

# One Sky Institute Summative Evaluation

Summer 2020



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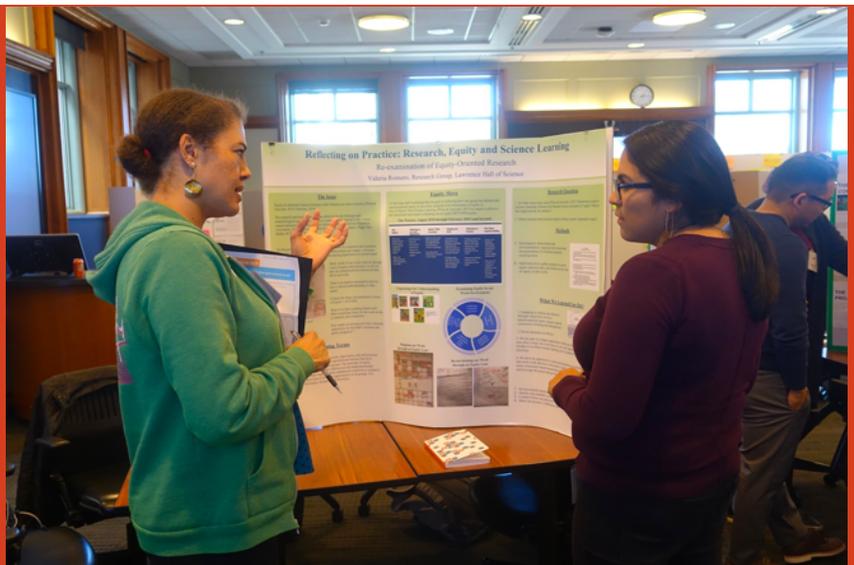
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# Overview



## Overview

The One Sky Institute (One Sky) was an NSF-funded Exploratory Pathways project aimed at developing a new strategy to broaden participation in informal science education. The program emerged from the current need to expand professional development to help increase and support a more diverse cadre of leaders in ISE. One Sky tested professional learning design strategies for mentoring program participants and engaging them in research and practice by developing equity-focused projects at their home institutions in order to: 1) build new knowledge about broadening participation and the barriers that exist to diversifying leadership in ISE and 2) build program participants' capacity to design and implement transformative, knowledge-building broadening participation projects at their home institutions. The University of Washington led the development and piloting of the project in partnership with two researchers and three ISE leaders who served as program faculty.

One Sky was funded as a Pathways project for one year and received supplemental funding for an additional year to further develop and pilot additional curriculum and instruction and convene participants in person. The project identified three main participant outcomes:

Outcome 1: Develop participants' socio-historical understanding of broadening participation. This includes developing more critical perspectives in equity and broadening participation and expanding familiarity with research and practice.

Outcome 2: Build participants' social networks and social capital.

Outcome 3: Build procedural know-how with respect to equity-focused project and proposal design.

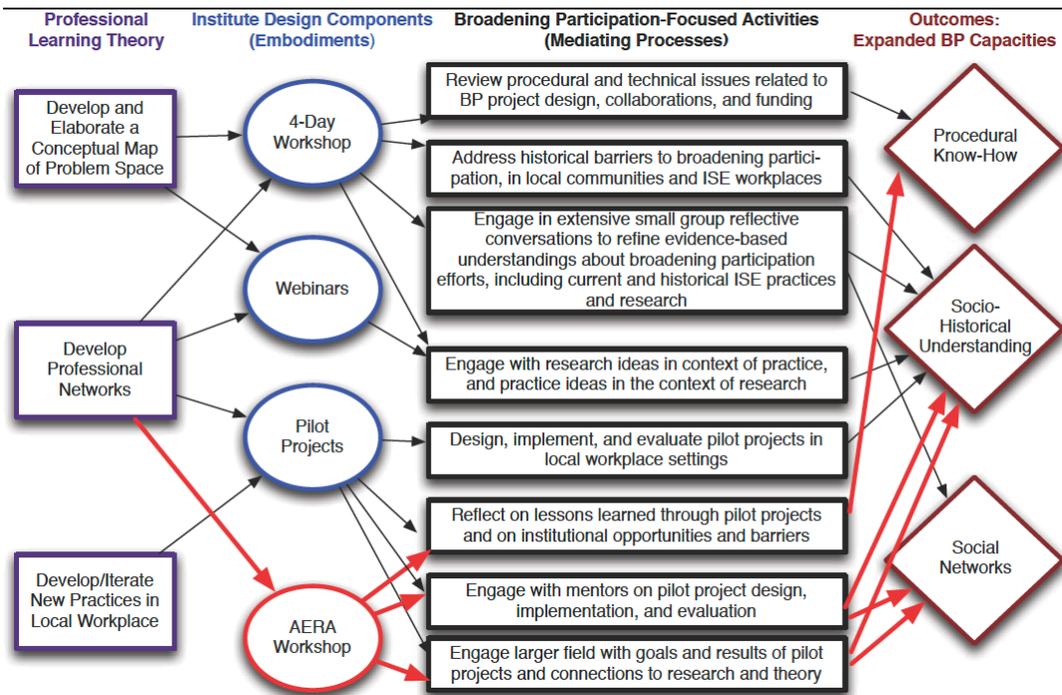
## Project Design

The One Sky Institute design included four core components: a) in-person three-day workshops; b) sustained online programming ("webinars"); c) "equity move" pilot projects; and d) poster presentations of equity move projects. Mentoring faculty provided instruction and participant support. The program design, as originally conceived by the project PI at the proposal stage for a full implementation grant, appears in Figure 1 and maps the links between program components, professional learning theory, and outcomes. (Note that revisions made during the

project implementation in response to participant needs and what the project team was learning are not reflected in the Figure below. These changes are described later in this section.)

**Figure 1. PD Experience Program Design Conjectures**

Source: One Sky NSF Proposal (Bevan, 2017)



The program design was grounded in two theories of learning and professional development: 1) learning is a cultural process that occurs in specific communities of practice (Lave and Wegner, 1991) and 2) learning, in a professional development context, must connect theory, research, and practice (Bevan and Xanthoudaki, 2008; Darling-Hammond and Bransford, 2005).

*Workshops*

In-person workshops were held to engage participants in a range of issues and practices and build the learning community. Specifically, these four-day sessions focused on supporting participants to: a) develop more critical perspectives on how to broaden participation; b) develop and expand their familiarity with research and practice relevant to broadening participation; and c) build and strengthen their social networks. The workshops included activities such as presentations by faculty and participants, small-group and full-group discussions, hands-on activities such as group poster creations on specific topics, and one-on-one sessions with faculty mentors. In-person meetings also provided opportunities for participants to connect

professionally and personally. Two workshops were held in Chicago in March 2018 and March 2019 (see Appendix A for workshop agendas). A third half-day workshop took place in September 2019, in conjunction with the *InclusiveSciComm* conference in Rhode Island. The workshop, which used the CAISE Broadening Participation Toolkit (CAISE, 2019), focused on examining systemic barriers to broadening participation in STEM and strategies to facilitate equity conversations with colleagues.

#### *Online Programming (“webinars”)*

Monthly online meetings were designed to continue sustained engagement and ongoing learning and connections. These 90-minute sessions typically included a presentation by a professional in the field whose work focuses on broadening participation and equity efforts. Presenters included researchers and practitioners who collectively introduced participants to a range of research and scholarship, including program models and examples of projects that linked theory and practice (see Appendix B). Short articles and research briefs were sent out in advance of some sessions, providing a basis for discussion during the online meeting. Sessions also included ample opportunities for check-in, breakout group work, and discussions. The project also used Slack (a communications platform for work teams/projects) through the duration of the project.

#### *Equity Move Projects*

Participants also developed and implemented an equity move project in their home organization. Projects were meant to provide participants with opportunities to concretely test out and apply new ideas or engage specific audiences and/or colleagues. Subgroups of participants working on similar equity move projects met as working groups during the year to share progress. Throughout the process, faculty mentors worked with participants to support them as they conceptualized, designed, and implemented their projects.

#### *Conference Poster Sessions*

Participants attended the September 2019 *InclusiveSciComm* conference, where they presented posters on their equity move projects. The conference focused on broadening participation in STEM science communication and included a wide range of sessions. One Sky participants attended the full conference and, as previously discussed, participated in a half-day pre-conference workshop.

## Summative Evaluation Design

Garibay Group was contracted to conduct an external evaluation to fill both formative and summative purposes. The evaluation sought to support adaptive learning for project leaders and participants by providing ongoing feedback about the project's trajectory and progress. At the same time, the evaluation measured and reported progress made toward meeting project goals and target outcomes.

In keeping with project aims and strategies, the evaluation was grounded in culturally responsive and contextually relevant evaluation (Frierson, Hood, and Hughes, 2002; Thomas, 2004). In this approach, the researcher considers the culture and context of the participants and the program as critical dimensions that inform every aspect of the project and the evaluation.

Summative evaluation examined the efficacy of the program's approach to professional development efforts to increase and support a more diverse cadre of ISE professionals. More specifically, the evaluation centered on these key questions:

- To what extent and in what ways do participants develop: a) socio-historical understanding of the barriers to broadening participation in STEM? b) social networks? and c) procedural know-how in project design, collaborations, and funding related to broadening participation?
- What insights emerge about the learning and mentoring needs of participating ISE professionals from non-dominant communities?
- What is the evidence for the efficacy of the program design? What elements are especially effective? What are areas of challenge? What key principles from this project pilot initiative can guide the development and design of future participation-broadening professional learning programs?

This evaluation employed a mixed methods design which combined quantitative and qualitative data (Greene & Caracelli, 2002). Qualitative data focused on understanding participants' diverse perspectives and values and explored project implementation, adaptations, and lessons learned. Quantitative data focused on tracking progress toward achieving goals and outcomes and examining the relative frequency of different experiences and perspectives among program participants.

Data collection methods included structured, non-participatory observations; surveys combining closed-ended, Likert scale, and open-ended questions; focus groups and semi-structured interviews; document reviews; and reflective conversations with the project team.

### *Observations*

Garibay Group conducted semi-structured, non-participatory observations (in March 2018, March 2019, and September 2020) of in-person sessions, which included workshops and a conference poster session. Evaluators also observed online sessions in both Years One and Two. We used a semi-structured observation guide to gather contextual information and look for evidence of engagement, nature of interactions and discussions, and overall participant response. Garibay Group staff conducted 74 hours of observation.

### *Workshop Surveys and Feedback*

Two surveys were administered after the Year One (March 2018) and Year Two (March 2019) workshops in Chicago. The surveys gathered data about participants' a) learning of content; b) areas of growth and challenge; c) overall satisfaction with and perceived value of the experience; d) response to specific workshop modules and structure; and e) sense of connection to the cohort (social network). Post-workshop surveys were administered online. The response rate for the 2018 workshop was 80% (16 of 20) and in 2019 was 94% (16 of 17). In order to inform the workshop in real time and help faculty respond to emergent needs and make adjustments, we also collected feedback after each day of the workshops. These data typically took the form of open-ended responses to prompts intended to surface insights about how participants were responding and connecting to content and structure, about areas where participants needed more support or time, and generally about what was working well and what needed course correction.

### *Mid-point Survey & Focus Group*

To inform program development, we also administered an online survey toward the end of Year One (November 2018). The questions we asked aimed to capture participants' sense of growth, particularly about: a) their learning; b) ways in which they were applying ideas learned in their work; c) areas where they felt challenged or felt they needed more support; and d) perceived connections and social networks in the group. We also conducted an online focus group to

further explore some of these areas and elicit input to inform the content and structure for the March 2019 workshop.

### *Document Review*

Document review allows for in-depth examination and analysis of specific artifacts, in this case participant applications to One Sky, meeting notes, attendance sheets, and equity move project posters from presentations at the *InclusiveSciComm* conference and Slack group communications. The goal of this review was to triangulate findings from observations and surveys. The One Sky project team also conducted an initial analysis of the equity projects, which included participants' notes on various project elements such as areas of focus and theoretical frames and literature that informed each project. Evaluators reviewed summary data and conducted a second-level analysis to look for trends across equity move projects.

### *Reflective Conversations*

Garibay Group participated in group conversations with One Sky faculty following each workshop and at the end of each year. These discussions provided opportunities to reflect on the projects, to consider aspects that were working well and any potential shifts based on participants' needs and desires, and to inform the plan for program content.

### *End-of Project Survey and Interviews*

At the conclusion of project activities, we administered a final online survey to examine participants' overall program experiences, including: a) increased socio-historical understanding of broadening participation and equity frames; b) sense of connection to cohort members and faculty and the nature of those connections (i.e., social networks); c) reflections on their equity move projects; d) responses to their experiences at the *InclusiveSciComm* conference (for those who attended); and e) perceived overall value of their participation in One Sky. Surveys were administered online and 16 of 17 participants (94%) completed the survey. Additionally, we conducted short interviews (~30 minutes) with participants to further understand their experiences. Eight of 17 individuals participated in these interviews, a response rate of 47%.

### *Data Analysis*

Interview transcripts, field notes from observations and reflective conversations, and meeting notes were coded using inductive constant comparison techniques (Patton, 2015). In this iterative process, each unit of data is systematically compared with each previous data unit,

allowing the researcher to continually identify, develop, and refine categories of data and patterns as they emerge (Miles, Huberman, & Saldaña, 2014). For quantitative data from surveys and document review, basic descriptive statistics are summarized in histograms and cross-tabulations. We conducted thematic coding of open-ended responses.

## Participants & Program Participation



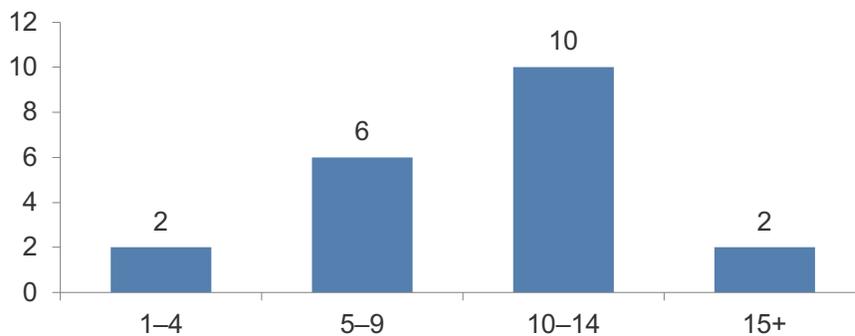
## Participants & Program Participation

### One Sky Institute Participants

Twenty individuals participated in the One Sky Institute. Participants were recruited through a competitive application process and were selected from a total of 51 applications. Seventy-five percent of participants (N=15) were from communities of color. The majority, 80% (N=16), identified as female, 15% (N=3) as male, and 5% (N=1) as queer.

There was wide variety in participants' years of experience in the ISE/Scicom field, ranging from four to 19 years and, on average, 9.8 years. (See Figure 2.)

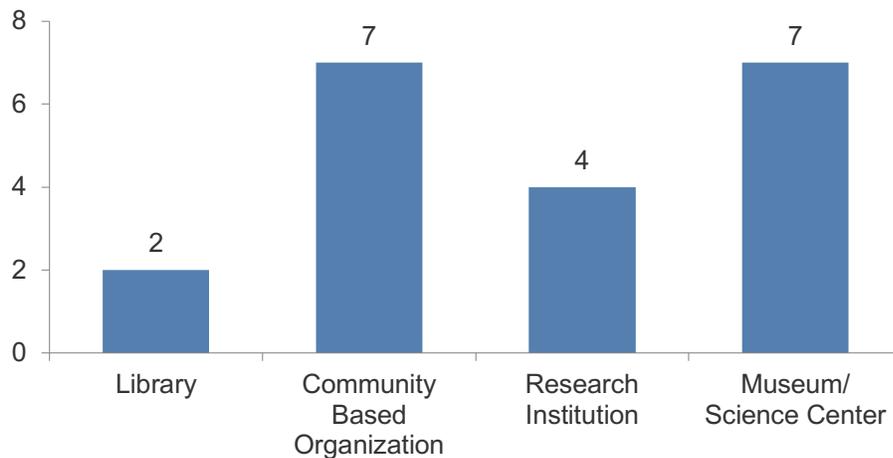
**Figure 2. Participants by Years in Field**



N = 20

Program participants' roles within their organization also varied widely, although the large majority were in an education departments. Ten of the participants held managerial roles while the remaining 10 participants were in non-managerial staff positions.

Participants' institutional affiliations also represented a wide range of organizations, although the largest clusters, came from museums/science centers (35%; n=7) and community based organizations (35%; n=7). A quarter of participants were in science communication and three-quarters in informal science education. (See Figure 3.)

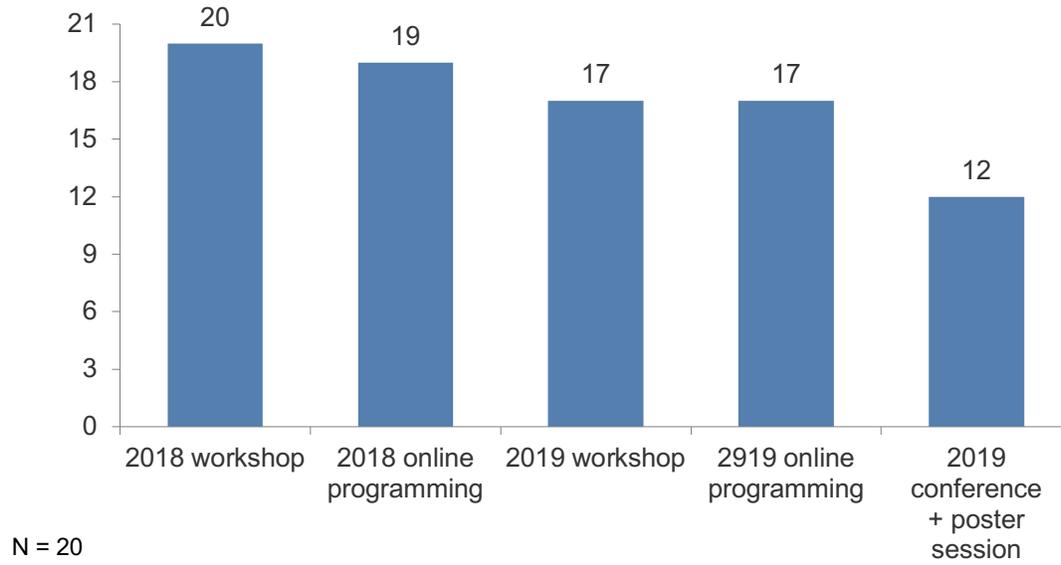
**Figure 3. Participants by Institution Type****Program Participation**

Of the 20 participants who began the program, all but one (95%) were actively engaged in Year One, attending the initial in-person workshop, monthly webinars and discussions, and mentoring/coaching sessions. (One person left nine months into the program due to family reasons.)

Of the remaining 19 individuals, 17 (85% or original cohort) continued their active involvement in Year Two, with all attending both the in-person workshop and actively participating in online programming. Those 17 individuals completed a version their equity move project which they presented (still mid-process) at the Year Two in-person workshop. (Of these two individuals who left, one did not remain with the program due to a job change to another organization, while the other was part of a science expedition that interrupted their participation.)

Of those participants, 12 (70%) attended the *InclusiveSciComm* conference and participated in the poster session where they presented a final version of their equity move project. The remaining participants did not attend the conference due to scheduling conflicts. (See Figure 4.)

Figure 4. Participation Across One Sky Project



# Results



## Results

Findings showed that One Sky was a successful Pathways Project, providing a robust proof of concept that can inform future professional development projects focused on increasing and supporting a more diverse group of leaders in the ISE field.

### **The Program Context: Early Career Professionals**

The One Sky Institute was initially conceptualized as a program for mid-career professionals. While the number of years that participants had been in the field varied widely (from four to 19), participants had, on the whole, less experience in broadening-participation work than someone later in their career. This is because including professionals from communities of color was prioritized in the selection process and fewer senior-level people from communities of color applied to the program. Thus, participants were mostly early-career professionals who needed more supports and scaffolding than more experienced professionals likely would have.

One strength of the One Sky Institute, in fact, was the project team's responsiveness to the needs of participants and its ability to adjust and tailor elements of the project to meet participants' needs, particularly in supporting their still-emergent understandings of socio-historical perspectives of broadening participation, theoretical perspectives, and general experience in the informal learning field.

### **Outcomes**

#### *Outcome 1: Develop socio-historical understanding of broadening participation*

The program successfully met this outcome and, in fact, was one of the strongest positive participant outcomes. Data show that participants deepened their awareness and understanding of equity as well as how they think about it in the context of their work. We documented three primary gains in understanding: a) more clear and broadened definitions of equity and the need to differentiate between access and equity in broadening participation; b) the importance of acknowledging and considering the social, historical, and political dimensions of equity in STEM; and c) increased awareness that formal and informal science education is grounded in dominant Western cultural perspectives. Engaging with these ideas also led participants to new ways of thinking about broadening participation and ISE.

#### *Outcome 2: Develop social networks and social capital*

This outcome was successfully met and was among the most impactful aspects of the program for participants, who often noted that developing connections and networks was one of the most valuable aspects of their One Sky experiences. The relationships they developed—both between participant and faculty—allowed them to discuss and share ideas, seek input and advice, and connect with others engaged in equity and broadening participation.

*Outcome 3: Build procedural know-how with respect to equity-focused projects and proposal design*

Given that participants in One Sky were early career professionals, and with respect to what was doable in the scope of a Pathways project, the project team determined early on that this hoped-for outcome was not appropriate. Instead, the project team focused on introducing foundational ideas and providing mentorship and supports. These shifts and adjustments were instrumental to participants' positive experiences.

**Program Design Elements Contributing to Outcomes**

One key goal of the evaluation was to help inform future professional development projects, examining project components and participants' experiences. Findings illuminated areas of strength and surfaced insights, particularly about the needs of early career participants. In general, the One Sky Institute's program design was well-conceived, with various program components working in concert.

*In-person workshops and online programming*

The combination of in-person workshops and consistent monthly online programming were central to participants' experiences, proving to be the most important elements in deepening their learning. The curriculum itself was robust and also allowed for flexibility so that the project team could respond to participants' needs. In particular, because participants were at an early stage in their career, this required spending more time on introducing the cohort to core ideas and equipping participants with a foundation on which they could build.

The in-person meetings introduced participants to core ideas and provided extended time over the course of three days to explore concepts in depth and build and strengthen social networks. The online component supported participants in further exploring ideas and building their understandings and provided many opportunities for rich discussion. Participants could learn

from each other and build cohesion as a cohort. The combination of these components allowed for sustained engagement and provided the faculty to get to know and support participants.

As a result, participants’ conceptions of broadening participation deepened over the course of their involvement. Participants developed a greater awareness of equity frames, and this expanded conceptions beyond seeing access and diversity as the main barrier to STEM engagement. When we asked participants about broadening participation frames and coded open-ended responses following their program involvement, we found they made more references to systemic (social/historical) and institution-level aspects (see Table1).

**Table 1. Broadening Participation: Primary Frames Mentioned by Participants**

Broadening Participation Frames (N=16)	Prior to One Sky Institute	After One Sky Institute
Systemic aspects that create inequities in STEM participation (Social/Historical)	2	9
Institution-level aspects as elements that can support or hinder STEM engagement/broadening participation	3	4
Importance of culturally relevant pedagogical practices	5	7
Broadening participation as primarily an issue of access	9	0

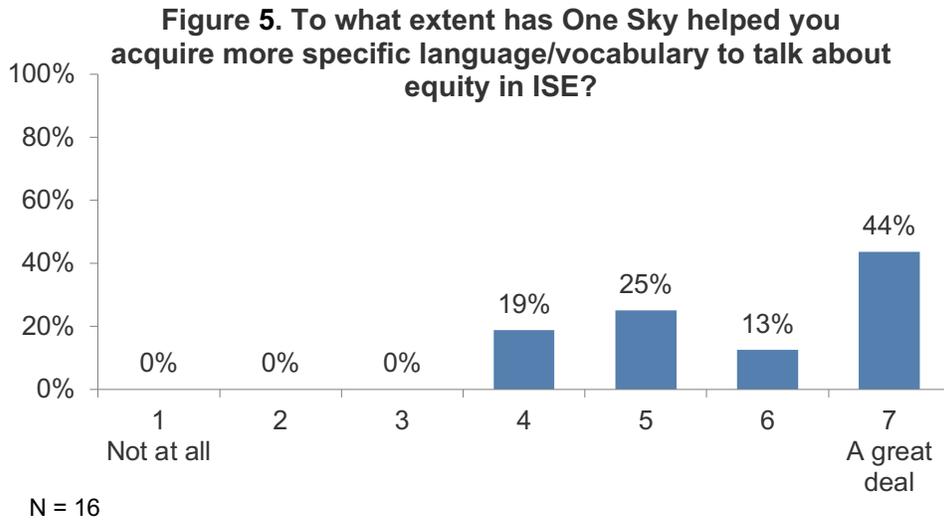
*\*Could name more than one aspect*

*I really appreciated the sociocultural-historical lens through which our discussions were often framed. It reminded me about the importance of critically thinking about how the historical context of our institution has shaped our thinking about equity and how knowing and challenging that history may shift our thinking of what equity can look like.*

*Having a new perspective of looking at things through an equity lens, because our institutions are truly not equitable to marginalized communities.*

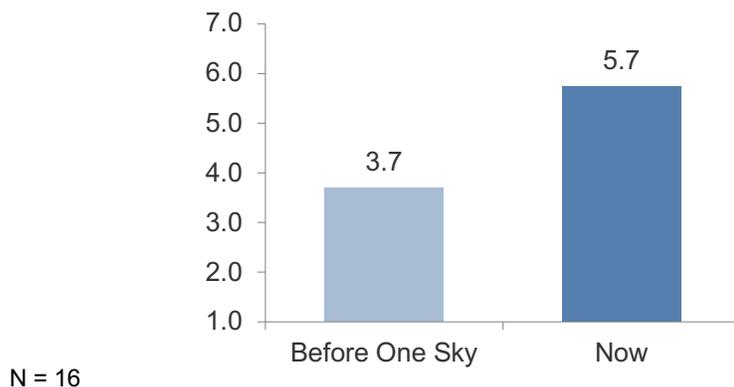
*The discourses around equity from [the] Phillips and Azevedo [reading] was also a great framing for the kinds of things I’ve seen in ISE.*

Data also showed that the One Sky Institute helped participants acquire language to talk about equity in the context of ISE—often linking theory/research to practice. Participants surveyed, for example, reported gaining specific language, with more than half (57%) reporting high acquisition levels (“6” of “7” on a 1–7 scale). (See Figure 5.)



Findings also indicated that in addition to deepening socio-historical understanding, the program helped develop participants' comfort in engaging with issues of equity and broadening participation. These are, in a way, important foundational elements in building capacity. When asked specifically about their comfort level through a retrospective pre/post question, participants reported increased comfort levels, with an average rating of 5.7 following program participation compared to 3.7 before the program. (See Figure 6.)

**Figure 6. Reflecting on where you were at the beginning of the project and where you are now, rate your comfort level in being able to engage with issues of equity in ISE.**  
 (1=Not at all comfortable, 7=Very comfortable)



*I think [One Sky] has given me more confidence and vocabulary to be able to share and navigate the STEM enterprise and environment.*

*Before One Sky I would hold back and feel like I didn't have the knowledge to participate in informed ways about these issues. I don't feel that way anymore. Not that I have "the knowledge" now (hah...)—now I just feel more comfortable with being present in the conversations.*

*Now I feel more comfortable with the discomfort of engaging with issues of equity in ISE. I also feel more comfortable with the complexity, messiness, and overlapping when engaging with equity issues.*

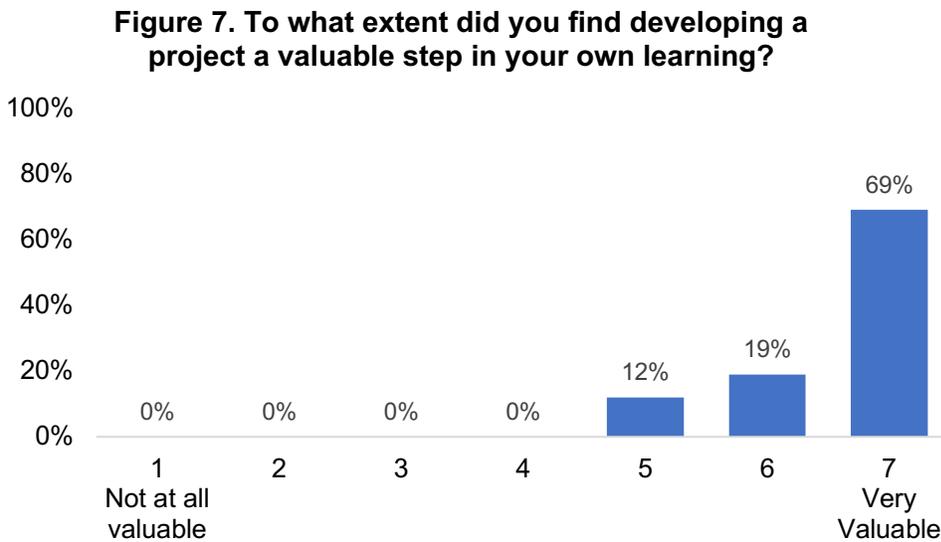
The main challenges in these program elements stemmed from the limitations of the scope for a Pathways project. In-person workshops could only be held infrequently (March 2018, March 2019, September 2019). The evaluation data, however, indicated that participants, in large part because of their career stage, could have benefited from more time exploring core concepts in even greater depth. Similarly, because of funding parameters, the number of faculty attending online sessions was limited (with the number of participating faculty dropping over time); this directly impacted how sessions were structured. While participants benefited from time with faculty both in person and virtually, and online sessions included a group of experienced professionals focused on equity, future online sessions could benefit from more faculty available to offer expertise and support.

### *Equity Move Projects*

The original project design anticipated that participants would develop pilot projects as a way to engage with research ideas in the context of practice and to try out their ideas in the context of research; toward developing procedural knowhow. During the first workshop, however, it became clear to the project team that this goal was not appropriate for participants given their stage of development. In fact, participants initially expressed a great deal of trepidation about what and how they would do their project. As a result, faculty reconceptualized these projects as "equity moves"—small pilot projects participants undertook focused on taking concrete steps and activities to shift their current program or internal staff routines to take more critical perspectives on broadening participation. The intent was to help participants move beyond strategies of providing access to existing programs and consider the nature of these opportunities so that they could be more relevant and engaging with their focal audiences.

The majority (17 of 19 participants) successfully completed an equity project as part of the One Sky Institute. The evaluation found that doing equity move projects was critical in helping participants consider how to link research and practice and apply their new ideas to their work.

Participants, overall, found the equity projects valuable and an important part of their learning. When asked specifically to rate the value of equity projects on a 1–7 scale (where 1 is “not at all valuable” and 7 is “very valuable,” the large majority of participants (88%) rated it 6 or 7. (See Figure 7.)



N=16

The large majority of comments noted that the value of having to develop and carry through a project was one of the most useful aspects of their involvement

*The equity move project helped me consider some of the ideas we’ve discussed throughout our time in One Sky and go put those into practice.*

*The project was somewhat challenging—it took me a while to find my focus, but in the end, I feel it was valuable learning and [valuable] to have something tangible to show.*

*It was the impetus for me to engage my some of my colleagues in conversations about some of the ideas like equity. I think I would have probably tried that, but this led me to finding ways to do that in a more structured way.*

Projects reflected a range of problems of practice (see Table 2).

**Table 2. Equity Project by Problem of Practice**

<b>Context</b>	<b>Total (N=17)</b>
Dominant cultural norms of STEM	5
Narrow definitions of STEM	4
Need for community voice	3
Need for program participant voice	3
Leading organizational discussions about equity and STEM	2

Participants also used a range of strategies in their projects (see Table 3).

**Table 3. Equity move projects by strategy**

<b>Broadening Participation Frames</b>	<b>Total (N=17)</b>
Forming or exploring institutional partnerships	6
Activating community voice	5
Exploring and expanding understanding of equity	4
Activating student voice	2

All but two were grounded in theory. Additionally, nine projects specifically mentioned and/or used literature and resources introduced in the One Sky Institute. Table 4 maps projects by the theoretical frames used. (See Table 4.)

**Table 4: Projects by Theoretical Frames Used**

Theory	Total (N=17)	Description
Asset-based	12	Recognizing the importance of valuing and the need to understand participant and community perspectives.
Ecosystems	7	Recognizing the importance of taking an ecosystem approach, understanding that one's organization is a player in a larger system and needs to intentionally be part of that system.
Epistemic Pluralism	4	Integrating western STEM perspectives with others' views, including everyday ways of thinking about science.
Culturally Responsive/ Sustaining Pedagogy	3	Recognizing the importance of building science programs around participants' interests and lived experiences.
Social Capital	1	Recognizing that social capital—the resources to an individual or group that accrue through networks of relationships—can be used to broaden and strengthen participation in STEM.
Unclear	2	

\* Could draw on multiple theoretical frames

For most participants, this was the first time they had undertaken a project in which they attempted to link theory to practice. Scoping the project appropriately, crafting research questions, and grounding projects in theory and the literature base all proved challenging. Therefore, participants required significant support throughout the process. Many were initially uncertain about which dimension of equity, for example, to address and how do to it. In addition, most participants were uncertain about which dimensions of equity their institutions were best positioned to address. One-on-one meetings with project faculty proved critical in every part of the process. Faculty, particularly the project PI, were especially responsive in tailoring support to each individual and guiding them in the process.

Participants found it important to present their projects to peers during the second in-person workshop because it provided them with opportunities to obtain feedback, see and learn from other projects, reflect on what they were learning, and consider ways to make refinements.

*[If found it] very valuable to learn about others' projects and get feedback on my own. This helped in refining my project and at the [actual] poster session [at the InclusiveSciComm conference] it was great fun to see everyone's final projects.*

*The poster session [segment of the in-person meeting] was great for getting to share and practice talking about my project.*

*The feedback really helped me walk away with a far more refined focus [for my final project/poster].*

Although the final projects varied in their sophistication, and required significant faculty support, this element of the program design was important in helping participants put concepts into practice. Future programs that build on the One Sky model would benefit from incorporating a similar equity move project component. In addition to planning for faculty support time for early career professionals, we recommend that equity move projects take place in Year Two of the project once participants have a more solid foundation of core concepts and ideas. Additionally, we recommend developing more project milestones and deadlines and providing more participants with further examples of projects for participants. A full-scale project with a longer duration would also provide the time to incorporate more sessions that specifically address how to situate practice in research (and vice versa) and give participants more time to iterate projects.

Future program iterations of longer duration than the One Sky pilot project, could also benefit from a more formal set of sessions that introduce participants to techniques for developing proposal ideas and funding structures. This thread could also include: a) writing assignments to give them practice at developing a full proposal about their equity move project and b) opportunities for participants to apply for a small mini-grant via a formal RFP process within the One Sky Institute. (Note that our recommendations would likely differ for a different cohort of more experienced participants and that these particular recommendations are based on our findings of this cohort's experience in One Sky.) We also recommend that future iterations of the program with more robust funding include at least two in-person workshops per year.

### **Conference/Poster Sessions**

Being able to participate in and present at a national conference (in this case, *InclusiveSciComm*) served as an important culminating moment for participants. It provided an opportunity for participants to present their work in a national forum and discuss broadening participation ideas and efforts.

Participants appreciated being able to present their project at a national conference, viewing it as a celebratory moment of their One Sky work and involvement. Participants were engaged and reported they enjoyed attending the conference and the opportunity to present. They reported being “satisfied” (75%) or “very satisfied” (25%) with the conference. Participants

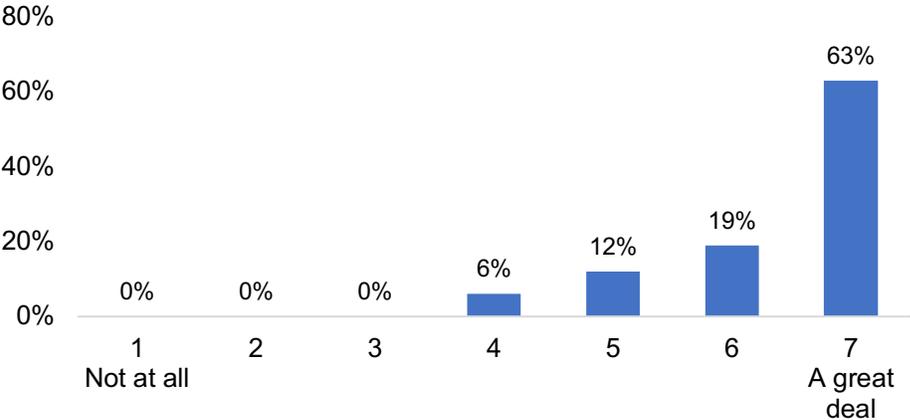
reported that conference sessions gave them the opportunity to become more familiar with the concepts presented and to explore them. Participation also provided opportunities for dialogue and helped respondents consider their ideas within the contexts of their work and institution. Respondents felt that one of the more useful aspects of their conference experience was the pre-conference workshop-focused CAISE broadening participation toolkit. The conference also provided participants the opportunity to reconnect in person; all named this as an important aspect of their experiences.

The *InclusiveSciComm* conference fit well with the One Sky program, given its focus on broadening participation efforts. In future programs, identifying the “right” conference for poster presentations will be important; this will provide alignment and focus and ensure that the conference is at the right “level” for emerging professionals. The AERA conference, initially envisioned as the place for poster presentations, may have been too academically geared given participants’ foci and experience. It will be important to consider providing participants with the mechanism to present on their work regardless of the specific conference they attend.

**Faculty Mentors**

Relationships with faculty were also an important aspect of participants’ experiences in One Sky and helped them feel supported in their learning. When asked to rate on a scale of 1–7 (1=not at all and 7=a great deal) how supported they felt by program faculty over the course of their involvement, the large majority (82%) provided 6 or 7 ratings. (See Figure 8.)

**Figure 8. To what extent did you feel supported by the faculty during your participation in One Sky?**



N=16

At the beginning of the project, data showed that the large majority of participants (90%) reported having no formal mentorship in their current workplaces and many noted specifically needed mentoring in STEM education and/or equity-specific work. Participants were able to connect with faculty aligned with their interest and greatly appreciated their guidance. In this sense, the One Sky Institute filled an important gap in participants' professional development.

*I valued the opportunity to connect with the faculty mentors. I have not had that type of mentorship before in other professional development trainings and I think their mentorship is a key between being introduced to these ideas and actually working on some of these ideas.*

*I also know that [One Sky] has deepened my network and social capital by connecting me to faculty members who are well known and connected in the field.*

*The extension of this project beyond a year helped also with my relationships with faculty. I have been somewhat intimidated by research and academia (often because of racism, etc.) but I was able to be comfortable in reading work, critiquing work (as faculty before me have), and seeing me as someone that potentially can one day contribute to research. I was also able to talk to faculty more as people, as mentors; and I think that would have only happened with the extended time rather than a shorter cohort.*

Early in the project it became clear that participants needed support due to feeling marginalized in their organizations. Participants, particularly from non-dominant groups, reported feelings of tokenism, lack of power, and isolation due either to their social identities or their equity-focused work (or both). During the first workshop, the project team reworked part of the agenda in order to spend more time on these issues. One faculty member led a session on micro-aggressions in the workplace. Participants developed posters to express issues they struggled with and then did a poster walk so participants could engage on issues that resonated with their experience. Faculty also helped develop shared talking points to support participants' discussing and sharing the issues and takeaways that emerged. Finally, faculty sent participants' supervisors follow-up letters after the workshop summarizing the workshop discussions and reminding them that participants would need their continued support in their One Sky participation and equity move projects.

Given that mentorship was among participants' primary needs, conceptualizing project leaders as faculty (i.e., lecturing on and providing expertise in content areas) *and* mentors proved

important. Beyond bringing content and teaching expertise—which successfully helped scaffold participants’ learning and development—mentors supported participants by helping them draw from their own lived experiences, working with them to clarify values and ways that could inform their equity-focused work, providing practical suggestions to navigate internal culture, problem-solving specific issues in their work, and supporting individuals in working through ways to handle micro-aggressions or resistance in their equity efforts.

It should be noted that participants did not feel that they always encountered active resistance to their work. In fact, many participants’ responsibilities included working with their communities and implementing programs focused on engaging traditionally underserved audiences. In general, however, their workplace supervisors did not have strong backgrounds in broadening participation. Additionally, most participants’ institutions approached broadening participation in ways that indicated the sense that it was not core work to the organization (“add-ons”) and that these efforts came from dominant culture paradigms. Thus, most participants lacked strong internal supports to draw on in their own institutions.

The main challenge of One Sky in terms of faculty-mentor support was working within the parameters of a Pathways project. The limited parameters meant that much of the faculty-mentor roles fell on the program PI, with less frequent interactions with other faculty as the program progressed. Participants were still relatively novice in their understandings of broadening participation and needed more support than was anticipated; they could have benefited from all faculty having similar levels of involvement. Additionally, while participants were assigned to specific faculty based on alignment of their projects to a mentor’s area of expertise, the PI was ultimately the one to work most closely with participants to refine their projects and iterative process.

Finally, while the One Sky Institute included faculty that was diverse in expertise and roles, with all faculty but the PI identifying as people of color, the PI did most of the heavy lifting, which meant that addressing equity issues—including, for example, follow-up conversations about experiencing micro-aggressions and a general sense of tokenism and marginalization—fell primarily (though not exclusively) to someone who was white. The PI actually raised this issue publicly with the entire group at the first online webinar as a challenge. There were many ways in which One Sky attended to this issue, including having a range of presenters at webinars some of were from non-dominant groups, re-engaging faculty-mentors at strategic moments,

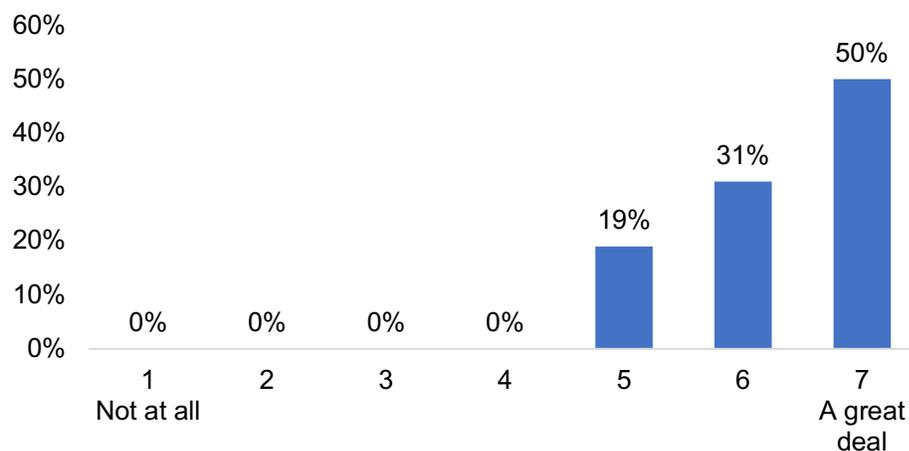
and crafting activities where participants could learn from each other. We would recommend that future iterations of the One Sky Institute fund four or five faculty at levels that could support their involvement throughout all aspects of the project.

### Social Networks

One strong aspect of One Sky was the social network that developed as a result of the program. The in-person workshops and online programming were important to the process. The former provided ways for participants get to know each other and connect personally and professionally and served to help the group coalesce into a learning community. The monthly online sessions allowed participants to continue their connections and further coalesce as a community.

When asked at the end of the program how much they felt that they had expanded their professional networks on a 1–7 scale (where 1=not at all and 7=a great deal) the large majority of respondents (81%) provided 6-7 ratings. (See Figure 9.)

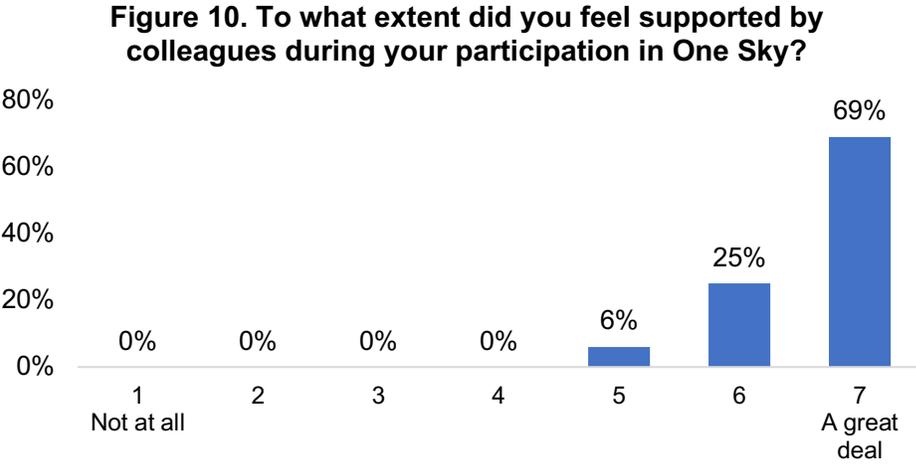
**Figure 9. To what extent has participating in One Sky helped you expand your professional network?**



N=16

The primary connections were created in the cohort and with faculty, largely because the duration of the project created on-going opportunities to connect. While participants reported that *InclusiveSciComm* provided opportunities to meet other professionals and appreciate doing so, these connections, understandably, were more cursory.

Participants also reported feeling highly supported by their peers, with the large majority (94%) providing ratings at the high end of the 1–7 scale. (See Figure 10.)



N=16

When asked about the most valuable aspect of this network, respondents notably mentioned the sense of community (being part of something bigger), the relationships they developed, and the nature of their interactions. (See Table 5.)

**Table 5. Most valuable aspects of the One Sky Institute network**

Category	Number of Responses (N=16)
Being part of something bigger	8
Nature of the relationships and interactions	5
Building relationships with faculty	3
Types of people who participated	2

*\*Open-ended responses could include multiple ideas*

Data also show that participants seemed to connect in meaningful ways both personally and professionally. Many participants indicated that through the program, they found a group with which they can share and hear others’ insights and personal stories, seek input and advice, and feel connected to others engaged in equity efforts. Additionally, data showed that these connections also proved important because participants could address the feelings of isolations

or marginalization they experienced in their workplace. Thus, the One Sky Institute network, which developed during the project, proved to be an important personal and professional support for participants in their equity-focused work.

*I really valued the opportunity to connect with peers who are doing related work. It was validating to hear their concerns and struggles and how they were similar to mine. I'm rather isolated in my organization so it was nice to connect with people who are thinking about the same things.*

*The support of this cohort has been critical—motivation, accountability, stamina. All of those have been important.*

*The way I do my work has been greatly impacted by this learning community... A voice within me that was once dormant now has a place of value again. I am grateful for this opportunity.*

*It's [the network/connections] made me feel that I'm not having to this by myself. There are others doing this that care about this [equity].*

*Knowing that others are trying/failing trying/succeeding is a powerful motivator to keep moving forward—reminders to keep doing the work via check-ins, being reminded that I play a small part of something big (20 mini-projects around the U.S. is so cool).*

*Knowing that there is a group of folks in One Sky who have gone through the same thing, are trying new efforts, and struggling with the same struggles is really important for my persistence in this (equity) work and overall mental health.*

Sustained engagement through online sessions was an important element in strengthening the network. Sessions, which included check-ins, participant presentations about their respective work, and opportunities for discussion, provided many ways for individuals to learn from each other and continued to strengthen the network. Online sessions also provided accountability and responsibility to each participant. Slack was an important vehicle for participants to seek guidance from each other, share news, and generally stay connected. In fact, a review of communications via Slack showed that participants used the space to share resources and information, ask questions, and post personal news. Even after the official completion of their involvement, participants continue to occasionally post, sharing articles, job postings, news, and generally check-ins.

The one challenge was that as participants focused more on their individual projects and one-on-one faculty meetings, fewer opportunities existed for them to engage in conversations and

continue to learn together. In future program iterations, we would recommend including some additional sessions for the entire cohort to meet (even if less frequently), even during stages where participants are more focused on their individual equity move projects.

### **Needs of Emerging Leaders in Broadening Participation**

Collectively, participants were relatively early in their careers. A number of unique needs of early career professionals emerged from One Sky, which can also inform future versions of the program, including:

- **Learning and readiness, given their career stage.** While they all had passion and educational and lived experiences on which to draw, participants were still developing their understanding and conceptualizations of equity and broadening participation, becoming familiar with the histories in the field, and learning about theory and research and practice. This also meant that at this early stage, they were not yet ready to implement sophisticated pilot projects.
- **Marginalization and positionality.** Participants commonly expressed feelings of marginalization in their organizations and looked to the One Sky Institute as a resource to help them address this challenge and to surface more professional conversations about equity in their workplaces. For many participants, this situation was likely compounded by the stages in their careers, and thus their relative power (or lack thereof) in their institutions.
- **Mentorship.** Participants needed mentors who were experienced in equity and broadening participation efforts to help them in their learning and own work. Additionally, they needed mentors who could provide guidance and support in navigating their organizational culture, help them strategize/problem-solve when they encountered resistance in their work environment, and help participants build confidence in general. A challenge here is the ongoing burden that falls on those individuals from communities of color who have the specific skill set to mentor mid-career ISE professionals; such potential mentors have many competing demands on their time.

## Conclusions

Overall, the One Sky Institute was largely successful. The evaluation found that the pilot program showed significant promise and can inform full-scale professional development programs. It also surfaced needs in the field for individuals at early stages in their career, including their marginalization, their need for professional development that supports foundational learning, their still-developing understandings (which meant they were not yet ready to implement sophisticated pilot projects), and their need for mentors and networks.

The project team successfully engaged 20 participants representing a range of organization types in both ISE and Science communication, with 75% being from communities of color. Although participants' years in the field varied widely, most could be characterized as more novice in their understandings of critical equity frames and the literature base. Evaluation found that program leaders responded to participant needs and that these needs largely informed program development, content of sessions, and any supports that were implemented, which was critical to the participants' professional development.

While program components worked in concert to develop participants' learning and support their growth, two major aspects mediated program implementation and the outcomes. First, the fact that participants were newer to broadening participation meant that more supports and scaffolding were needed than may have initially been anticipated. Second, the fact that the One Sky Institute was a Pathways project meant that some program components were not as robust as may have been needed to fully meet some outcomes.

Evaluation findings also raise the question of the potential applicant pool for programs such as One Sky. Recruitment efforts cast a wide net and drew twice as many (N=44) applicants than there were available spots. The project team prioritized including professionals from communities of color, most of who were at earlier stages in their career. Given that the ISE field is predominantly white, with fewer people of color in managerial and senior-level positions, it is possible that professional development programs focused on diversifying leadership in the field will primarily draw (and therefore need to focus on) early-career professionals.

Evaluation identified three key needs that emerging professionals, particularly those from communities of color, focused on for their equity efforts: a) professional development in developing their still-emergent understanding and supports in how think about responsive

broadening participation efforts grounded in theory; b) supports that help to navigate marginalization; and c) mentorship from experienced leaders in equity-focused STEM work, particularly faculty from communities of color. A related need for emerging professionals is to develop and strengthen their social networks, particularly in connecting with others also focused on broadening participation efforts.

All program components proved to be essential and worked well in supporting and building participants' capacity. Most of the insights gleaned from this pilot program were about specific components; this raises questions about readiness and the kinds of supports that are needed across early and later states of a career. Possible supports could include:

#### *Early Career Stage*

- More in-person meetings that allow for deeper exploration of key concepts and opportunities for further group work;
- A longer online series (even when small group work is in process) that provides opportunities for further exploration of core ideas;
- Team approaches that include multiple individuals from an institution;
- Supports for at least four to five faculty-mentors to be involved throughout the entire project.

#### *More Established Stages for Individuals with More Time*

- More structures and time to iterate mini-projects as well as additional workshop/webinar sessions to help participants situate practice in research (and vice versa);
- Addition of sessions and tools that focus on interrogating internal organizational practices around equity and inclusion;
- Addition of modules on how to translate project ideas into proposals as well as sessions;

#### *More Advanced Work*

- Formal activities for participants to collaborate on mini-projects or to experiment with equity moves.

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# Appendices



## Appendix A: One Sky Institute Workshop Agenda 2018

### Monday, March 26, 2018

How are participants thinking about BP, equity, and inclusion? What ideas and needs to they identify, what barriers and questions are they grappling with?

- 8:00 Breakfast
- 8:30 Goals & Introduction
- 9:00 Mapping Exercise  
Establishing baseline for where people work and what issues of exclusion they see and contend with (for themselves, for their communities)
- 10:00 Presentation Planning  
Four groups meet with assigned faculty lead to do last minute planning for presentations
- 10:30 Break
- 10:45 Group Presentations  
Presentation 1: Systemic Racism Group
- 12:00 Presentation 2: Cultural Norms Group
- 1:15 Lunch
- 2:15 Presentation 3: Ecosystems Group
- 3:30 Group Discussion: Recap
- 4:00 Adjourn/Faculty Debrief

### Tuesday, March 27, 2018

What does equity look like within a program design? Designing for multiple ways of knowing; micro-interactive moves; recognizing and leveraging learners' resources

- 8:30 Breakfast
- 9:00 Recap
- 9:15 Presentation 4: Organizational Barriers Group
- 10:30 Redefining Broadening Participation
- 11:45 Poster Preparation  
Highs & Lows Evaluation Board
- 12:00 Working Lunch: Skills Posters
- 12:45 Designing for multiple epistemologies
- 2:15 Break
- 2:30 Concretizing Equity & Justice
- 3:30 Recap
- 4:00 Adjourn/Faculty Debrief

**Wednesday, March 29, 2018**

Zooming out, thinking about systems/communities, interweaving new ideas into current projects and ideas for mini pilots

- 8:30 Breakfast
- 9:00 Recap  
Whole group discussion about thoughts and questions they have: What are the big questions for field?
- 9:15 Posters  
Participants engage in a gallery walk—posting ideas for equity move projects. Break out groups work through the big questions related to the category of ideas they are working on.
- 11:15 Video
- 11:45 Working with the community
- 1:00 Lunch
- 2:00 Planning
- 4:00 Adjourn/Faculty Debrief

**Thursday, March 30, 2018**

The foci of projects are refined. Mentors are matched with projects.

- 8:30 Breakfast
- 9:00 Personal Struggles: Marginalization/Micro-aggressions  
What struggles/skilled responses; nurturing your own resiliency
- 10:00 Equity Moves Projects  
Participants share their plans with the whole group and get feedback
- 11:30 Feedback
- 12:15 Next Steps
- 1:00 Lunch/Adjourn/Faculty Debrief

## Appendix A: One Sky Institute Workshop Agenda 2019

### Monday, March 25, 2019

In-depth critical examination of equity discourses and links to practice. Equity move project poster session and feedback.

- 8:30 Breakfast
- 9:00 Re-connecting share-pair updates: personal and work
- 9:30 Revisiting Philip & Azevedo.  
Overview and then Small Group Discussions: Read Brief
- 10:15 Break
- 10:30 Equity Discourses: Examining and Expanding
- 11:00 Small Group Discussions Re “Discourses”
- 11:45 Poster Preparation for Group 1  
Highs & Lows Evaluation Board
- 12:00 Lunch
- 12:45 Poster walk
- 1:45 Whole Group: Designing, Noticing, Building/Next Steps
- 2:15 Small group discussions around concrete moves and next steps
- 3:00 Open Space Topic Generation: Writing and nominating
- 3:30 Adjourn: Homework Reading and High/Lows board  
Faculty Debrief

### Tuesday, March 26, 2019

Historical view of equity discourses and theories in ISE and continued equity move poster work

- 8:30 Breakfast
- 9:00 History of ISE practices in the field
  - 20 mins Share a timeline of significant past efforts, and theories/discourse on equity and ISE; (Chronological but with bands representing the different discourses)
  - 20 mins Panel session from professionals in the field: personal stories equity in ISE:
    - Where are you on the timeline? What influenced the work you have done?
    - Can you describe the political and ethical dimensions of your work?
    - What needs to be done differently today?
  - 20 mins Small groups: Participants place themselves on timeline. Consider what models and ideas personally resonate.
- 10:15 Break
- 10:30 Culturally Responsive Evaluation: what is it when and why?

- 11:45 Poster Preparation  
Highs & Lows Evaluation Board
- 12:00 Working Lunch: Participants add to the history timeline
  - What can you add? National to local to personal
- 12:45 Poster Walk
- 1:45 Small group discussions around concrete moves and next steps for equity move projects
- 3:00 Open Space Topic Generation
- 3:30 Adjourn/Faculty Debrief

**Wednesday, March 27, 2019**

Examining personal values to inform equity-focused work

- 8:30 Breakfast
- 9:00 Values: Mapping and centering work on your values
- 11:30 Next Steps: What are immediate next steps you want to take?  
Writing, pair-share, then whole group.
- 12:00 Adjourn/Faculty Debrief I

## Appendix B: Online Programming Schedule

### Schedule Year 1

May 1, 2018	Transitioning back to the workplace: Equity Move Project Progress and Challenges (Faculty)
June 5, 2018	Youth Learning Ecosystems (Nichole Pinkard)
July 10, 2018	What is a Research Poster? (Faculty)
August 7, 2018	Community Partnerships (Diane Miller)

### Schedule Year 2

September 11, 2018	Culturally Responsive Evaluation, Interview and Survey Tips (Cecilia Garibay & Rebecca Teasdale)
October 2, 2018	Activating Youth Voice (Angela Calabrese Barton)
November 6, 2018	Engaging Colleagues with the River of Life (Ben Koo and Lakisha Witzel)
December 4, 2018	Group Conversation: Needs and Interests for the Coming Year (Garibay Group)
January 8, 2019	CAISE Report: Broadening Perspectives on Broadening Participation (Faculty)
February 5, 2019	Cultural Norms of STEM (Faculty)
March 2019	No Webinar
April 23, 2019	Creating an Equity Moves Statement (Rabiah Mayas)
May 28, 2019	Equity Statements Feedback and Refinement (Rabiah Mayas)
June – August 2019	Equity Move project preparation and support (Faculty)