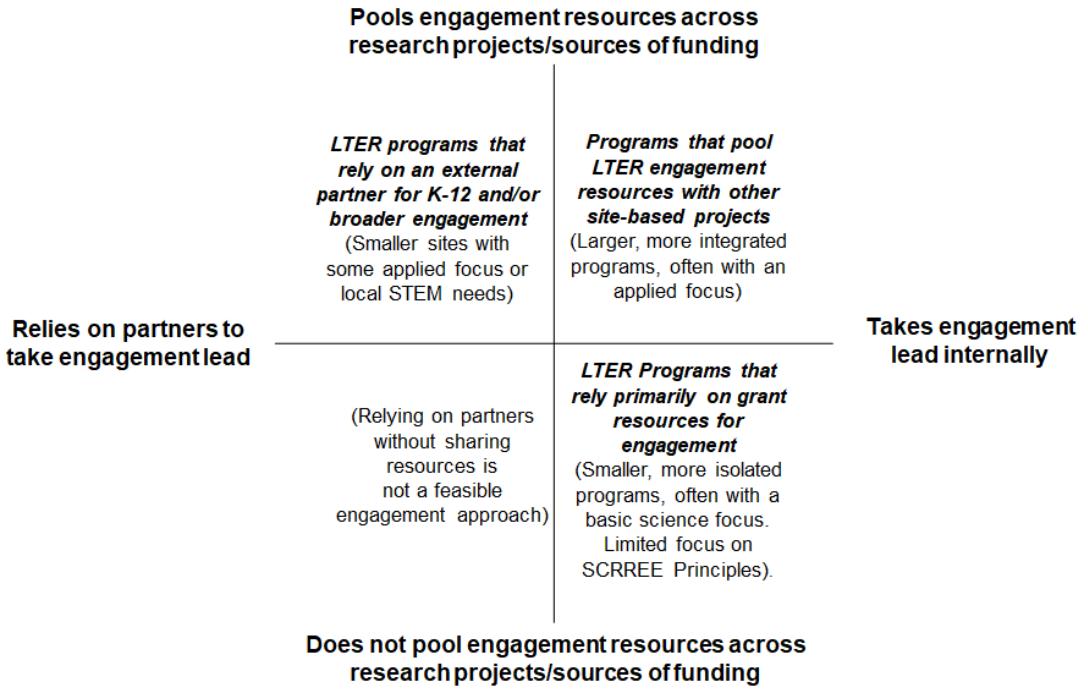

Figure 1. Two proposed axes aimed at describing how different LTER programs approach engagement at an organizational level.

programs: (1) LTER programs that try to manage engagement on their own with limited budgets, (2) programs that rely on partners to help design and implement engagement, and (3) programs that integrate LTER engagement planning into broader programs of engagement with multiple sources of funding. These categories can also be understood by thinking along two continuums (Figure 1), with one dimension focused on the degree to which the program pools engagement resources across various projects/sources of funding and another that focuses on the degree to which the program takes the lead on engagement activities or whether it relies on partners. These continuums are not negative-to-positive continuums; they are just options that different LTER programs appeared to take based on opportunity and history (as well as categories that this manuscript argues may deserve additional scholarly attention in other contexts). The bottom left-hand quadrant is empty as partnerships without resources by either partner does not seem like a feasible option for any organization. We discuss these three categories below.

4.1 ▪ *LTER programs that rely primarily on LTER grant resources for engagement*

About a fifth of the LTER programs seem to rely largely on the limited resources provided by their LTER grants, including researcher time, for engagement activities. These programs' activities seemed to focus on K-12 education (as noted, a required element of LTER grants), rather than broader engagement. This group would sit somewhere in the bottom right-hand quadrant of Figure 1.

Several of these programs are based around remote, extreme sites where there is little potential for geographic-based community engagement (i.e., in polar regions) and focus primarily on basic research questions. The remaining programs seem to have scientists do

their own ad-hoc/individual activities but do little to coordinate non-K-12 efforts. Outside of an LTER context, this type of approach might look like a research organization that limits its engagement activities to those specifically written into individual grants.

As might be expected, these LTER programs studied were generally not positioned to approach engagement in a way that might be seen as consistent with SCRREE principles for their non-K-12 activities (i.e., their efforts did not seem especially strategic, cumulative, etc.) (RQ2). These programs often noted the budgetary and practical challenge of asking people to do more engagement while maintaining their science efforts.

> Mostly it's budget … we have [many] [co-] PI's; none of them get any money really. And so, to ask them to take [engagement] on ends up being only if they're passionate about it. … We stress over the budget, and so there hasn't been a [lead communication] person, and there hasn't been as much of a priority as some things. [Scientist 9]

One potential consequence of lacking substantial access to specialized engagement expertise is that substantive conversations around engagement priorities may be less likely to occur and thus make the reflexivity challenging.

> [Engagement] always gets talked about. The question is more about the depth of the conversation and how much of that conversation does it wind up entailing. That varies, but you know, admittedly, the science will always take the lead and be the dominant discussion. (Scientist #3)

Two of the programs in this category also appeared to be in a period of transition, with new leadership teams, and it seems reasonable to expect that projects may take time to identify potential partners and build the necessary relationships for resource sharing.

4.2 ▪ *LTER programs that rely on an external partner for K-12 engagement and/or broader engagement*

This category has two sub-categories.

4.2.1 ▪ *LTER programs that rely on an external partner for K-12 engagement, but not broader engagement*

About another fifth of the LTER programs have an external partner to help implement K-12 engagement/informal education efforts, but did not have a similar primary partner for non-K-12 efforts. These education-focused partners were often museums, aquariums, or informal science education groups with largely youth/family-oriented missions. This group would sit in the top left quadrant of Figure 1. Outside of an LTER-context, this might look like astronomy department that has a long-term partnership with a planetarium or a chemistry lab that has a long-term relationship with a local on- or off-campus summer program.

As might be expected, a primary argument for many of these partnerships was pooling funding to increase impact.

> [T]he budgets for [informal education in the LTER grants] are teeny tiny. And don't even support … a full person without having some sort of like leverage funding. This enabled us to use my entire team. And because we're already embedding our work into the things that [we're] already doing, then it gives me a lot of other resources. [Engagement specialist 5]

A couple of these programs were remote sites in areas with large Indigenous populations and the decision to focus on the K-12 audiences was grounded in evidence that the communities involved wanted such a focus and that such a focus was consistent with scientists' desire to advance principles of equity and reciprocity.

> [The] most important thing we do is work with the kids. That's what [the communities] want. They want us to work with the kids. They care most about their children. So, we're doing everything we can to work with the kids. [Scientist 3]

Non-youth activities at these programs, however, often seem to be more individual/ad-hoc, often based on requests.

> Often I get the request initially, and then I shop it around and beg somebody else to call on in my stead. [Scientist 20].

One important thing to note in this category is that the lack of a primary partner does not mean that these programs did not have non-K-12 collaborators. Many interviewees at these programs mentioned specific groups with whom they interacted regularly. The key is just that interviewees tended to discuss these groups in the form of specific examples of recent activities and/or in terms of less extensive collaboration than the types of partnerships described in the next category. For example, an interviewee noted that their site is increasingly working with an Indigenous organization to coordinate activities and ensure that activities made sense for the broader community.

It is also noteworthy there was still a sense within these programs that scientists deeply appreciated the help of professional communicators/educators (whether internal, or at a partner organization). It sometimes sounded like a desire to entrust logistical responsibility for engagement efforts to partners so that scientists could focus on core scientific questions.

> We also often say we do the hard messy work so [the scientists] get to kind of come in one piece, where they can really contribute and feel like, you know, because we recognize that's not a huge component of any of their jobs. So, if we take away some of the pieces that are more time consuming and less fun and really maximize their time and effort, it really is just kind of a win for everyone. (Engagement Professional #10)

In terms of the SCRREE principles (RQ2), the fact that LTER programs relying on external partners for K-12 activities often left scientists to pursue their own non-K-12 engagement priorities meant that such efforts may have been less strategic and less focused on

cumulative impact. Also, while respondents' efforts sounded consistent with ensuring reciprocity, reflexivity, equity, and evidence-based practice around K-12, the more diffuse nature of the non-K-12 engagement made it difficult to discern from the interviews the degree to which projects were centering these types of ideas in such activities. Indeed, across programs, the interviews suggested a broader desire to ensure that all relevant communities had access to LTER programs' insights. Indigenous communities near LTER programs, in this regard, were often noted as a frequent priority for relationship building and efforts to ensure equity and reciprocity. This was true regardless of partnership category.

4.2.2 ▪ *LTER programs that rely on partner(s) for both K-12 and broader engagement*

The largest group of LTER projects (about a third of those for which we have data) appear to have partnered with one or more external entities to both conduct their K-12 engagement efforts, as well as help lead broader engagement efforts. A key difference between this sub-category and the previous sub-category is that the nature of the non-K-12 partnerships seemed to be deeper and broader (i.e., multiple topics, and/or activities). In many cases, the same partner helped with both K-12 and non-K-12 activities. Further, a person from the external partner organisation was typically part of the LTER program management team or, at least, participated in LTER program planning (this was also sometimes true in the previous category). In some cases, the key partnership was based in physical geography such as when an LTER program was housed on the site of another organization. For example, there are programs that are on foundation-owned nature reserves or government land, such that the LTER program turns to the foundation or government entity for engagement direction. A scientist at one LTER program, in this regard, noted that they lean on their host site for a range of programming, as well as to build and manage regional relationships, while LTER scientists focus on research, including research relevant to the host site's activities.

> We take a lot of our motivation for what they get from [our partner's] priorities. So, both in terms of, the … K 12 programming and also public outreach. … They're kind of building up [relationships] more and more with some of the local tribes. For the LTER we really keep pretty close in terms of focusing on our research. [Scientist, #6]

A scientist at another program relied heavily on a long-term partnership with an off-site informal education group for both K-12 education and some relationship building with potential research users, while simultaneously partnering with the government agency that hosts the LTER program on their land for engagement with public- and private-sector resource managers.

> We ride the coattails a little bit of our … hosts … their role is very much about outreach to [private-sector actors] and land managers … I shouldn't be sheepish about it. It's a good way of leveraging our relationships. [Scientist #10]

Another LTER program in this category described a partner that started out as focused on K-12 but that, over time, became more involved in facilitating research about co-production

and community science. “So, it was just for many years kind of parallel and now it’s much more integrated.” (Engagement professional #2). Outside of the LTER context, this type of partnership might occur if a chemistry research institute or centre partnered with a professional chemistry group (i.e., a scientific association).

In terms of the SCRREE principles (RQ2), it seemed like programs that relied on a partner for both K-12 and broader engagement — whether a government or foundation group, or a group that does more than K-12 — to think more strategically and long-term (i.e., cumulatively) about their engagement than sites that do not have partnerships or that have more limited partnerships. If nothing else, deeper partnerships seem more likely to ensure that engagement gets discussed broadly as part of the six-year renewal process, and these processes were typically described by all interviewees as a primary point during which LTER scientists, staff, and partners strategized around engagement priorities. Having one or more people (sometimes from a partner organization) with a broad engagement focus on the management team (i.e., executive committee) also seemed to provide such programs with additional opportunities for the type of reflexivity that comes with discussion opportunities. As noted above, JEDI committees were also often described as important places for engagement-related discussions, and it can be expected that such discussion can help promote SCRREE principles such as reciprocity, reflexivity, and equity.

> [T]he start of our project should be inclusion, then you know that that goes into engagement that goes into collaboration and, you know, how do we do this? What’s the process and, and so it really makes us stop and reflect on how we proceed instead of just go with the, you know, our old ways of conducting research. (Engagement professional #4)

4.3 ▪ *Programs that pool LTER engagement resources with other site-based projects*

There were a handful of research organizations for which their LTER program was just one of several sources of funding, and thus were able to integrate LTER-related engagement efforts into broader engagement efforts. This group would sit in the top right quadrant of Figure 1 and be similar to many multi-investigator research centres or institutes with extended histories. In this regard, such programs typically had access to at least a small staff dedicated to K-12 and broader engagement efforts and it was this type of program that led Besley et al. [2020] to argue about the importance of internal communication support.

> We have always had a structure where people can bring ideas forward … It’s a slow process, and it requires a lot of meetings. But it seems to be the way that has worked for us and in generating the ideas that are most exciting. And also, because we work directly [with local government resource managers], we are involved in their meetings. And then all the restoration meetings. And so, we’re always listening to the many voices of the [region] because they are also looking to us for answers. … [W]e’re not a site that can basically work in isolation. (Scientist #8)

Another element of these larger programs is that, while all were engaged in some basic research, all were also doing research that had relevance to multiple other groups in society,

perhaps increasingly so. Similarly, all seemed to be engaging with other actors to ensure that their research and engagement efforts were meeting community needs. For example, an engagement specialist noted that their teacher training efforts included a community-based emphasis.

> Right from the beginning, [our efforts were] very focused on listening to our partners and asking for what they want and creating programming around what our partners were requesting. (Engagement professional #7).

This does not mean that sharing and seeking community insight was limited to the larger, more integrated LTER programs but these larger programs seemed to have more mechanisms through which to communicate.

In terms of SCRREE principles (RQ2), the sense was that these larger programs were talking more about their engagement efforts (i.e., being strategic and reflexive) and had more bandwidth to try to be evidence-based in their efforts. Their size also seemed to enable additional opportunities for reciprocity. And, like all the programs, equity appeared to be top-of-mind.

4.3.1 ▪ *One additional case*

One outlier LTER program that we did not categorize was a relatively new program designed around community-engaged scholarship. In this case, engagement resources were core to the program, and thus there was a substantial effort to follow SCRREE-like principles, especially those associated with reciprocity and equity.

5 ▪ Discussion

The results above suggest that one way to make sense of how LTER programs organize themselves for public engagement is to think in terms of the degree to which programs partner with external organizations and pool resources across different sources of funding (RQ1).

From both a theoretical and practical perspective, our interpretation of what we heard during the interviews suggests that, whereas Excellence Theory focuses on building within-organization structures to manage communication strategy and implementation [e.g., Grunig & Grunig, 2008], scientific organizations may not need to build their own internal engagement infrastructure to take advantage of the potential benefits of pooling engagement resources across multiple projects and/or sources of funding. This contradicts the argument that Besley et al. [2020] make about the potential need for scientists to ensure that they have within-organization capacity for engagement planning and implementation. Such infrastructure seems to help — and we would still encourage research organizations to consider the potential value of such infrastructure — but the current findings also suggest that some types of scientific organizations may be able to obtain some of the benefits of an internal engagement infrastructure if they can find organizations that share their broader goals and that might be willing to partner (e.g., a non-profit or government organization who also has a mission to conserve an ecosystem or support a community). Noting the limitation

discussed below, the results thus point to the potential value of doing more to explore the range of potential partnership approaches that scientific organizations might consider when trying to maximize their engagement impact in resource-constrained contexts.

5.1 ▪ *Limitations and future research*

A central limitation of the current study is that it focuses on exclusively on LTER programs in the United States. LTER programs' long-term nature and focus on ecology may give them some advantages when it comes to finding and maintaining partnerships. However, while this focus provided a context within which to ground the study, we expect that there would be benefit in additional thinking about whether there are other types of organizations that similarly rely on external partners for communication support as well as how such research could include a quantitative component [e.g., Entradas, 2022]. With regard to other contexts in which the types of partnerships, companies often form industry groups to communicate around shared goals (i.e., lobby), but these seem different from what we heard above. In this regard, LTER programs did not generally create engagement-focused partnerships with other research programs. Rather, their partners complemented their interests. Similarly, the partnerships we heard about were not simply client-contractor relationships, such as might occur when a company hires a public relations/community relations firm. The partner organizations that we heard about here tended to have their own topic-based priorities, whereas strategic communication firms largely adopt their clients' priorities in exchange for financial recompense. It may be that the scientific organization + engagement organization partnership space is relatively unusual. That being said, we can imagine partnerships in other scientific contexts, such as astronomy research organizations partnering with astronomy clubs, engineering researchers partnering with trade groups, and a wide range of research groups partnering with regional, national, or international professional associations or scientific societies.

At a theoretical or conceptual level, relying on partners has several potential implications that also deserve attention. We are especially eager to develop additional research to further explore how partnership approaches might affect the nature of public engagement activities, as was operationalized in the current study through the use of the 'SCRREE' framework described above (i.e., to what degree are engagement activities strategic, cumulative, reciprocal, reflexive, equitable, and evidence-based) (RQ2).

Reflecting on Excellence Theory [Grunig & Grunig, 2008], we are particularly curious about how organizations that depend on partners for engagement activities might miss out on the benefits of having an internal voice. This internal voice can help bring external perspectives about engagement and research priorities into scientific discussions and help prioritize goals in line with SCRREE principles. We would hypothesize that heavy reliance on external partners may limit an organization's ability to develop strategies tailored to their specific needs and reduce reflexivity, as organizational leadership could end up less directly connected to external voices whose insights could help the scientists make better research or engagement decisions. Consequently, scientific organisations might pursue more accessible goals rather than those most crucial to scientists. However, being strategic involves pursuing feasible goals, and partner organizations with specialized engagement expertise can offer advantages, such as focusing on cumulative impact, equity, and evidence-based design. Additionally, any potential downsides may be outweighed by the

benefits of pooling engagement resources across various funding sources and gaining access to outside thinking.

In addition, we also noted that one of the sites of the three LTER programs not discussed here (because of its broader role in the underlying project) has created their own engagement partner in the form of a foundation that is not fully internal to the site but that is also not fully independent. This foundation does some engagement activities that are directly related to the site and project priorities but has also developed its own priorities and fundraising efforts. We are thus curious about the extent to which other groups of scientists have self-created similar partner organizations and what the implications of such an approach might be for engagement quality.

Looking forward, we are eager to explore the role of partnerships between scientific research organizations and engagement-oriented organizations beyond long-term ecological research programs. An obvious place to start is other biological field stations (i.e., established locations such as the LTER-associated programs where people like ecologists go to do research).

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References

American Association for the Advancement of Science. (2019). *Public engagement*. Retrieved January 23, 2025, from https://www.aaas.org/programs/center-public-engagement-science-and-technology

American Marketing Association. (2023). *2023 AMA Symposium for the Marketing of Higher Education: Agenda*. Retrieved July 1, 2025, from https://www.ama.org/events/conference/2023-ama-symposium-for-the-marketing-of-higher-education/

Besley, J. C., & Dudo, A. (2022a). Strategic communication as planned behavior for science and risk communication: a theory-based approach to studying communicator choice. *Risk Analysis*, *42*(11), 2584–2592. https://doi.org/10.1111/risa.14029

Besley, J. C., & Dudo, A. (2022b). *Strategic science communication: a guide to setting the right objectives for more effective public engagement*. Johns Hopkins University Press.

Besley, J. C., Garlick, S., Fallon Lambert, K., & Tiffany, L. A. (2021). The role of communication professionals in fostering a culture of public engagement. *International Journal of Science Education, Part B*, *11*(3), 225–241. https://doi.org/10.1080/21548455.2021.1943763

Besley, J. C., Newman, T. P., Dudo, A., & Tiffany, L. A. (2020). Exploring scholars' public engagement goals in Canada and the United States. *Public Understanding of Science*, *29*(8), 855–867. https://doi.org/10.1177/0963662520950671

Bowen, G. A. (2006). Grounded theory and sensitizing concepts. *International Journal of Qualitative Methods*, *5*(3), 12–23. https://doi.org/10.1177/160940690600500304

Braun, V., & Clarke, V. (2022). *Thematic analysis: a practical guide*. SAGE Publications.

Brossard, D., & Dudo, A. D. (2012). Cultivation of attitudes toward science. In M. Morgan, J. Shanahan & N. Signorielli (Eds.), *Living with television now: advances in cultivation theory & research* (pp. 120–146). Peter Lang.

Canfield, K., & Menezes, S. (2020). *The state of inclusive science communication: a landscape study*. Metcalf Institute, University of Rhode Island. https://web.uri.edu/inclusivescicomm/wp-content/uploads/sites/1568/State-of-Inclusive-SciComm-2020-2.pdf

Chilvers, J. (2013). Reflexive engagement? Actors, learning, and reflexivity in public dialogue on science and technology. *Science Communication*, *35*(3), 283–310. https://doi.org/10.1177/1075547012454598

Dawson, E. (2014). "Not designed for us": how science museums and science centers socially exclude low-income, minority ethnic groups. *Science Education*, *98*(6), 981–1008. https://doi.org/10.1002/sce.21133

Dawson, E. (2019). *Equity, exclusion and everyday science learning: the experiences of minoritised groups*. Routledge. https://doi.org/10.4324/9781315266763

DEIMS-SDR. (2025). *Dynamic Ecological Information Management System*. Retrieved July 25, 2025, from https://deims.org/

Dozier, D. M., & Broom, G. M. (2006). The centrality of practitioner roles to public relations theory. In C. H. Botan & V. Hazleton (Eds.), *Public Relations Theory II* (pp. 137–170). Lawrence Erlbaum Associates. https://doi.org/10.4324/9780203873397

Dozier, D. M., Grunig, L. A., & Grunig, J. E. (1995). *Manager's guide to excellence in public relations and communication management*. Lawrence Erlbaum Associates. https://doi.org/10.4324/9780203811818

Dudo, A., Besley, J. C., & Yuan, S. (2021). Science communication training in North America: preparing whom to do what with what effect? *Science Communication*, *43*(1), 33–63. https://doi.org/10.1177/1075547020960138

eLTER. (2025). *Integrated European Long-Term Ecosystem, critical zone and socio-ecological Research: evolution & components*. Retrieved July 24, 2025, from https://elter-ri.eu/evolution-components

Entradas, M. (2022). Public communication at research universities: moving towards (de)centralised communication of science? *Public Understanding of Science*, *31*(5), 634–647. https://doi.org/10.1177/09636625211058309

Entradas, M., Marcinkowski, F., Bauer, M. W., & Pellegrini, G. (2023). University central offices are moving away from doing towards facilitating science communication: a European cross-comparison. *PLoS ONE*, *18*(10), e0290504. https://doi.org/10.1371/journal.pone.0290504

Garlick, S., & Fallon, K. (2023). The ECO framework: advancing evidence-based science engagement within environmental research programs and organizations. *BioScience*, *73*(6), 422–432. https://doi.org/10.1093/biosci/biad037

Garlick, S., Besley, J. C., Peterman, K., Black-Maier, A., Downs, M. R., Ortiz Franco, E., Groffman, P. M., Lavallee, A., O'Connell, K., Storksdieck, M., & Templer, P. H. (2025). Six elements of effective public engagement with science. *Frontiers in Ecology and the Environment*, e70014. https://doi.org/10.1002/fee.70014

Golafshani, N. (2003). Understanding reliability and validity in qualitative research. *The Qualitative Report*, *8*(4), 597–606. https://doi.org/10.46743/2160-3715/2003.1870

Grunig, J. E., & Grunig, L. A. (2008). Excellence theory in public relations: past, present, and future. In A. Zerfass, B. Ruler & K. Sriramesh (Eds.), *Public relations research: European and international perspectives and innovations* (pp. 327–347). VS Verlag für Sozialwissenschaften. https://doi.org/10.1007/978-3-531-90918-9_22

Hall-Wallace, M., & Regens, N. L. (2003). Building university-school partnerships: an exercise in communication and understanding. *Journal of Geoscience Education*, *51*(1), 96–103. https://doi.org/10.5408/1089-9995-51.1.96

Koivumäki, K., & Wilkinson, C. (2020). Exploring the intersections: researchers and communication professionals' perspectives on the organizational role of science communication. *Journal of Communication Management*, *24*(3), 207–226. https://doi.org/10.1108/jcom-05-2019-0072

Loroño-Leturiondo, M., & Davies, S. R. (2018). Responsibility and science communication: scientists' experiences of and perspectives on public communication activities. *Journal of Responsible Innovation*, *5*(2), 170–185. https://doi.org/10.1080/23299460.2018.1434739

LTER Network. (2025a). *About the network*. Retrieved July 1, 2025, from https://lternet.edu/about/

LTER Network. (2025b). *LTER history*. Retrieved February 19, 2025, from https://lternet.edu/network-organization/lter-a-history/

Maibach, E., Roser-Renouf, C., Myers, T., Kotcher, J., & Reed, D. (2024). The "think-and-do tank" model: action-oriented climate communication research. *Environmental Communication*, *18*(1–2), 68–75. https://doi.org/10.1080/17524032.2024.2304571

Nadkarni, N. M., Weber, C. Q., Goldman, S. V., Schatz, D. L., Allen, S., & Menlove, R. (2019). Beyond the deficit model: the ambassador approach to public engagement. *BioScience*, *69*(4), 305–313. https://doi.org/10.1093/biosci/biz018

Peterman, K., Garlick, S., Besley, J., Allen, S., Fallon Lambert, K., Nadkarni, N. M., Rosin, M. S., Weber, C., Weiss, M., & Wong, J. (2021). Boundary spanners and thinking partners: adapting and expanding the research-practice partnership literature for public engagement with science (PES). *JCOM*, *20*(07), N01. https://doi.org/10.22323/2.20070801

Petty, R. E., & Cacioppo, J. T. (1986). The elaboration likelihood model of persuasion. In *Communication and persuasion: central and peripheral routes to attitude change* (pp. 1–24). Springer. https://doi.org/10.1007/978-1-4612-4964-1_1

Public Relations Society of America. (2025). *Educators Academy*. https://www.prsa.org/home/get-involved/professional-interest-sections/educators-academy-section

Risien, J., & Storksdieck, M. (2018). Unveiling impact identities: a path for connecting science and society. *Integrative and Comparative Biology*, *58*(1), 58–66. https://doi.org/10.1093/icb/icy011

Rödder, S. (2020). Organisation matters: towards an organisational sociology of science communication. *Journal of Communication Management*, *24*(3), 169–188. https://doi.org/10.1108/jcom-06-2019-0093

Rodgers, S., Wang, Z., & Schultz, J. C. (2020). A scale to measure science communication training effectiveness. *Science Communication*, *42*(1), 90–111. https://doi.org/10.1177/1075547020903057

Rubega, M. A., Burgio, K. R., MacDonald, A. A. M., Oeldorf-Hirsch, A., Capers, R. S., & Wyss, R. (2021). Assessment by audiences shows little effect of science communication training. *Science Communication*, *43*(2), 139–169. https://doi.org/10.1177/1075547020971639

Saldaña, J. (2021). *The coding manual for qualitative researchers* (4th ed.). SAGE Publications.

Samanta, A., Eanes, F. R., Wickerham, B., Fales, M., Bulla, B. R., & Prokopy, L. S. (2020). Communication, partnerships, and the role of social science: conservation delivery in a brave new world. *Society & Natural Resources*, *33*(7), 914–926. https://doi.org/10.1080/08941920.2019.1695990

Sataøen, H. L., Lövgren, D., & Neby, S. (2024). Metaphors of communication professionals in higher education: between the trivial and significant. *JCOM*, *23*(05), A06. https://doi.org/10.22323/2.23050206

Schäfer, M. S., & Fähnrich, B. (2020). Communicating science in organizational contexts: toward an "organizational turn" in science communication research. *Journal of Communication Management*, *24*(3), 137–154. https://doi.org/10.1108/jcom-04-2020-0034

Thaler, R. H., & Sunstein, C. R. (2008). *Nudge: improving decisions about health, wealth, and happiness*. Yale University Press.

Toth, E. L. (Ed.). (2007). *The future of excellence in public relations and communication management: challenges for the next generation*. Lawrence Erlbaum Associates. https://doi.org/10.4324/9781410613967

Waide, R. B., & Kingsland, S. E. (Eds.). (2021). *The challenges of long term ecological research: a historical analysis*. Springer. https://doi.org/10.1007/978-3-030-66933-1

Wilson, L. J., Ogden, J., & Wilson, C. (2023). *Strategic communication for PR, social media, and marketing* (8th ed.). Kendall Hunt.

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