



## **A Virtual Community of Practice to Promote LGBTQ Inclusion in STEM: Member Perceptions and Community Outcomes**

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# **A Virtual Community of Practice to Promote LGBTQ Inclusion in STEM: Member Perceptions and Community Outcomes**

The results discussed in this paper are part of a transformative project that links diversity research with a faculty development initiative to promote LGBTQ equality in engineering. The aims of the project are to (1) identify aspects of engineering culture that present barriers to LGBTQ equality, (2) build knowledge and skills to disrupt discrimination and promote LGBTQ equality in engineering departments on college campuses and (3) to identify best practices for promoting LGBTQ equality in engineering. This paper focuses on understanding the roles of a Virtual Community of Practice (VCP) in advancing the goals of LGBTQ equality in engineering. The VCP was established in fall 2015 consisting of 19 professionals from STEM academic departments in the initial cohort. During the first semester, the VCP members completed human relations facilitator training and developed content for Safe Zone LGBTQ inclusion training geared toward STEM academics. Since completion of the facilitator training, the VCP members have actively promoted LGBTQ inclusion in their own departments and conducted Safe Zone workshops at their own institutions, online and at professional society meetings. A survey was used to assess the VCP members' perceptions of VCP design, benefits to individual members and to their departments, and individual and professional characteristics. Results and insights from the survey will be presented in this paper along with a description of the specific outcomes of the VCP.

## **1. Introduction**

In its 2012 "Engage to Excel" Report to President Obama, the U.S. President's Council of Advisors on Science and Technology (PCAST) called for producing one million more STEM professionals over the next decade than would be produced at the current graduation rates. This equates to a 34% annual increase in undergraduate STEM degrees awarded annually. Citing a very low average undergraduate STEM retention rate of 40%, the report recommends the fastest and most economically viable option for achieving the workforce goal is to retain more STEM majors [1].

One of the key reasons that students cite for leaving STEM is the perception of an unwelcoming climate, especially by those who are members of underrepresented groups [1]. Campus and classroom climate is essential for student retention and also for learning. The way in which students experience their campus environment impacts both learning and developmental outcomes [2, 3]. Environments in which students are subjected to harassment or discrimination hinder student learning, and both minority and majority students are negatively impacted by the failure to create an inclusive environment for minority students [4-8]. Further, there is compelling evidence that diversity among students and faculty is crucially important to the intellectual and social development of *all* students [9-12]. The benefits of diversity extend beyond higher education to the business environment as well: research suggests that improving diversity in a workforce can have positive effects on innovation and productivity [13]. Given the need to increase our STEM workforce to remain competitive in a global economy, efforts must be made to attract and retain talented individuals to STEM disciplines and professions. Therefore, increasing diversity in science and engineering is identified as a national priority by

the National Research Council [14]. The National Academies calls for elimination of all forms of bias that may hinder academic career success in science and engineering [15].

Recent years have seen significant progress toward LGBTQ equality in the United States through legislation and societal acceptance, but research on the perceptions and experiences of LGBTQ faculty and students on college campuses clearly demonstrates the prevalence of negative experiences that range from exclusionary behavior to overt discrimination [16-21]. A landmark study involving over 5,100 students, faculty and administrators from all 50 states was conducted to explore how LGBTQ people experience campus climate and to examine behavioral and institutional responses to LGBTQ issues [22]. The following examples illustrate several disturbing trends that emerge from the study:

- Within the last year, 29% of LGBTQ students and faculty experienced harassment and discrimination; one-third of respondents believed the university's response to incidents of LGBTQ harassment was inadequate.
- 13% of LGBTQ, 22% of transmasculine, 17.9% of transfeminine, and 17.3% of gender nonconforming respondents feared for their physical safety on campus.
- 31% of LGBTQ respondents were not comfortable with the campus climate; an even higher percentage (37%) of students were not comfortable in the classroom. The percentage of those uncomfortable in the classroom was highest (41%) for students who identified as lesbian or queer.
- 30% of LGBTQ individuals seriously considered leaving their institution due to negative experiences and perceptions. This percentage was highest (42%) for faculty and first year students (72%).

These experiences and perceptions are attributed directly to sexual orientation and gender identity, and they extend to both students and faculty. The intersection of multiple marginalized/underrepresented/etc. cultural and social identities (e.g. race, religion) further increases the risk of negative experiences and perceptions of climate [22]. Despite the discrimination and negative perceptions that pervade the campus climate for LGBTQ people, only about 6% of U.S. institutions have centers that offer support services specifically focused on the needs of this community, based on current data from the Consortium of Higher Education LGBT Resource Professionals [23].

Institutions offering support services, programming and appropriate policies are effecting a gradual positive change in climate for LGBTQ individuals [24]. Yet in academic departments, engineering departments have proven more impervious to change than other disciplines [16, 18, 21, 25-28]. Many LGBTQ engineering students are immersed in unwelcoming and often hostile heteronormative environments [18, 28]. Research studies have found that cultural norms and biased perceptions of competence limit LGBTQ students' opportunities for success, which causes stress, social and academic isolation, and anxiety over future job security [18], [29]. In the professional workplace, science and engineering professionals report experiences and perceptions similar to those of students [19], [16], [30]. In a study that compared the academic climate and career consequences for LGBTQ faculty, those in STEM fields reported the highest level of discomfort on campus, in departments and in classrooms; those who were not comfortable were more than twice as likely to consider leaving their institution [20].

To respond to the need to improve LGBTQ inclusion, particularly in engineering departments, in 2015 ASEE launched a transformative project that links diversity research with a faculty development initiative to promote LGBTQ equality in engineering. As described previously [31, 32], the aims of the research-education-advocacy project are to (1) identify aspects of engineering culture that present barriers to LGBTQ equality, (2) build knowledge and skills to disrupt discrimination and promote LGBTQ equality in engineering departments on college campuses and (3) to identify promising practices for promoting LGBTQ equality in engineering. As part of this effort, a Virtual Community of Practice was formed to develop engineering faculty who are aware, empowered and equipped to advance LGBTQ equality in their departments. This paper focuses on understanding the roles of a Virtual Community of Practice (VCP) in advancing the goals of LGBTQ equality in engineering.

## **2. Project Overview**

### **Research-Action cycle**

This project is a research-informed faculty development initiative that uses social change strategies to foster a positive and welcoming environment for LGBTQ individuals in engineering departments [33, 34]. Our research investigates the factors in engineering culture that hinder LGBTQ inclusion. The new knowledge that is generated from the research is continually incorporated into the targeted Safe Zone interventions to better tailor them to an audience of STEM professionals and students, and is used by the VCP members to develop strategies to effect change within their own STEM departments. This approach is based on the transformative cyclical research model described by Mertens [35].

### **Research**

Cech and Waidzunas [18] and others have suggested that heteronormativity and heterosexism may be promoted through particular ideologies in engineering culture, especially “technical/social dualism” (devaluation of social, communicative and personnel-related aspects) [36-38] and “depoliticization” (relegation of questions of social justice and inclusion as “political,” and thus irrelevant to “real” engineering) [39, 40].

This project used a mixed-methods research plan with surveys of engineering deans, faculty and students as well as ethnographic participant observations of a Virtual Community of Practice for LGBTQ inclusion in STEM. The surveys and ethnographic research generated new knowledge and understanding of engineering cultures, which provided empirically grounded ways that the next Safe Zone workshops were contoured to be most effective for engineering audiences. The research findings help the members of the Virtual Community of Practice advocate more effectively as they try to promote LGBTQ equality in their departments, and help shape promising practices for promoting LGBTQ equality in engineering.

**Surveys:** In the fall of 2015 the survey of Engineering and Technology Deans was completed as described previously [41]. The reader is referred to the paper by Cech, Waidzunas and Farrell [41] for more information, but a summary of the findings is useful in the context of this paper. While only about 1/3 of deans were aware of incidents of LGBTQ bias within their colleges, most deans did express strong support for a variety of LGBTQ-inclusion initiatives. The strength of their support for these initiatives suggests that engineering deans may be an underutilized

resource for supporting changes that promote LGBTQ inclusion. This research also identified a potential obstacle to LGBTQ inclusion initiatives: engineering deans perceived that faculty would be unsupportive of such initiatives [41].

In the spring of 2016 surveys were sent to faculty and students at eight institutions where engineering deans agreed to have their colleges participate in the study [28]. More detail is available in the paper by Cech, Waidzunas and Farrell [28], but a summary of findings is provided here for convenience. Findings from 1729 survey responses across the eight schools show that (1) LGBTQ students are significantly more likely than their non-LGBTQ peers to report marginalization in their engineering programs; (2) LGBTQ students are less likely than their peers to feel that their work is respected, (3) these negative experiences have serious personal consequences such as emotional strain, difficulty sleeping, stress and exhaustion caused by compartmentalizing their lives [28]. These findings were consistent across all eight schools involved in the study, indicating that heteronormativity and homophobia are part of STEM culture more broadly, not micro-cultures that are observed in environments that are especially conservative.

**Ethnographic Participant Observation:** The goals of participant observation in the Virtual Community of Practice is to illuminate advocates' experiences to promote LGBTQ inclusion, and to develop promising practices in Safe Zone workshops for engineering audiences in general and also for different engineering school environments. The ethnographic observation is ongoing.

### **Community and Advocacy**

**The Virtual Community of Practice (VCP):** Wenger-Trayner [42] describes three essential elements of a community of practice: the domain (interest in LGBTQ equality), the community (members who engage in discussions, support each other, share information and learn from each other) and the practice (promoting LGBTQ inclusion at the department level). The Virtual Community of Practice relies on technology to support the creation of a scalable and sustainable model for sharing knowledge, tools and resources to promote LGBTQ inclusion in environments that are traditionally difficult to penetrate.

A Virtual Community of Practice was established in the fall of 2015 to promote LGBTQ equality and inclusion in Engineering. VCP participants were recruited via email distribution lists, and ultimately 20 leaders were selected from institutions across the country.

Since the establishment of the VCP, members have met online via Adobe Connect every 2-4 weeks during the academic year to (a) identify LGBTQ inclusion approaches appropriate for their department context, (b) share resources and (c) support each other as they develop and implement an action plan to change climate and promote LGBTQ equality in their own departments.

During Phase 1 (also called Leadership VCP or LVCP) in the fall of 2015, a series of Human Relations Facilitation training sessions was led by two meta-trainers who trained twenty STEM faculty and staff to facilitate Safe Zone workshops. The meta-trainers brought rich perspectives and expertise to the community: The training involved about 10 hours of online facilitator training and practice prior to the start of the Safe Zone Workshops, and two follow-up meetings

after the facilitator training was complete. This phase of the VCP focused on the development of human relations facilitation skills, and formation of the community. In phase 2 (also called Action-oriented VCP or AVCP) beginning in the spring, the focus was action-oriented and the online community developed workshop content, produced actionable resources for their Safe-Zone workshops and VCP, and initiated the online Safe-Zone workshops.

## Education

**Safe Zone Workshops** are campus ally training programs that aim to create a visible network of LGBTQ-affirming individuals and contribute to creating a positive and inclusive climate [24, 43]. Conventional Safe Zone Workshops are general training for all members of a campus community, and they address general campus concerns rather than issues that might arise in departments and classrooms. A key aspect of the Safe Zone workshops developed for this project is the emphasis on experiences in classrooms and other academic spaces on campus. Our series of research-informed interactive Safe Zone workshops are specifically tailored for a STEM audience to raise awareness for LGBTQ inclusion *in STEM* and create a network of allies to foster a supportive atmosphere for LGBTQ individuals *in STEM*.

The content of the Safe Zone Workshops was developed to address learning outcomes embraced by the Consortium of Higher Education Resource Professionals [43]:

- (1) understanding LGBTQ concepts and developing awareness of biases,
- (2) understanding LGBTQ issues and recognizing discrimination and heterosexual privilege and
- (3) becoming active support persons to LGBTQ individuals.

A fourth, unique objective of our training is:

- (4) to develop an understanding the aspects of engineering culture that act as barriers to LGBTQ equality.

As recommended by Woodford [43], the program offers an incremental design with successive trainings to address audiences with varying levels of knowledge and awareness. The content of the Safe Zone workshops are tailored for an Engineering/STEM audience by incorporating the findings from our research on LGBTQ in Engineering. This is done by various means such as direct presentation of quantitative results, case studies about experiences of LGBTQ individuals in STEM, and activities exploring how STEM culture impacts LGBTQ individuals. Upon completion of Safe Zone training, graduates receive a Safe Zone sticker to display in their workplace. This simple symbol of LGBTQ alliance has been shown to benefit LGBTQ students and faculty in powerful and meaningful ways [24].

Safe Zone workshops were first introduced at the ASEE Annual Conference in 2014 and offered again at the 2015 Annual Conference [31]. Through this project we redesigned the Safe Zone workshops for a STEM audience. Since 2016 we have offered multiple Safe Zone workshops at the ASEE Annual Conference each year, three online workshops each semester since spring

2016, several workshops at the conferences of other professional societies such as AIChE, ACS and IFEES, and on several college campuses.

A more detailed description of the Safe Zone workshops and their effectiveness was described previously by Farrell, et al. [32]. The workshops were successful in promoting knowledge and awareness of LGBTQ issues, recognition of heteronormative and cisnormative assumptions, and understanding of heterosexual/cisgender privilege. In addition, the workshop participants indicated strong agreement with statements that they would adopt several promising LGBTQ-inclusive behaviors.

### **3. Methods**

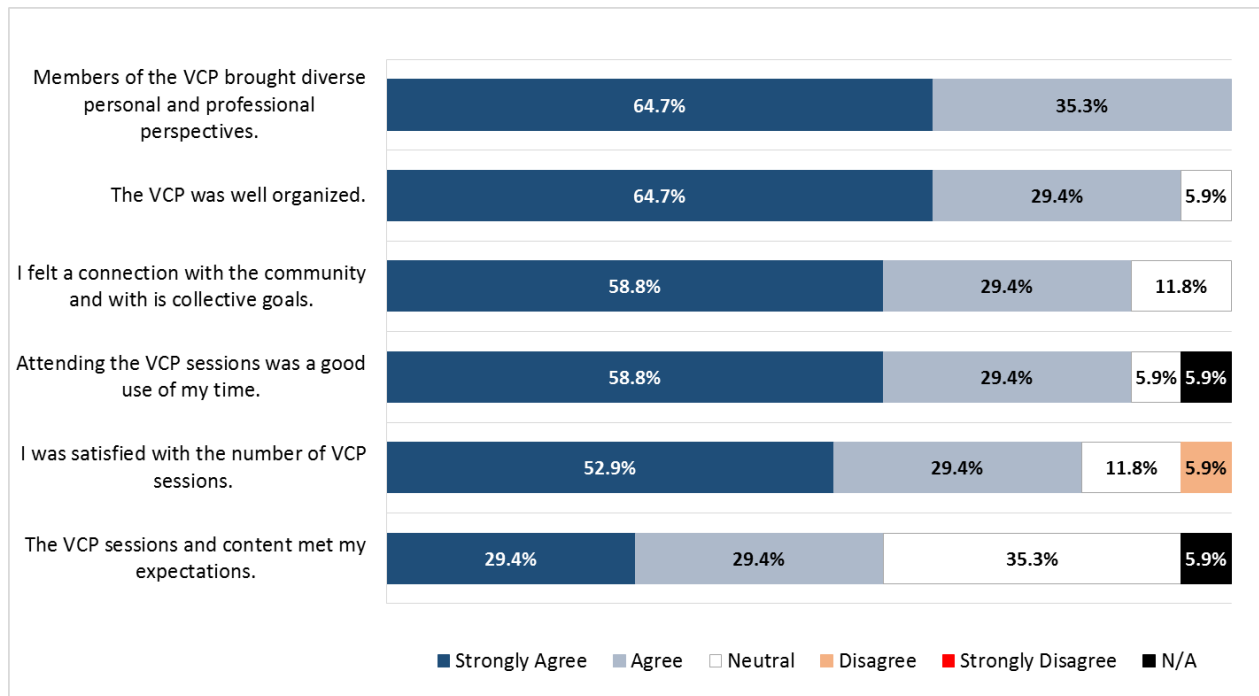
In spring 2016, ASEE conducted an online survey with the Leadership Community in order to measure and document progress, satisfaction and outcomes for the LVCP community. At the time the survey was administered, the participants had completed the facilitator training and had developed the content of the Safe Zone level 1 and level 2 workshops. The results reflect the perceptions of the members of a Community of Practice in the early stages of development and will provide an indication of the strength of the foundation of a sustainable community of practice capable of achieving individual and community goals.

Of the original 20 members of the VCP, one was unable to attend the facilitator training or meetings due to schedule conflicts, and two were PIs on the project. Links to the online survey were sent to the remaining 17 VCP members. The survey received 17 responses.

Survey questions addressed the following areas related to participants' experiences with the VCP: overall VCP experience; gains in knowledge; growth of support network; gains in skills and actionable outcomes; facilitator training outcomes; and content development outcomes.

### **4. Findings**

**Overall VCP Experience:** Ten out of the 17 survey respondents (59%) reported that it was their first time participating in facilitation and content development training that address LGBTQ inclusion, whereas the remaining seven people (41%) had previous experience and participation in such trainings. As Figure 1 illustrates, the overall VCP experience was positive and beneficial to participants. Respondents referred to the VCP as enlightening and worthwhile experience, well organized, and a valuable use of time. Participants were able to learn how to converse, get to know each other, and learn from each other much faster than they expected. The excellent collection of literature and other content - organized largely by the leaders and with contributions from all members - and the efforts to understand the content and how to use it has provided the tools participants needed to help educate others.



**Figure 1.** Member satisfaction with various aspects of the VCP Experience (n=17).

### Strong Community

Deeper insights were provided from about 40 responses to open-ended questions. The sense of a supportive community and the strong commitment to LGBTQ equality that all respondents shared was what they valued the most about the LVCP experience. Of the nine respondents who referred to the strong community in their responses, four were experienced with LGBTQ inclusion facilitation and content development, and five had no prior experience. Participant comments indicated that the VCP provided a safe environment for supportive interactions and sharing of experiences and different points of view. The training was enhanced by people who contributed materials and shared their own experiences, which strengthened the perception of community and optimized the expertise of the group and the collaborative effort to get all members prepared to facilitate.

In terms of content and activities, one respondent (with previous experience in LGBTQ inclusion facilitation and content development training) shared that they prefer the synchronous online interactions versus the asynchronous activities:

“I think the "in-person" or synchronous events were much more useful than any asynchronous activities. I often felt as though myself and others were too busy to accomplish tasks to the level of my general professional expectations during asynchronous activities. Alternatively, when people set aside the time to actually meet in synchronous events, I felt we actually accomplished things and grew in the LVCP.”



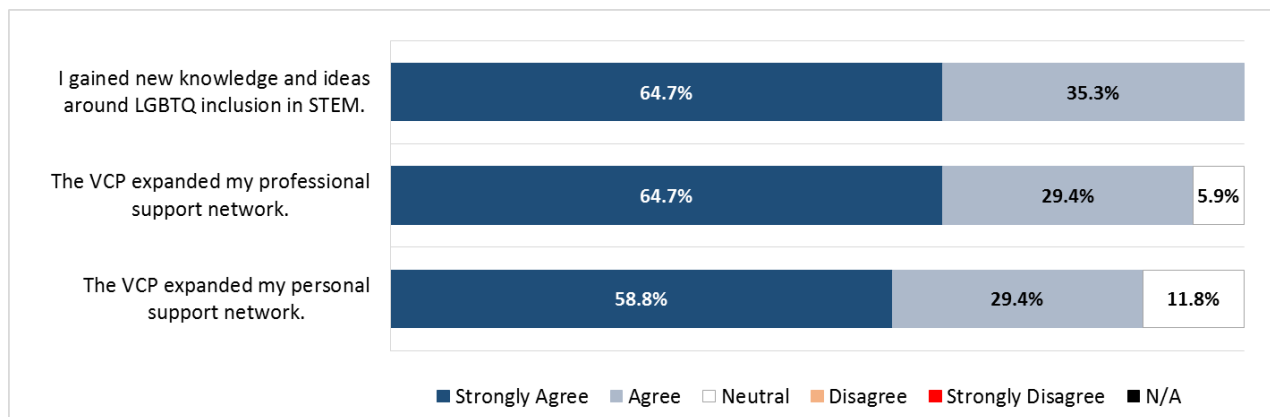
Another first-time trainee noted that the structured training, followed by more loosely structured discussions and the option to put the training in use in by facilitating a safe zone workshop all worked well together for participants.

### *Challenges*

The only challenge as reported by four (4) attendees related to time. Scheduling proved difficult for busy academics for regular group meetings across multiple time zones, and finding sufficient structured or unstructured time between the regular group meetings to discuss content with other participants and prepare for the group sessions. One person also suggested that a formal mechanism for documenting all the learning would have been helpful (e.g. facilitator portfolio).

### *Gains in Knowledge and Support Networks*

The majority of LVCP participants reported that they were able to expand their personal and professional support networks, and to gain new knowledge around LGBTQ inclusion in STEM, LGBTQ resources and facilitation techniques (Figure 2).

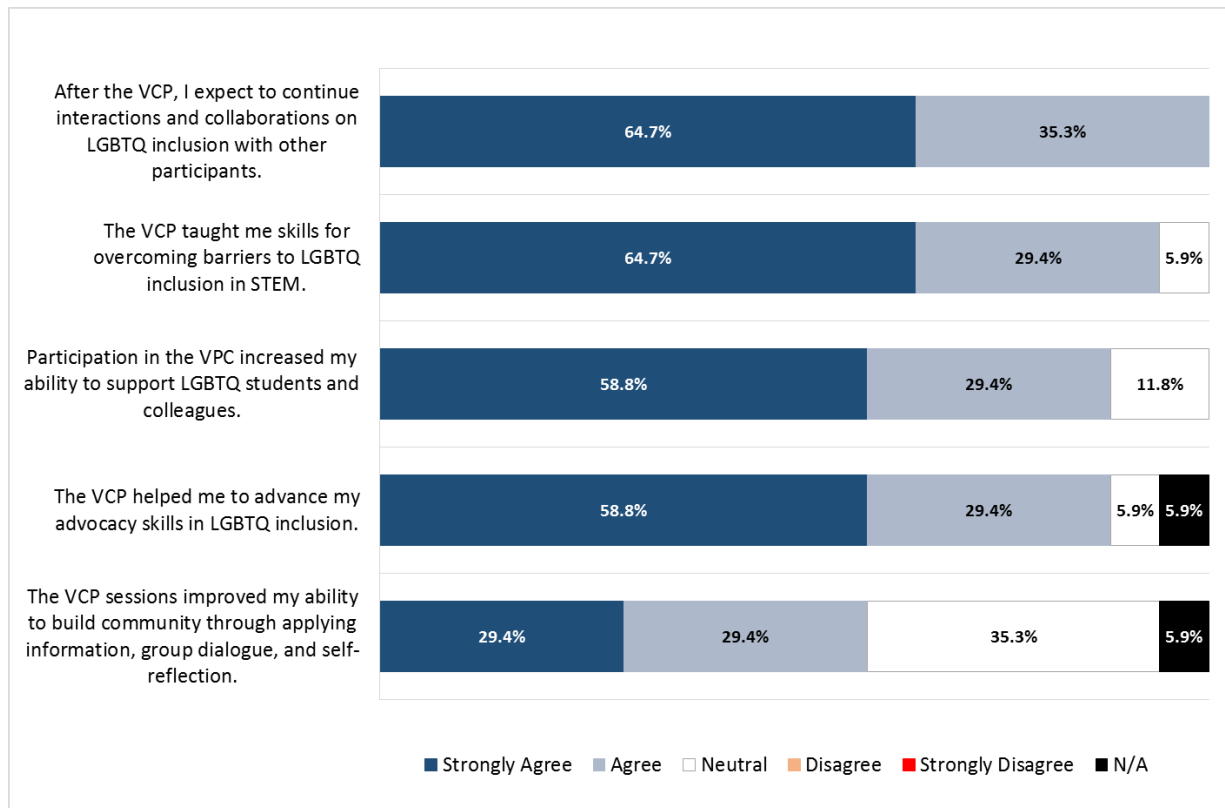


**Figure 2.** Knowledge and support network gains (n=17).

In the open-ended comments, three (3) respondents elaborated on **professional outcomes** from the LVCP in terms of **outreach, networking, and collaboration** (2 experienced/1 first-timer). The LVCP made it possible to find other like-minded people who want to advocate for LGBTQ equality. Participants were able to support each other individually, as well as contribute to the goals of the community. **Strong connections** were forged during the experience, allowing people to reach out for professional or personal support, or to develop ideas and future projects together. For one person, the LVCP has been also a source of motivation to reach outside of their campus and into the surrounding community to encourage LGBTQ students to enter into STEM fields.

### **Skills and Career Outcomes**

The reported data in Figure 3 shows that LVCP increased participants’ abilities around supporting the LGBTQ community, and allowed them to develop skills around inclusion, advocacy and overcoming barriers that they can apply in practice and in collaboration with others.



**Figure 3.** Skill gains and actionable outcomes (n=17).

Reportedly, some LVCP participants were able to utilize the resources and facilitation techniques from the meetings in their work. Nine (9) respondents were able to trace **professional outcomes** back to the LVCP. Some reported supporting LGBTQ students and faculty, training others, and championing, and benefiting from, the inclusion cause on their campuses directly (4 experienced/2 first-timers). As the quote below illustrates, the professional outcomes seem to have been even more direct for those who attended a LGBTQ facilitation and content development training for a first time:

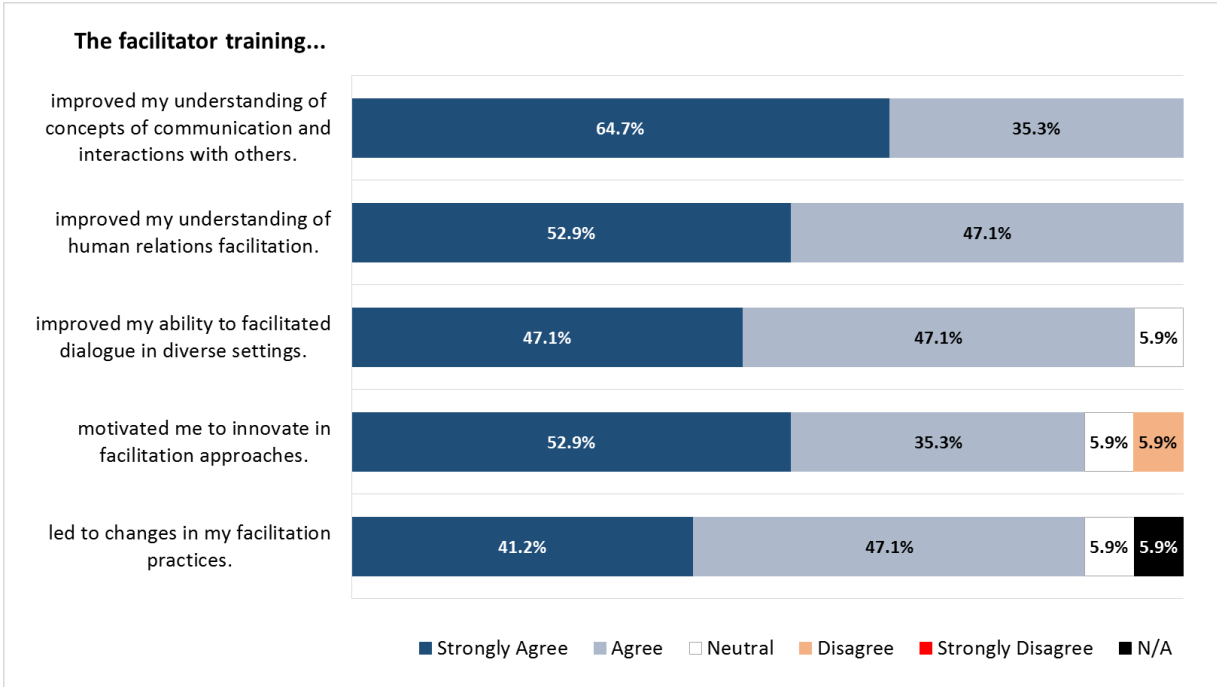
*“I barely know where to begin regarding ways that this project has impacted me. Based on this experience, I am considering changing my professional path to do this type of work full-time! This project has benefited me in personal, professional, and academic ways.”*

One of the participants with previous experience in facilitation and content development of LGBTQ ally training also shared that they have been able to implement college-wide steps and change the culture on campus:

*“I can directly link participation in this group to significant positive changes in my college for our LGBTQ students and faculty. Having the support of this community at my back has given me the encouragement and information needed to finally get underway college-wide changes that I’ve been trying for years to effect. The support of colleagues outside of my institution and being able to point to the support of ASEE and NSF, has been very useful in catching the attention of and motivating decision makers in my college. In the end, I can say our campus is a safer and more welcoming place because of this work.”*

**Facilitation Training Outcomes**

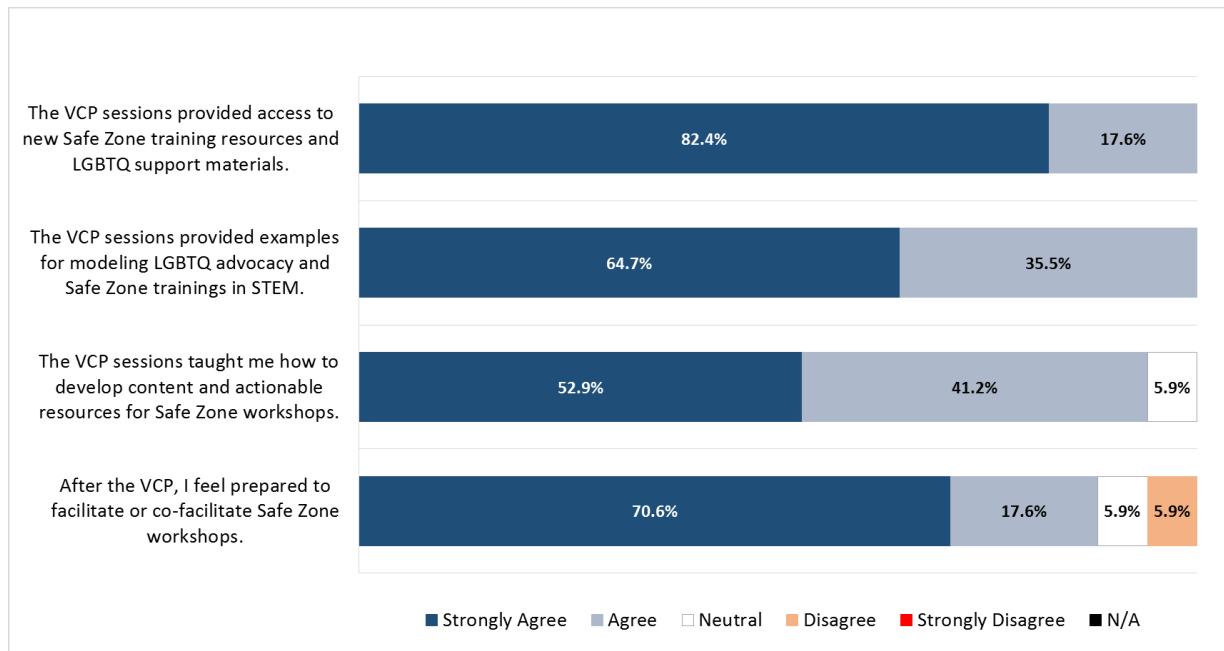
The data in **Figure 4** shows that LVCP Phase 1 on facilitation training scored high gains in knowledge, skills, motivation, and actions. All respondents reported improved understanding of concepts of communication, interaction, and human relations. Most also reported better facilitating abilities as a result of the training.



**Figure 4.** VCP Phase 1: Facilitator training outcomes (n=17).

**Content Development Outcomes**

The data in **Figure 5** shows that LVCP Phase 2 also scored high gains with regards to content development and application in practice. All respondents agreed that LVCP provided participants access to new Safe Zone training resources and support materials, as well as examples of advocacy and modeling training. Most also agreed that they have learned how to develop content themselves and are ready to facilitate Safe Zone workshops independently.



**Figure 5.** VCP Phase 2: Content development outcomes (n=17)

### Recommendations for Improving the VCP Experience

Fifteen respondents provided concrete recommendations for future improvements to the LVCP experience. The essence of their comments is listed below as bullets, with the frequency of that recommendation in parenthesis preceding the comment.

- (3) Encourage and structure time for informal communication among members in between the group meetings, where subsets of community members can meet to work on content creation, topic focus, handout design, etc. in order to get work done before the full group meetings.
- (2) Start LVCP with a single session on literature review and a summary of existing quality research on LGBTQ students and faculty.
- (1) Have one session on facilitator skill overview with regards to workshops to help give perspective and motivation for the facilitator training content (e.g. a viewing of a real-recorded or model-simulated Safe-Zone workshop with some commentary from trainers on some of the "facilitator skills" that are highlighted)
- (1) Community members had different levels of awareness and knowledge about LGBTQ issues and research. A novice member just being introduced to the topic may require more background knowledge to become a full participant in the meetings and feel confident about their ability to facilitate a discussion on the topics. Some of the initial training may be more effective if the group were separated based upon knowledge and awareness.
- (1) Have designated time and space for separate meetings for the allies (individuals that do not identify as LGBTQ) and the LGBTQ groups, where the former talk about how to

be better allies based on educating themselves and the latter talk about their experiences and how to better share those experiences with allies (*Experienced*).

- (1) Start developing a facilitator portfolio to capture a one-page reflection after each session and document the learning of the facilitators, because there is a lot of information to process (*First time*).
- (1) Have participants set SMART (Specific, Measurable, Achievable, Relevant, Time-bound) goals after the training for what they individually want to achieve and what the community wants to achieve as measurable goals of accomplishments going forward.
- (1) Track and document testimonials of members who were unfamiliar with the LGBTQ topic, but are facilitating sessions now.
- (1) Have more opportunities for safe zone co-presentations (online or in-person) in the year after the training.
- (1) This is an experience that, at some point, engineering and STEM deans are going to want for at least one person their college to become a facilitator - to perform Safe Zone style trainings/workshops. It is worth thinking about a strategy for how best to collect groups of new potential trainees while it's on the cusp of growth.

## 5. Conclusions

VCP participants had positive perceptions of the overall VCP experience as well as the outcomes of the facilitator training and the content development phases. Participants indicated strong perceived gains in knowledge, gains in skills and actionable outcomes, and growth of their personal and professional networks. Individual satisfaction and perception of individual outcomes are significant because these aspects of community development will provide a strong foundation for the development of a sustainable community of practice with the potential to transform STEM culture in departments and institutional contexts.

Participants also provided several concrete recommendations that will be incorporated into the iterative refinement of the VCP in terms of organization and management during the next iteration of the VCP.

## 6. Acknowledgement

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