Work in Progress: Challenging the Narrative of Accessible Training Being a Burden: Developing Training on Belonging in a STEM University.

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Introduction

The purpose of this work in progress (WIP) research paper is to explore the ways that DEIA (Diversity, Equity, Inclusion, Access) training provided to student leaders within STEM (Science, Technology, Engineering, Math) universities can be conducted in more inclusive ways. The way DEIA is taught can often, itself, be exclusionary and rest on problematic assumptions about learners and how they experience those spaces. The continued gatekeeping and social exclusion of minoritized individuals from engineering must be continually challenged to begin addressing the damage that years of institutional denial created, but so often those who need recognition are physically or socially excluded through alienation from DEIA education spaces. The BASE Camp program (Belonging and Allyship in the Student Experience) was developed at the Colorado School of Mines to build education related on the student belonging experience into the foundation of the university itself via educating peer leaders on DEIA topics in-depth. The program operates with the goal of not only educating students on the complexity of the human experience, but ultimately creating a space that values the skills and knowledge that every student brings to the table. This is best done through ensuring that not only the research methods are inclusive, but also the ways that information is disseminated. For example, utilizing methods that take the pressure off of students to sit in a physical classroom for multiple hours while engaged in (often overwhelming) group activities can bring more individuals into a safe space to learn about the different lived experiences of their peers and future coworkers. Additionally, the social alienation that occurs in these trainings at the detriment of the numerically small minoritized populations in STEM makes the spaces feel even more exclusionary, creating an issue that needs to be addressed. These topics will be elaborated on further in the coming paper.

Throughout this paper, the focus will be on discussing the 1) development of accessible assessments, 2) safety in DEIA program building to protect minoritized students in majority white (and specific Asian ethnicities) male training spaces, 3) creation of accessible trainings, 4) adjustment of methods moving forward, and 5) ideas on how to continue to challenge normalized violence that occurs in many DEIA education spaces. For preliminary results of the program, please reference the companion paper and poster (Lopez-Rogina, et al. 2025. BASE Camp at Mines: NSF BPE Track 4 Year 1).

Program Overview

Nationwide, students coming from underrepresented and underserved groups (URG) receive bachelor's degrees in STEM at lower rates (this includes populations such as those with disabilities, racial and ethnic minorities, women, trans, and third-gender persons, those from low-income backgrounds, and more). A part of the task that needs to be done, beyond just educating peer leaders on DEIA and the way it exists in American social spheres, lies in teaching students about funds of knowledge. Funds of knowledge (FOK) are the skills individuals learn most often through their culture, home, and family life that are deeply valuable yet often overlooked. Avenues to help train both peer educators and students on FOK are rooted in making the connection from FOK to valuable engineering skills. By recognizing and calling attention to the

social violences that occur in not only STEM education, but also in the dissemination of DEIA education within many STEM universities [1, 2], this program seeks to go beyond teaching about categories and instead help create connections between theory and lived experiences in ways that feel relevant to students from more privileged circumstances.

The three overarching research questions to gauge success of the program center on 1) education, 2) comprehension and implementation, and 3) a resulting increase in a sense of belonging on campus. The program is structured into four tiers students can move through to gain further knowledge and experience. Preliminary findings suggest that student leaders who have undergone the first module of training are entering with less DEIA knowledge than their faculty mentors hoped. They know broad themes like privilege and microaggression, but do not feel confident in their deeper knowledge of any particular topic and have a desire to better understand what actions can be taken on their part to challenge social norms. This finding promises space to grow the program within both the home university and similar STEM institutions across the US.

Brief Literature Review

Importance of Accessibility of Training

A broader recognition of the dearth of basic accessibility accommodations in both STEM and DEIA programming is deeply lacking, despite data proving there is an issue [3-7]. Given that more than 28.7% of adults in the US have a disability, building accessibility into everyday life should be the standard [8, 9]. If more than 1 in 4 adults within the US have some form of disability, it is guaranteed that the students in our classrooms are also experiencing difficulty in their daily lives. This number is also likely to be under-estimated due to the reality that many individuals fail to recognize the ways that their daily struggles fall into the category of disability, instead often blaming themselves for aspects of their health they cannot control and instead opting into struggling silently and without supports. Disabilities can take many forms, and more often than not, are not visible to the untrained eye. Forms of disability include a range of diagnoses and experiences such as 1) conditions that are present at birth and may affect functions later in life including cognition, mobility, vision, hearing, behavior, and more, including gastrointestinal disorders 2) developmental conditions that become apparent during childhood or adolescence such as ADHD and Autism Spectrum Disorder (ASD), 3) conditions related to injuries, such as a traumatic brain or spinal cord injury, 4) conditions associated with a longstanding diagnoses such as vision loss, nerve damage, or limb loss from diabetes, and 5) progressive static or progressive intermittent disabilities such as muscular dystrophy or multiple sclerosis among others. Although people do not often consider it to be, conditions such as C-PTSD and PTSD also fall into these categories, which is a particular issue on college campuses related to sexual assault trauma, high levels of stress and distress, and other violences common within that population, with a recent rise that found a doubling of the numbers reporting PTSD on college campuses since 2017 (3.4% to 7.5% in 2021). What these numbers and the vast array of disability experiences tell us is that implementing accessibility should be the norm, not the dreaded adjustment *after* someone has requested it. Students are less likely to know they have a disability and are even less likely to know how to advocate for themselves in getting the help they need. As individuals seeking to help students succeed, it is our responsibility to try to meet them where they are.

Data Collection Methods

The specific research questions developed in order to gauge success of the program are as follows:
RQ1: When provided with DEIA training, do student leaders at the Colorado School of Mines feel more comfortable with their knowledge of these topics?
RQ2: Upon receiving training and a deeper comprehension of DEIA topics (RQ1), do student leaders gain confidence in their ability to navigate peer leadership on DEIA related issues?
RQ3: Once RQ1 and RQ2 have been implemented, does the student population feel a stronger sense of belonging and identity within their peer group/organization? classroom? research space? campus? field session/field research?

In order to tackle the complexity of these questions, a mixed methods approach was utilized. Using both quantitative and qualitative research ensures that exploratory data is being accurately captured. As with any new program development, some aspects of the target population, specifically their way of processing new information and making decisions with said information, is unknown. Generational shifts in ways people think, language used, stressors and the way students think about the use of their time, and pre-existing knowledge cannot be assumed. This is why a combination of survey data, reflection journals, and focus groups was built into the structure of the research side of the program. The ways these methods were shaped to protect students while still gaining information will be discussed in the Assessment Plan below.

Protection of Students While Educating

The protection of minoritized students while educating about DEIA is often overlooked in the name of convenience. Despite good intentions, many students end up being placed in positions of hypervisibility, complete invisibility, or token minority status in DEIA training spaces [10]. For example, speaking about the experience of Black American students in a training space with only two non-white students, one of which identifies as Black, can cause mental and emotional harm [11]. Minoritized students are placed in situations in which they have to listen to peers ask questions about their very humanity and outdated misassumptions about intelligence, athletic prowess, and laziness, among others. The same can be said for trans and queer students, immigrants and children of immigrants, students with disabilities, and others. It is finding simple ways to address this normalization of social violence that occurs in DEIA research and education spaces, along with the integration of what people consider “common” disability accommodations, that we seek to discuss via curriculum and training methods for the remainder of this paper.

Outline of Program

At the time of writing, the BASE Camp education programming consists of four tiers of training, with each tier able to be completed within a semester. As a reminder, the primary training goal is to educate students in STEM on the variation in human experience and how it connects to their own work and research. In each tier, a student completes a certain number of hours of

lecture/podcast/reading/etc. learning plus certain tasks (i.e., journals) to gauge deeper comprehension and application of the training materials. Tiers include BASE Leader I, BASE Leader II, BASE Leader III, and BASE Expert. In addition to this, there is an Advisory Committee of students composed of five individuals who have made it to the BASE Leader III and above level. All positions are paid. Additionally, students who complete each level are awarded swag items (i.e., t-shirt, sticker, cap) for their effort. This also boosts visibility of the program on campus.

Timeline of Program

In Fall 2024, a pilot training program and the associated study were conducted at Colorado School of Mines with NSF (National Science Foundation) BPE Track 4 Funding: Phase 1. Pending continued funding, adjustments to the pilot will be made from Fall 2024 and Spring 2025 feedback and BASE Camp programming will be continued in the 2025-2026 school year with continued data collection to measure progress and success metrics.

Curriculum Plan

The teaching and peer leadership objectives of the BASE Camp program focus on comprehension, critical thinking, and application of knowledge. Information on the curriculum objectives and lesson plans can be requested from the primary author, Dr. Danni Lopez-Rogina. All training will seek to meet as many accessibility norms as possible, including captions, screen reader capability, printable scripts, and more. In addition, multiple formats of content will be used to better work with a variety of learning styles, such as lectures, podcasts, readings, and more.

Accessibility of Information Sessions

In order to better meet the needs of students with different learning requirements, time restraints, and physical and mental needs, training sessions are held in three different ways. These include 1) scheduled small group (<20 participants) in-person with time for discussion, 2) scheduled synchronous sessions through Microsoft Teams, and 3) asynchronous online pre-recorded lessons for students to work through at their own pace. Through both initial planning and student feedback, these three forms were recognized as creating more inclusive options for students who need to be in-person to learn and discuss as well as those who, for both health and processing reasons, prefer to take their time working through material. Captions are included on each video, with students' ability to download the transcript of the video also available (At this moment in time, translations into other languages present within the university have not been completed, with potential ASL interpreters being added in eventually. That would be an ideal next step.) The inclusion of the synchronous online option also allows students to learn in their own safe spaces and to control aspects like volume setting and whether or not their camera is on or off. Although many educators since 2020 have expressed reasonable frustration with students turning off their cameras, for many neurodivergent students, the option saves them mental energy by enabling them to be less hyper-aware of factors like facial expression and eye contact [12]. It also provides caretakers the ability to learn while managing essential tasks. On the other hand, in-person sessions are needed for other types of learners. Some need the quiet away from home,

others struggle with decent internet access, while many need the in-person interaction in order to both stay focused and absorb new information. This is frequently a difficulty students with ADHD experience. For in-person sessions, a facilitator provides the lectures while a specialist is available via a live chat to answer questions that come up both vocally and submitted online by students. This allows the facilitator to focus on sharing information while the specialist can answer tough questions and provide resources to students. Whatever resources are shared during the session are sent out to students afterward for further perusal. This solution was created due to the accidental violence that occurs in training spaces and classrooms when minoritized students and students with disabilities feel isolated and dehumanized due to the types of questions asked by well-meaning peers. One real example of this is as follows: "I was told Black people had an extra muscle in their leg and that is why they are such great athletes. Is that not true??" This is truly a question the primary author has had asked by students in a sociology classroom within the last 5 years. Additional questions heard in the classroom and training spaces include questioning the capability of different minoritized populations to succeed in the workspace and questioning the point of wheelchair accommodations in bathrooms, parking, buildings via elevators, and buses since "they don't really go outside anyways", according to students.

Assessment Plan

The below assessments were conducted with the pilot group in Fall 2024 consisting of 40 students total from two different peer leadership groups. They were developed in attempts at being more inclusive in data gathering, but future modifications will be made in the future to improve effectiveness.

The **Belonging Assessment** was developed from a combination of two different 'belonging in university setting' surveys. While the Verdin and Godwin [13] survey included measures that focused on student confidence in relation to Funds of Knowledge within their major and field, Leibowitz et al (2019) questions pulled on the idea of students having a sense of belonging, comfort, and support within their institution [14]. This survey took students an average of seven minutes to complete and was composed of a 5-point Likert scale, with the additional option of "Unsure". There were a total of 24 measures analyzed. 27 students from the pilot groups completed this survey. At this point in time, the Belonging Assessment has only been given one time, before students went through the first round of training. Future benchmarks collections are in planning.

The **Pre and Post Surveys** were created primarily with the work of Brion-Meisels, Soto-Shed, and Natarajan (2020) from the Harvard Graduate School of Education's DEIB Survey [15]. Their survey was created to gauge the place students are at as they enter the program in relation to DEIB knowledge and beliefs. With their permission, we used their language and framework in order to gauge student comprehension of various DEIA topics, broken down by umbrella topic. With that said, we are using it as a longitudinal survey to gauge growth in participants, instead of as a one-time check-point. Success in using it in a longitudinal format has yet to be validated, but preliminary findings are positive. The subsections of the survey for the term familiarity part include 1) broad concepts related to DEIA, 2) ableism and disability education, 3) gender and sexuality, 4) immigration, and 5) race and ethnic relations. These are answered on a 5-item Likert scale based on confidence in knowledge on a term or idea. The second half of the survey

gauges how strongly they agree or disagree with statements related to their role in their community and what issues they think exist within their social space. Example statements include, “Ableism is not widespread in my university” and “Fighting against oppression is a central part of my role as a leader among my peers.” Included in *only* the post-survey are some additional questions for the program’s outside consultant to gauge program efficacy. Example statements answered on a 5-point Likert scale include “I know how to intervene if I see microaggressions based on a persons’ social identities” and “I know how to create an inclusive climate in my classes at Mines.” A total of 35 students completed the pre-survey and 27 completed the post-survey. It took students an average of seven minutes to complete.

The **Short Answer Survey** is composed of two open-ended questions, ideally taken a few days after finishing the BASE Level I training. The questions include “What further topics do you feel you should know about to be more effective in your peer leadership position(s)?” and “What is a diversity related topic or question you have always been curious about but are not sure how to ask about?” 24 students completed this survey, and it took them an average of six minutes.

Focus Groups were conducted in two different formats. The first format included scheduled Microsoft Teams virtual meetings that students could sign up for. The primary researcher and program manager meet students in that space, gain consent for use of the transcription tool by students, and proceed to ask specific feedback questions. The second format includes those same questions being put into a survey format (open ended) for students who could not make pre-set times or who did not feel comfortable giving feedback in a social space. The video-chat format took around 30 minutes to complete due to the round robin method and the online survey format took around eight minutes.

Additional future data collection methods and data points to be used include guided reflection journals (BASE Level II thru IV) and student developed and led community projects (BASE Level III and BASE Expert).

All surveys are conducted with the use of QuestionPro software, with the surveys set to accessibility settings in terms of font size, color, background color, and more. Additionally, all surveys can be accessed and answered on computers, phones, and tablets, with the ability to use text to speech functions and screen readers on all. Additionally, for the attention span and limited time of participants, all surveys aim to take less than ten minutes on average to complete.

Discussion and Conclusion

The goal of this program is to not only educate engineering students on the normalized social violence within their field and community, but to do so through methods that challenge the institutional violence and ableism that occurs as the norm in DEIA training spaces. By creating inclusive and accessible methods of collecting and dispersing information, we hope to create more conversation around the options that are available to educate aside from long in-person training seminars. The shift to remote caused by the COVID-19 pandemic created visible spaces for individuals who otherwise felt that they could never participate in social and educational spaces. Additionally, setting up online chat options (even for in-person) means that students can ask questions (that they often do not have the proper language for) without making other

participants feel dehumanized by their language choices. Students can submit questions privately and the specialist on chat can provide answers publicly in a way that provides clarification without calling people out or can send back answers and resources privately. These are just a few of the ways that we can challenge the social violences that occur in DEIA training spaces, in addition to the alternate information dispersal techniques. Through these methods, we hope to develop a norm of accountability for students and student leaders through an increased recognition of not only different needs and how to meet them reasonably, but also an awareness of who resides in their social spaces and the unseen marginalized identities that so many people hold. Erring on the side of kindness and assuming that everyone has experienced pain based on some aspect of their identity is the preferred route to take to grow empathy within STEM fields.

Moving forward with the program, the goal is to train student leaders in ways they connect with more, with a lean on the Funds of Knowledge lens and making it into a formal curriculum. Through an emphasis on belonging and acknowledgment of the skills everyone brings to the table, the engineers of tomorrow will have more awareness of the human components of not only what they create and who it impacts, but also the people they are creating with. With this knowledge, more individuals will have the critical thinking skills to recognize and interrupt everyday institutional violence in the workforce of the coming generations.

UPDATE: As of 4/21/2025, the NSF funding for this program, BASE Camp, and the associated work has been cancelled via a federal stop-work order. The primary author hopes to continue this type of work in another capacity in the future with a different source of funding.

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