



Capacity Building Workshop for Two-Year Colleges Seeking U.S. National Science Foundation Funding

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ABSTRACT

In this paper, we report the description and evaluation of an annual workshop titled “Capacity Building Workshops for Competitive S-STEM Proposals from Two-Year Colleges in the Western U.S.” which was offered in June of 2019, 2020, and 2021 with the goal of facilitating submissions to the NSF S-STEM program from 2-year colleges (2YCs). The two-day workshop was composed of separate sessions during which participants discussed several aspects of proposal preparation. Participants also received pre- and post-workshop support through webinars and office hours. To evaluate the program, post-workshop surveys were administered through Qualtrics™. The workshop and related activities received overall positive feedback with specific suggestions on how to better support participants. The paper discusses specific challenges faced by 2YC teams in preparing their proposals. Over three offerings, the program welcomed 103 participants on 51 teams from 2YCs. As of 2021, 11 teams total (from the 2019 cohort) submitted proposals. Among them, four were funded, which is approximately double the typical success rate. Six of the declined teams resubmitted and one of them is currently in negotiations.

Introduction

Community colleges, or two-year colleges (2YCs), play an important role in U.S. higher education. With their open access, affordability, and connection with the local community, they are a vital pathway for a diverse population of students to access higher education (Lowry & Thomas-Anderson, 2017). A 2017 report released by the National Student Clearinghouse Research Center revealed that, during academic year 2015–2016, nationwide 49% of bachelor’s graduates had been enrolled in a 2YC during the previous 10 years (National Student Clearinghouse Research Center, 2017). A 2019 NSF report showed that 47% of students who earned a STEM bachelor’s degree between 2010 and 2017 enrolled in one or more classes at a 2YC with 18% earning an associate’s degree (Trapani & Hale, 2019). Additionally, about 20% of students earning a STEM doctoral degree in 2017 attended a 2YC (Trapani & Hale, 2019).

Due to their mission, 2YCs keep tuition low (in some states, they are tuition free) and provide open access to all students regardless of their academic background, offering both full time and part time options. The majority of funding for 2YCs comes from tuition and local jurisdictions while all but four states disburse higher funding to four-year institutions with an average gap of approximately \$3,700 more per full-time student equivalent (Yuen Victoria, 2020). Among other types of funding, grants and scholarships account for a small percentage for 2YCs (D’Amico et al., 2014; Gearhart et al., 2018), although they are becoming of increasing importance to 2YCs to fulfil their mission (Keener et al.,

2002). Despite the high number of students enrolling in 2YCs, state and local funding are shrinking, imposing a growing reliance on tuition, fees, and financial aid opportunities (Phelan, 2014).

Among the financial aid and grants available to support 2YCs mission, the U.S. National Science Foundation (NSF) has a Scholarships in Science, Technology, Engineering, and Mathematics Program (S-STEM) program with the main goal of broadening participation by providing scholarships for high achieving domestic students in financial need to pursue careers in STEM enrolled in U.S. institutions of higher education (NSF 21–550, 2021). Faculty and administrators write proposals to NSF, and the funds are awarded to the institution to disburse to students deemed eligible. While financial aid cannot alone improve the retention and completion rates of STEM students, it is certainly a factor influencing students' path toward degree attainment. Other factors that can impact 2YC students' ability to pursue a degree are transfer credits and receiving proper mentoring and advising throughout their college career (Jenkins & Fink, 2015; Shapiro et al., 2017; U.S. Government Accountability Office, 2017). For over a decade, the S-STEM program has required recipients to provide evidence-based interventions such as mentoring, tutoring, and community-building activities for scholarship recipients, many of which are documented in the literature (Martin et al., 2019). In 2016, the S-STEM program added a requirement to “generate knowledge to advance understanding of how interventions or evidence-based curricular and co-curricular activities affect the success, retention, transfer, academic/career pathways, and graduation of low-income students in STEM” (NSF 16–540, 2016, p. 2), through the addition of an educational researcher to the team. Given the teaching and advising responsibilities and expectations on 2YC faculty, finding a willing collaborator posed a potential barrier to 2YCs competing for S-STEM funding in recent years. Indeed, the 2021 solicitation no longer included the educational researcher requirement (NSF 21–550, 2021).

The majority of NSF S-STEM awards are made to four-year institutions (Pearson et al., 2018), which tend to be well prepared and organized to submit successful proposals for external grants, including NSF S-STEM applications. They often have specialized offices working exclusively on grant writing and submission of the substantial paperwork involved. 2YCs, in contrast, are often not equipped to successfully complete all the steps necessary to submit S-STEM applications with rigid deadlines, and the burden of grant writing falls on faculty with little administrative support (Keener et al., 2002). This paper describes a project funded by NSF S-STEM to support 2YCs through preparing and submitting competitive S-STEM proposals.

This paper describes and reports on the evaluation of an annual workshop titled “Capacity Building Workshops for Competitive S-STEM Proposals from Two-Year Colleges in the Western U.S.” which was offered three times with the goal of facilitating submissions to the NSF S-STEM program from 2YCs. This project aligns with an S-STEM workshop grant to Rice University which did not have an explicit focus on 2YCs (Boyle et al., 2020; Pearson et al., 2018). The current project started with a focus exclusively on supporting participants from 2YCs in the western region of the United States, a few of which had no S-STEM grants to any of their 2YCs: Washington, Oregon, California, Nevada, Arizona, Idaho, and Utah. In response to demand and success rates, we expanded in the third and final year to nationwide eligibility of 2YCs with no prior S-STEM awards.

In order to evaluate this program, the following research questions are examined:

- (1) How well and in what ways did the activities prior to the workshop prepare institutions for the workshop?
- (2) What was the impact of the educational researcher?
- (3) How did the workshop's content and structure influence the institutions' proposals?

In addition to the overarching mission to improve the chances of 2YCs to secure S-STEM grants, an important underlying intent of this project concerns the skills developed by participants, faculty in particular, to address the two merit review criteria of Intellectual Merit and Broader Impacts; these skills are transferable to other NSF programs. We believe that the workshops could be beneficial in terms of

capacity building that facilitates the ability of participants to continue to pursue NSF grants when appropriate.

Methods

NSF scholarships in science, technology, engineering, and mathematics (S-STEM)

The National Science Foundation's (NSF) Scholarships in Science, Technology, Engineering and Mathematics (S-STEM) program started in 2006 (NSF 06–527, 2006). Funded by H1B visa fees, the main goal of this program is to provide funding and support to students with proven financial need to pursue their STEM degree. The program aims to improve students' outcomes in STEM disciplines. Pearson et al. (2016) summarizes characteristics of the S-STEM solicitation and its predecessors.

Proposals may only be submitted by institutions of higher education, including 2-year and 4-year institutions, located in the US via FastLane (NSF FastLane, 2020) and Grants.gov (NSF Grants.gov, 2020).

The current (i.e., 2018–2021) NSF S-STEM program supports four types of projects: Track 1 (Institutional Capacity Building), Track 2 (Implementation: Single Institution), Track 3 (Inter-institutional Consortia) and Collaborative Planning. Track 1 projects, which are the focus of the current workshop series, seek to increase participation of institutions that are submitting an S-STEM proposal for the first time. Track 1 projects must be led by a PI who is a STEM faculty member and an administrator of that institution, e.g., a dean. Track 2 proposals have the same goals of Track 1 proposals, but the submitting institution may have received prior S-STEM awards. Track 3 and Collaborative Planning projects support multi-institutional collaborations (NSF 21–550, 2021).

All proposals should include a literature review to support the institution's project, clearly stated goals, and student data to specify the targeted student population, the number of eligible students and details of students' financial need (NSF 21–550, 2021). Thus, the collection of student data must involve financial aid and institutional research offices or staff. This task has proven to be challenging for 2YCs, who often lack the infrastructure to efficiently address this phase of the proposal submission (Keener et al., 2002).

The workshop series focuses on several aspects of proposal preparation, including the two NSF Merit Review Criteria: Intellectual Merit (potential to advance knowledge) and Broader Impacts (potential to benefit society more broadly) (NSF 21–550, 2021). Additional components of the proposal include a detailed budget justification and detailed evaluation and dissemination plans, all of which are topics treated in depth during the workshop.

Program description

“Capacity Building Workshops for Competitive S-STEM Proposals from Two-Year Colleges in the Western U.S.” is a two-day long workshop, composed of separate sessions, during which participants learn and receive feedback on several aspects of proposal preparation. The workshop, usually held in June, was in-person in 2019 and virtual in 2020 and 2021.

Workshop facilitators were carefully selected to include individuals who had previously worked as rotating program officers at NSF with responsibility in the S-STEM program across a variety of STEM disciplines. Two-person teams from 2YCs attend the workshop, composed of a STEM faculty member serving as PI of the proposal and a STEM administrator. In 2019 and 2020, each team paired with an educational researcher – typically a faculty member from a 4-year institution, whose collaborative role strengthened the S-STEM proposals, as first required by the 2016 solicitation (NSF 16–540, 2016):

The leadership and management team should also include an institutional, educational, or social science researcher who studies higher education (NSF 16–540, 2016).

The 2021 workshop teams didn't include the educational researcher, since this clause was removed from the NSF S-STEM 2021 solicitation (NSF 21-550, 2021).

To fully benefit, participants were strongly encouraged to complete several tasks prior to the workshop, including student data collection and determination of scholarship eligibility criteria. Guidance and support were provided through pre-workshop and post-workshop webinars and office hours. Pre-workshop seminars and activities were limited during the summer 2021 due to COVID restrictions. For this reason, the 2021 workshop was a kickoff compared to previous years, and more support was provided afterward through additional on-demand post-workshop webinars. Webinar topics were selected in part based on specific requests from participants.

The second and fourth author planned and organized the yearly edition of the workshop and offered sessions, pre- and post-workshop office hours, and webinars.

Proposals were usually submitted in the spring following the summer workshop; deadlines varied slightly due to COVID-related extensions. Over three offerings, the program welcomed 103 participants on 51 teams from 2YCs. As of 2021, 11 teams total (from the 2019 cohort) submitted proposals. Among them, four were funded; among the declined teams, six resubmitted and one of them is currently in negotiations. The 36–45% success rate is well in excess of NSF's typical 22% proposal success rate for the Division of Undergraduate Education (DUE) (where S-STEM is managed) (National Science Foundation, 2021). Participants from more recent workshops are still reporting on their submission plans, and none have heard back yet about the status of their proposals.

Workshop content and structure

The workshop provided broad treatments of several aspects of proposal preparation, such as: (1) the requirements of the S-STEM program, (2) the NSF Merit Review Criteria of Intellectual Merit and Broader Impacts, and (3) specific examples of how those preview aspects were addressed in other projects. Additionally, participants had time to work on activities (e.g., worksheets on Intellectual Merit and Broader Impacts) and were given the opportunity to develop the core ideas that would form the nucleus of the proposal while receiving real-time feedback.

Table 1 shows the agenda of the 2019 in-person workshop. The 2020 virtual workshop followed a similar agenda. The agenda for the 2021 workshop was slightly different to include discussion of topics that were included in pre-workshop seminars in previous years.

Once those core proposal ideas were developed by the teams, the ideas become a solid foundation, and the task of layering the additional required elements of the proposal typically becomes more logical.

Pre-workshop activities

Participants were required to complete a series of tasks prior to the workshop, developed through the adaptation of techniques advocated by the NSF Innovation Corps for Learning (I-Corps L) (NSF16-049, 2016), to help strengthen intellectual merit and broader impact of proposals and improve effectiveness of dissemination plans.

Through pre-workshop webinars and virtual office hours, participants were supported in conducting structured interviews with students who are potential recipients of the S-STEM scholarships, college administration, and industry (i.e., employer) representatives. This process ensured that S-STEM proposals were targeting critical areas of students' needs. Prior to the workshop, each 2019 and 2020 team was expected to conduct approximately 10 interviews. During the workshop, data from the interviews were analyzed.

Post-workshop

Post-workshop webinars were offered to provide additional support to 2YC teams in their process of developing a full proposal. The topics for post-workshop webinars were selected based on collective

Table 1. 2019 workshop agenda.

Day One	
8:00–9:00 a.m.	Welcome, Overview of the S-STEM program and Introductions
9:30–10:15 a.m.	Preparing Competitive Proposals I • Components of a good proposal • Proposal Review Criteria – NSF and S-STEM • Successful collaboration
10:15–10:30 a.m.	Break
10:30–11:30 a.m.	Preparing Competitive Proposals II • Defining project goals, objectives, and outcomes • Articulating your rationale
11:30 a.m. – 1:30 p.m.	Time with Researchers to Work on Proposals (working lunch)
1:30–2:15 p.m.	Aspects of Conducting STEM Education Research
2:15–3:30 p.m.	Preparing Competitive Proposals III • Practical aspects of proposal review • Structure and style considerations
3:30–3:45 p.m.	Break
3:45–5:30 p.m.	Time with Researchers to Work on Proposals
6:00 p.m. - evening	Dinner
	Read and review redacted proposals
Day Two	
8:00–8:30 a.m.	Review Previous Day's Activities
8:30–10:00 a.m.	Mock Review Panel and Discussion
10:00–10:15 a.m.	Break
10:15–11:30 p.m.	Strategies for Building Institutional Support • Proposal-writing support • Support/sustainability/institutional commitment • Working Lunch with Researchers
11:30 a.m. – 12:30 p.m.	Preparing Competitive Proposals IV
12:30–2:00 p.m.	• Structure and components of an evaluation plan • Evaluation resources
2:00–5:00 p.m.	Time with Researchers to Work on Proposals
6:00 p.m.	Dinner
Half Day	
8:00–8:30 a.m.	Review Previous Day's Activities
8:20–9:00 a.m.	Preparing Competitive Proposals V • Budget • Dissemination
9:00–11:30 a.m.	Final Meeting with the Researcher
10:15–11:30 p.m.	Strategies for Building Institutional Support • Proposal-writing support • Support/sustainability/institutional commitment
11:30 a.m. – 12:30 p.m.	Workshop Wrap-Up • Final Q&A, future steps, workshop evaluation

experience of the project leadership and requests from participants. In addition to the main narrative at the heart of all NSF proposals, several other ancillary documents and forms are required. A significant proportion of the post-workshop webinars is devoted to addressing the completion of these documents and forms.

Furthermore, a two-day workshop is limited in the time it can dedicate to each aspect of the proposal process. Revisiting (or addressing for the first time) proposal elements such as project dissemination, preparing a budget and its justification, and other important aspects of proposal development during post-workshop webinars makes more time available during the workshop for core issues and provides valuable support to project participants. Using this design, information was distributed in more manageable chunks on a timeline that helped teams pace their writing and document preparation. Additionally, the process of navigating the online portals NSF employs for submitting proposals (FastLane and Research.gov) can be daunting for first-time users, and an entire webinar was devoted to this aspect of the process.

Table 2. Post-workshop webinars for 2020 S-STEM proposal preparation workshop.

Revisiting the Required Components of an S-STEM Proposal
Elements of Evaluation Plans and Evaluators
Forms: Facilities, Equipment and Other Resources
Content: Data Management Plan & Results from Prior NSF Support
Project Dissemination and Sustainability Plans
Industry & Institutional Partners and Letters of Commitment
Content: Institutional Data Necessary for S-STEM Proposals
Forms: NSF-Format Biographical Sketches
Technology: Navigating FastLane
Forms: Current and Pending Support + COA + IRB
Revisiting the Budget and Budget Justification
Tying it all together: Goals, Objectives & Research Questions

Table 2 reports the 12 post-workshop webinars offered between June and December of 2020. Similar topics were offered in 2019, while 2021 post-workshop webinars included additional topics such as data collection and data management.

Recruiting

Participant recruiting was accomplished via a variety of mechanisms. One utilized various listservs associated with state systems and other organizations of 2YCs. Other recruitment tactics were more targeted. Specifically, the second author spent considerable time reaching out to individuals in 2YCs known by the project leadership team or recommended by others as those who may be interested in such an opportunity. We also shared the call for participants with individuals who are known to be at the nexus of several colleges, such as principal investigators on other NSF grants that connect with other 2YCs, project evaluators, and other consultants.

The scope of recruitment expanded in successive years, as COVID-19 challenges diminished enthusiasm and/or availability of personnel to participate in activities outside of instruction. Also, as a few institutions were awarded S-STEM grants, they lost eligibility for the workshop. What began in 2019 as a focus on the western states listed in the original proposal (CA, WA, OR, AZ, NV, UT, ID) expanded in 2020 to include the additional western states of Montana, Wyoming, Colorado, and New Mexico. Recruitment for the 2021 workshop was focused nationwide.

Once received, applications were reviewed by project personnel and scored with a rubric. Priority was given to institutions that had never submitted a proposal to the S-STEM program. Other considerations included the background of the team members willing to participate in the workshop and submission process. For example, applications required a letter of commitment from an administrator who could agree to some of the NSF requirements embedded in the S-STEM solicitation.

Ideally (although not exclusively) participants were 2YCs eligible to submit Track 1 proposals to the S-STEM program. A few 2YCs pursuing other tracks participated in the workshop.

Data collection

Data were collected through a survey at the end of the workshop, which was administered on paper in 2019 and via Qualtrics™ in subsequent years. The survey had been kept fairly consist over time with a combination of 5-point agreement and satisfaction Likert-type scales and some open-ended text entry items. The questions marked as “Not Asked” in the tables, were not included in the survey for that particular year.

We also followed up with institutional teams about their proposal submission and funding success. An IRB allows for data analysis and publications (Institution University of Texas at Austin, 2018-07-0132).

Instruments and data analysis

The data analysis for each research question includes calculating mean and standard deviation of 5-point Likert scale items with 1 = Strongly Disagree and 5 = Strongly Agree. Answers from open-ended questions provided additional qualitative data to support statistical findings.

Results

RQ1: How well and in what ways did the activities prior to the workshop prepare institutions for the workshop?

To answer research question 1, how well and in what ways the activities prior to the workshop prepared institutions for the workshop, the mean and standard deviation of answers related to activities prior to the workshop are reported. Table 3 reports participants' responses related to the pre-workshop activities and webinars.

Overall, participants seemed pleased with the support received prior to the workshop and with the workload required during this phase. Indeed, "I received adequate support from the facilitators to complete pre-workshop tasks" shows high marks, with a mean of 4.58 (2021, SD 0.67; Not Asked in 2019 and 2020). However, when asked which pre-workshop requirement was the most challenging, gathering the required data has been mentioned by the majority of the participants, with one adding that "*some of the data doesn't exist at my institution.*" This is an interesting observation from a 2021 participant, since pre-workshop tasks were far less demanding of the 2021 cohort; nevertheless, data collection has been a stumbling block for 2YC teams throughout the years. Only two participants of the 2021 cohort reported that data gathering wasn't particularly difficult.

Table 3. Pre-workshop activities.

Pre-Workshop Activities	2019 (n = 36)		2020 (n = 17)		2021 (n = 15)	
	Mean	SD	Mean	SD	Mean	SD
Overall, the webinars adequately prepared me for the workshop	4.14	0.72	4.69	0.46	4.60	0.89
Completing the webinar assignments prepared me for the workshop	4.06	0.73	4.56	0.70	Not Asked	Not Asked
I received adequate support from the facilitators to complete pre-workshop tasks	Not Asked	Not Asked	Not Asked	Not Asked	4.58	0.67
I felt like I had at least one idea for my proposal after completing customer discovery interviews with students	4.24	0.97	4.81	0.39	Not Asked	Not Asked
I felt like I need additional guidance prior to the workshop	3.43	1.18	3.81	1.01	2.08	1.26
I found it difficult to collect the financial and institutional data needed prior to the workshop	2.88	1.32	3.12	1.41	3.36	0.92
The process of data collection resulted in building relationships at my institution that will be useful	3.87	0.98	3.81	1.01	3.20	1.03
I found it difficult to collect the necessary student enrollment information to be ready for the workshop	Not Asked	Not Asked	Not Asked	Not Asked	3.17	1.40
Creating a student profile prior to the workshop was a valuable use of time	Not Asked	Not Asked	Not Asked	Not Asked	4.50	0.50
Communication with the presenters was prompt and clear prior to the workshop	4.24	0.94	4.81	0.39	4.75	0.60
The workshop was a valuable use of time	4.21	0.85	4.94	0.24	Not Asked	Not Asked
The amount of work assigned prior to the workshop was appropriate	4.09	0.82	4.31	0.85	4.70	0.90

3 = Neither agree or disagree (1 = strongly disagree, 5 = strongly agree).

Not Asked indicates that the question was not included in the survey for that particular year.

When asked to suggest ways to improve pre-workshop support to facilitate participants' readiness for the workshop, some participants recommended more time or examples and templates for data gathering. Lastly, "The workshop was a valuable use of time" received high marks (Mean 4.21, SD 0.85 in 2019; Mean 4.94, SD 0.24 in 2020; Not Asked in 2021), possibly testifying the importance of providing such training to 2YC faculty and administrators and the good results obtained by this workshop.

RQ2: What was the impact of the educational researcher?

In 2019 and 2020, the 2YC teams were matched with educational researchers (ER), as a requirement in the NSF S-STEM solicitation. Since this clause was removed in the 2021 NSF S-STEM solicitation, the 2021 2YC teams didn't include an ER.

To answer research question 2, concerning the impact of the ER, the mean and standard deviation of answers concerning the interaction with the ER and their role were analyzed and reported on Table 4. At the end of their workshop, the 2YC teams were overall pleased with their matching ER and they found their expertise helpful. Indeed, "Working with the education researcher will strengthen my S-STEM proposal" received high marks with a mean of 4.78 (2019, SD = 0.48) and 4.87 (2020, SD = 0.34).

Among the suggestions received on how to improve this collaborative relationship, some suggested to pair each team with an ER earlier to help with activities necessary prior to the workshop, as stated in the quote below:

Earlier matching is better. It would have helped guide what institutional data I asked for as my institutional researcher asked me more specific questions than were in the workshops and I did not know the answers. (2020)

A few respondents suggested making the role of the ER clearer from the start since the ER is an integral part of the writing of the proposal. One of the 2YC participants mentioned that having a clearer picture of the role of the ER "would have shaped who we sent to this workshop" (2019).

Although most of the 2YC team participants were pleased with the collaboration with their educational researcher during the workshop, as proposal deadlines approached, we became aware of a number of barriers faced by various teams. NSF offers a few mechanisms for crediting and providing funding to the educational researchers, and we reviewed these extensively with the educational researchers during their pre-workshop sessions. However, some 2YC administrators who needed to sign off on proposals before they could be submitted were unwilling to grant co-principal investigator status to an external person or to offer them the funding resources agreed-upon by the teams who attended the workshop. In extreme situations, these failed relationships led to the educational researchers feeling as though they had been used or their intellectual property stolen. In other cases,

Table 4. Collaboration with educational researcher.

Collaboration with Ed Researcher	2019 (n = 36)		2020 (n = 17)	
	Mean	SD	Mean	SD
Working with the education researcher will strengthen my S-STEM proposal	4.78	0.48	4.87	0.34
I received valuable feedback and guidance on structuring the proposal from the education researcher	4.61	0.59	4.67	0.60
I felt that the education researcher respected the mission of our 2-YR college	4.81	0.46	4.47	0.81
The proposal teamwork times were scheduled well with respect to presentations (i.e., I felt that I had new content to work with)	3.92	1.01	4.33	0.87
I am unclear of our roles and how we are supposed to work together moving forward	2.22	1.34	1.47	0.50
I am confident that my education researcher and my team will successfully work to create an S-STEM proposal for the March 2020 submission*	4.47	0.90	4.47	1.02
My team would benefit from additional guidance from the presenters going forward	4.22	0.85	4.73	0.57
I felt actively engaged when collaborating with my team	4.75	0.43	4.93	0.25
The education researcher on our team helped design our evidence-based strategies for student supports	4.22	1.00	4.40	0.71

3 = Neither agree or disagree (1 = strongly disagree, 5 = strongly agree).

*In 2020 - The Ed Researcher and my team will successfully work to create an S-STEM proposal for the 2021 submission.

submissions as collaborative proposals between the 2YC and the institution of the educational researcher were deemed by NSF to be ineligible for track 1 since the researcher's institution had a prior S-STEM grant; these proposals were frustratingly returned by NSF without review.

RQ3: How did the workshop's content and structure influence the institutions' proposals?

To answer research question 3, how the workshop's content and structure influenced the institutions' proposals, [Tables 5 and 6](#) report the mean and standard deviation of answers related to the workshop.

[Table 5](#) summarizes the analysis of answers related to the workshop's content. Participants provided overall positive feedback and made suggestions for the following years, including more details on strategies, objectives and budget, content specific to evaluation plans, and insights on NSF review processes. When asked about the most and least useful topics treated during the workshop, the majority of participants felt that all the topics were very useful, but many participants indicated

Table 5. Workshop content.

Workshop Content	2019 (<i>n</i> = 36)		2020 (<i>n</i> = 17)		2021 (<i>n</i> = 15)	
	Mean	SD	Mean	SD	Mean	SD
The content presented at the workshop will strengthen my S-STEM proposal	4.75	0.64	4.93	0.26	4.85	0.53
The content helped me understand how to submit an S-STEM proposal to NSF and the requirements involved with submission	4.78	0.48	4.79	0.41	4.69	0.60
The content helped the team formulate an idea for an S-STEM proposal and narrow our focus	4.53	0.69	Not Asked	Not Asked	4.46	0.50
The content presented at the workshop was appropriately geared toward 2-YR institutions	4.08	1.11	4.71	0.59	4.46	0.75
I feel confident knowing the next steps going forward with my proposal development following the content in this workshop	4.25	0.83	4.64	0.48	4.38	0.62
I felt actively engaged during the workshop presentations	4.11	0.91	4.57	0.73	4.46	0.63
The communication skills of the presenters engaged me in the presentations	4.31	0.81	4.29	0.88	4.38	0.83

3 = Neither agree or disagree (1 = strongly disagree, 5 = strongly agree).

Not Asked indicates that the question was not included in the survey for that particular year.

Table 6. Workshop structure.

Workshop Structure	2019* (<i>n</i> = 36)		2020** (<i>n</i> = 17)		2021** (<i>n</i> = 15)	
	Mean	SD	Mean	SD	Mean	SD
I had time to collaborate with the education researcher during the workshop	3.03	0.90	4.14	0.83	Not Asked	Not Asked
I had opportunities to interact with the presenters during the workshop	3.06	1.00	Not Asked	Not Asked	4.54	0.63
I had opportunities to interact with the other 2-YR college teams during the workshop	2.69	1.02	4.00	0.76	4.39	0.92
I had time to collaborate with my 2-YR college and education researcher during the workshop	3.14	0.85	4.29	0.80	Not Asked	Not Asked
I had time to digest the information presented in the workshop presentations	2.56	0.98	3.57	1.18	4.00	0.88
I had time to plan different aspects of the proposal during the workshop	2.94	0.98	4.21	0.26	4.08	0.83
The feedback I received from the workshop presenters was valuable	4.37	0.93	4.93	0.26	4.70	0.82
I would recommend that you use this venue (hotel, catering, etc.) again for the S-STEM workshop the following year	3.42	1.19	Not Asked	Not Asked	Not Asked	Not Asked
I would recommend using a virtual conference format again for the S-STEM workshop next year	Not Asked	Not Asked	4.07	1.03	Not Asked	Not Asked

*3 = Appropriate amount of time (1 = too little, 5 = too much).

**3 = Neither agree or disagree (1 = strongly disagree, 5 = strongly agree).

Not Asked indicates that the question was not included in the survey for that particular year.

interest in additional examples of accepted and rejected proposals specific to 2YCs and possibly a mock panel to experience the entire process (removed in 2021). Lastly, one of the participants proposed to add an additional workshop or webinar prior to the conference “for those who have never submitted a proposal and may be unfamiliar with the grant writing process and terminology” (2019).

Table 6 summarizes the mean and standard deviation of the answers related to the structure of the workshop. From the table, it is possible to deduce an overall positive response with “The feedback I received from the workshop presenters was valuable” showing a mean of 4.37 (2019 – SD = 0.93), 4.93 (2020 – SD 0.26) and 4.70 (2021 – SD 0.82). The main issue reported by several participants was the need of additional breaks to digest the information and to network with the other teams. An interesting suggestion came from one of the participants who recommended adjusting the workshop’s content and structure “to have a topic on each major section of the proposal and then time to work on it before moving on” (2019).

“I had time to digest the information presented in the workshop presentations” (Mean 2.56, SD 0.98 in 2019; Mean 3.57, SD 1.18 in 2020; Mean 4.00, SD 0.88 in 2021) and “I had time to plan different aspects of the proposal during the workshop” (Mean 2.94 SD 0.98 in 2019; Mean 4.21, SD 0.26 in 2020; Mean 4.08, SD 0.83 in 2021) show improving marks in 2020 and 2021 compared to 2019. It is possible that the transition from on-site to virtual platform (in 2020 and 2021) had a positive impact on the amount of time the participants had to digest, plan and address tasks set before them. Furthermore, in 2021 we removed the mock proposal review panel from the agenda, which likely freed up more time for participants to focus on other activities. Additionally, although a direct question related to the virtual format was not included in the survey, “I had opportunities to interact with the presenters during the workshop” (Mean 3.06, SD 1.00 in 2019; Not Asked in 2020; Mean 4.54, SD 0.63 in 2021) and “I had opportunities to interact with the other 2-YR college teams during the workshop” (Mean 2.69, SD 1.02 in 2019; Mean 4.00, SD 0.76 in 2020; Mean 4.39, SD 0.92 in 2021) show an increasing trend from 2019 to 2021 possibly reflecting the beneficial opportunities to interact with the presenters and within small groups granted by the virtual setting offered in 2020 and 2021.

When asked about the kind of help participants may need after the workshop, many replied that “keep in touch” to answer questions either through webinar or “coaching” could be very important, as expressed in the quotes below:

I like the idea of connecting in the future, either with webinars or maybe just “coaching” sessions of some sort. We need to go back and re-group a bit, so I think being able to discuss a more refined idea in the future would be very helpful, if you all have time! (2019)

Continue with webinars as we put together the proposal to answer questions that come up (2019)

The post-workshop webinars and the continuous individual support provided through virtual office hours helped support and retain participants through the entire submission process. Indeed, participants tended to depart from workshop very “fired up” and excited to pursue the submission of a proposal. However, once they return to their campuses and encounter the heavy teaching loads and other commitments faced by 2YC faculty members, their enthusiasm can be diminished significantly.

Discussion

This paper describes a workshop including pre- and post- activities and ongoing support to encourage and guide 2YC in submitting proposals to NSF for S-STEM scholarships to support their students. These workshops were primarily evaluated based on post-workshop surveys conducted over three offerings, which spanned in-person and virtual offerings prior to and during the COVID-19 pandemic.

For two of the three years, in response to NSF requirements, 2YC teams were matched with educational researchers, most of whom were faculty at 4-year institutions. Overall, the 2YC teams were pleased with the matching, suggesting ways to improve it such as early matching and better definition of the educational researcher role in the proposal writing process. One of the tough lessons

learned is related to how teams decided to submit their proposals to NSF, which resulted in some being returned without review because the researcher's institution had a prior S-STEM grant. In other instances, collaborations fell apart due to upper-level 2YC administrators' unwillingness to honor agreements made to credit or compensate the educational researcher for their work. Even after removing the clause of the educational researcher, the S-STEM program still maintains expectations of knowledge building, as explicitly stated in the quote below from the 2021 solicitation,

Proposals should seek to generate knowledge about how institutions create and strengthen learning environments for their scholars and their larger community of students that promote diverse, equitable, and inclusive participation in STEM. (NSF 21-550, 2021)

Because data about student characteristics and needs inform the overall focus of the proposal, compilation of student data was emphasized in the pre-workshop activities. Many participants reported difficulties in gathering students' data and expressed the need for more time to attend to this task; even in 2021, when less preparation was required prior to the workshop, the analysis of open-ended questions shows that many teams reported this phase as challenging. Indeed, student data collection is a challenging task for many 2YC faculty teams; according to Keener et al. (2002) 30% of the 373 U.S. 2YCs did not have a grants office when surveyed in 2002 and the burden of preparing proposals often falls on faculty. The webinars and support provided prior to the workshop intend to help 2YC faculty address these challenges specifically, while building knowledge that will improve 2YCs ability to prepare successful proposals.

Since the primary focus of the pre-workshop efforts requested of participants is on gathering data and establishing an initial view of the institutional landscape, one area of improvement may include being more intentional in structuring the teams of participants from each college by inviting personnel from units like Institutional Research or Institutional Advancement and/or a Grants Office to participate in the pre-workshop activities. In most cases, the participants were faculty members who then had to go through a variety of campus chains of command to gather those data (if they were able to gather them at all).

Overall, the content of the workshop received very positive feedback. One of the strong points of the workshop was the diverse personnel that were recruited to lead them, selected across a variety of STEM disciplines, including several former NSF S-STEM program directors. Participants felt that the topics treated during the workshop were very useful and suggested additional content related to strategies, objectives, budget, and evaluation plans. Many participants indicated interest in additional examples of accepted and rejected proposals specific to 2YCs and support to better understand the complete submission process. The workshop's structure was well-received as well but some changes could be made in the schedule to include more breaks to give time to digest the material and promote collaboration and networking.

Participants reiterated the importance of post-workshop support through office hours and webinars to facilitate the completion of the submission process. We agree that what 2YC teams needed the most after the workshop is *"Info – none; guidance – plenty"* as expressed by one 2020 participant. Post-workshop webinars and office hours were established specifically to support 2YC teams in finalizing and submitting their proposals.

In sum, the major barriers to 2YC faculty submitting NSF funding proposals to the S-STEM program were compiling required student data, budget and form preparation, administrative overhead associated with non-routine process of submitting funding proposals, and time and motivation in the context of demands on 2YC faculty time.

Given that the majority of our team's background is composed of faculty, principal investigators, and former NSF program officers, we were able to anticipate knowledge gaps and challenges from the point of view of the 2YC teams working on these proposals, as well as anticipate some of the challenges to collaborating on proposals across institutional cultures. We knew that 2YC teams would need assistance navigating NSF's proposal submission systems and preparing hundreds of pages of documentation to accompany their proposals, since few 2YC have grants personnel or routine procedures for submitting proposals. What we did not fully anticipate was the involvement of higher-level

administrators in questioning some of the details or interpretations of NSF expectations as they related to submitting proposals as the deadline approached. Nonetheless, we worked with a great many passionate and motivated 2YC faculty and administrators who were willing to take on the challenge of grant writing in addition to their assigned duties. These faculty can be better supported through recognition of their efforts in annual reviews, release time from other responsibilities, and building institutional knowledge that could streamline the process for future proposal submissions.

Conclusion and limitations

We believe that the strengths of this workshop lie in the continuous support provided before, during and after the workshop series through office hours and on-demand webinars and in the careful selection of presenters and materials discussed during the workshop.

The evaluation of the workshop is based on a survey administered right after the end of the workshop. Since one of the challenges has been retaining participants through submission of an S-STEM proposal, a further investigation months after the workshop could provide useful information.

Furthermore, the adverse impacts of COVID-19 on the ability of participants to stay the course through proposal submission cannot be overstated. Several of the groups simply couldn't keep up with the extra demands of managing their obligations of online instruction. Additionally, due to administrative and supporting staff working remotely, it simply wasn't possible for a faculty member to walk to offices like Institutional Research or Financial Aid to speak with colleagues. Similarly, some key institutional units & individuals were also forced to pivot during the period of online instruction, impacting the resources that may have once been available to support faculty members during the preparation of their S-STEM proposals. These include administrators like STEM Deans and Vice President for Academic Affairs, whose attention was shifted to managing all of the instructional reorganization associated with remote instruction, and personnel in offices like Institutional Research busy collecting students' data to better attend to their learning needs and analyzing enrollment data to report to statewide Chancellor's offices and similar governing bodies.

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