Developing a Research Agenda for the Engineering Ambassador Community

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Project Goals

The overarching goal of the project includes three-phases in order to create a shared research agenda. This project is bringing together leadership and other key stakeholders in the engineering ambassador community to create a plan for more in-depth evaluation of K-12 outreach programs that focus on broadening the participation of traditionally underrepresented groups, while promoting engineering identity development. Stakeholders include: K-12 teachers and administrators, undergraduate and graduate students, university administrators, and STEM identity researchers. The three phases of this two-year long project are: stakeholder identification and engagement, research agenda meeting, and research agenda proposal.

Accomplishments

Major Activities:

Phase One: Stakeholder identification (September 2018 – February 2019)
During this phase of the project, we leveraged an existing collaborative relationship with the Engineering Ambassadors Network and located other engineering ambassador programs around the country that focus on broadening the participation of underserved groups in engineering. Fifty stakeholders participated in 30-45 minute interviews.

Phase Two: Research Agenda Meeting (March 2019 – August 2019)
During this phase, the steering committee is co-planning the research agenda meeting informed by the initial interview findings. The meeting will take place in September 2019.

Phase Three: Research Agenda Proposal (September 2019 – March 2020)
During this phase, we will create an iterative process of synthesis which allows for stakeholders to reflect on, respond to, and otherwise inform the findings of the proposal writing team.

Specific Objectives:

Phase One Objectives:
Through brief, semi-structured interviews, we identified key stakeholders and stakeholder groups, as well as foundational programmatic information. Programs that specifically focus on reaching traditionally underrepresented and underserved were prioritized. Further, ambassador programs that currently conduct thorough evaluation were invited for the purposes of best-practice-sharing.

Beyond the Ambassador network, the research team also conducted a literature review and researched other experts in the area of STEM identity development or elements related to success in engineering among K-12 traditionally underserved youth and K-12 STEM evaluation experts to recruit relevant leaders to participate in the interviews and research meeting.

Phase Two Objectives:
The research team is organizing a two-and-a-half-day workshop in which stakeholders identified from phase one of the research project, including members of the broader STEM research

community, selected K-12 teachers and administrators and targeted ambassador network members, were invited to attend.

Significant results:

Phase One Outcomes: Through the combination of research and interviews, we identified stakeholder groups for all engineering ambassador programs, which may range from K-12 teachers to engineering identity researchers. The interview findings were used to inform the focus of the research meeting and allowed interviewees to self-identify for the research meeting steering committee.

The Principle Investigator and research team completed a total of 50 semi-structured interviews with educators, administrators, researchers, students and other relevant stakeholders from across the country. All interviews were coded and analyzed.

Key outcomes or Other achievements:
Eleven key themes emerged from these interviews and a written report was created to inform the development of our meeting that will be held in September 2019. Ten of the themes were shaped into questions that participants will address over the course of the meeting. Interview questions are included in attachments, below.

***Phase Two Outcomes*:** Fourteen steering committee members self-identified to participate in monthly steering committee meetings, which commenced in March. Steering committee members include: one student, two educational researchers, one k-12 administrator, and ten university administrators. Each month, we discussed a pre-planned agenda to allow for steering committee member input to help shape the direction of the meeting.

The PI and research team are coordinating the meeting logistics, including hotel contract, catering, BU room reservations, speaker recruitment, and other travel arrangements to prepare for the meeting. RSVPs were collected from all those who participated in the interviews. The goal is to have between 30 and 40 participants at the meeting in September. Participants will include: undergraduate and graduate students, researchers, administrators, K-12 educators, and evaluators.

Key outcomes or Other achievements:

Over the course of the meeting, participants will address ten of the key themes that emerged from the interviews. Though sessions will vary in terms of how they are moderated based on subject matter, each session will include a component of sharing of (a) current state along with (b) challenge/gap identification and (c) brainstorming for challenge/gap resolution. Through this process, we expect to identify the gaps in the community's body of knowledge which will be the foundation of the research agenda. Additionally, we hope to also extract information critical to identification of current best practices among ambassador and other engineering outreach programs.

Opportunities for Training and Professional Development

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Participation in interviews is a useful professional development opportunity because it gives participants a chance to share their knowledge. Further, talking about their experiences can increase confidence and identity.

Once we completed interviews, we elicited volunteers for the steering committee. Being a member of the steering committee provides the members with ample opportunities to discuss ambassador and other K-12 outreach programs with other colleagues from across the country. Further, these leadership positions can be beneficial to their careers and growth of their professional networks.

We have also invited undergraduate and graduate students to participate in the workshop as note takers and participants, so they can gain valuable networking opportunities, professional development, and important exposure to conducting human-focused observational research which can be critical in future careers.

Results Dissemination

The interview results were shared with the steering committee members. Further, the PI and research team submitted a proposal to present at the American Educational Research Association conference. Please see attachments for a copy of the proposal. The title of that proposal is: *Participative Co-Creation: Engaging the Engineering Ambassador Community in the Development of a Research Agenda Workshop*

Next Year's Goals

During the next year, we will hold our conference (September 2019), analyze notes and feedback from participants, and co-create with stakeholders the final research agenda to be distributed to the NSF, conference participants, and other interested parties. Further, the PI and research team will work to publish our results in relevant education and engineering journals.

Impact on Engineering and Other Disciplines

The information collected in the 50 interviews is being used to determine the priorities for the engineering ambassadors' community of practice we are currently developing. Further, the process of developing a community-informed workshop can be replicated and shared with other educational organizations that would like to develop communities of practice. The results from the working meeting will help develop a research agenda to move forward with understanding the impact of ambassador programs on the engineering pipeline. Additionally, the findings of the initial interviews will be used to inform identification of outreach best practices as well as the development of an ambassador program taxonomy.

An important focus of this project was to include participants from different stakeholder groups and disciplines so that practitioners can better apply the findings of research and researchers can design studies more informed by the real world. As such, simply bringing a subset of these diverse stakeholders together for the steering committee allowed members to think about their respective

disciplines from new angles. We anticipate that this is a microcosm of what will happen at the meeting in September. Ultimately, we hope that through the exchange of information each person will leave a little more equipped for success. For example, we hope administrators will be able to infuse the knowledge shared by researchers in their programs. Conversely, we hope that researchers will use the administrators and student experiences to inform their research questions.

Beyond engineering and STEM outreach program impact, our model of collective, community-informed program development could be used more broadly with organizations who want to work with constituents in other parts of the country. Though co-creation is not uncommon when addressing complex community issues, there is often heavy backend work conducted before the community is engaged. We have sought to establish an approach that invites the community to shape the process from beginning to end. Further, the learning from the engineering ambassador programs may benefit other STEM disciplines who participate in outreach. The field of education, informal education, engineering and STEM education may all benefit from the results of this work.

Human Impact

The human impact of this project is that 50 people from around the country participated in an interview and many of these interviewees will also participate in the working meeting process related to ambassador programs. In addition to each participant getting the opportunity to think deeply about their programs and learn from each other, each of those individuals will return to their local universities and/or communities, and can share their knowledge and best practices throughout their communities. The potential impact is much greater than just those who participated in the meeting, but rather all of the ambassadors and the community members and schools in which they serve could be positively impacted through this work.

In particular, through inviting students to engage as both participants and note takers, they gain valuable networking opportunities, professional development, and important exposure to conducting human-focused observational research which can be critical in future careers given the human-use component of engineering design.

Results from the interviews and meeting will be shared across the community of ambassador programs and more broadly through engineering and STEM education platforms. A number of participants that attend the meeting have leadership roles within their university. Thus, the information each individual gathers through participating in the meeting has the potential to shift their respective infrastructure.

As engineering outreach programs are inherently intended to improve understanding of and access to engineering and related concepts improvements made in outreach efficacy as a result of this research agenda and the information sharing that will occur during the September meeting will have an immediate impact on the populations that each program interacts with.