RESEARCH DEVELOPMENT & EARLY-CAREER FACULTY: CATALYSTS OF CHANGE FOR DIVERSITY, EQUITY, AND INCLUSION IN STEM

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ABSTRACT

Problem Statement: Early-career science, technology, engineering, and math (STEM) faculty members are often challenged when identifying authentic diversity, equity, and inclusion (DEI) goals, objectives, and tasks for their research grant proposals. Advancing DEI has not been one person's job but rather the responsibility of a highly organized network within a system. Research development professionals have been and will continue to be critical resources for developing DEI plans and broadening participation. Their value is partly due to relationship-oriented processes that research professionals cultivate and shepherd as well as the inherently cross-disciplinary nature of the day-to-day work. **Observation**: In FY 19, 53% of the highest growth in R&D was in biological, biomedical, and health sciences followed closely by engineering. While many complexities are involved in advancing DEI within our universities, colleges, and workplaces, this article is focused on early-career STEM faculty and research development professionals' roles to facilitate DEI linkages within research. **Analyze:** First, descriptions of the recent federal definitions of diversity, equity, and inclusion are provided in research development; This is intended to anchor the discussion and propel the ideation for early-career faculty in federal funding solicitations. Next, a few examples of how early-career STEM faculty engaged in authentic DEI activities with a research development professional are provided. **Reflect and Recommend:** Finally, five potential DEI partners for collaboration and resources for early-career STEM faculty are provided to support brainstorming as faculty begin to develop their own DEI engagement for research. Context drives design, and research development resources are mechanisms for authentic engagement in DEI for faculty.

Keywords:

early-career, grant writing, professional development, diversity, equity, inclusion, STEM faculty

INTRODUCTION

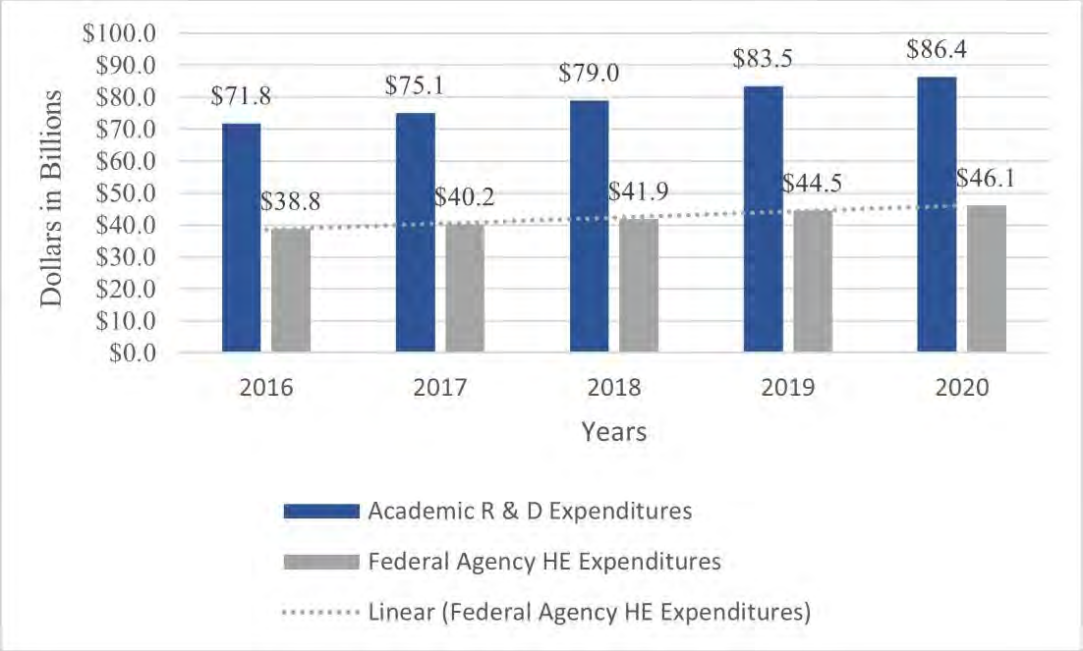
Diversity, equity, and inclusion (DEI) have been pervasive buzzwords in media, society, and legislation. However, these three words have profoundly impacted faculty, students, and the workforce on a day-to-day basis. The importance of each of these to innovation, research, and our society as an integrated whole cannot be discounted. This article is intended to provide research staff and administrators with a new resource to address the grant requirements formatively emerging in our competitive academic landscape.

Importantly, it was developed as a key resource for supporting authentic research engagement in faculty grant development. In addition, the authors acknowledge it is a starting point for decision-makers and other faculty mentors to successfully engage with faculty without resorting to tokenism or deficit thinking. We anticipate this article will be utilized in workshops, online courses, mentoring sessions and as a starting point for some organizations for where to begin with their faculty. Although this resource is relevant to multiple fields, the purpose of specifically creating a resource directed at STEM is intentional. The volume of new faculty attrition in STEM fields when juxtaposed with the high growth of the research dollars would seem to suggest that moving beyond "bootstrapping it" is the only sustainable solution. Many research staff, administrators, and faculty are thoughtfully seeking to engage in DEI nationally, and collectively we have provided a steppingstone.

Theoretically, people are often concerned about their roles and the overall impact they may have. Most faculty members' contracts have defined how they allocate their day-to-day effort: a) research, b) teaching, and c) service (Carter et al., 2021; Jaschik, 2020, September 23; Moore & Ward, 2010). President Biden has issued several parallel and capacity-building executive orders that direct federal agencies' implementation and reporting. In conjunction with the new Congressional budget allotments for the agencies, this could be a critical tipping point in academia and our society for DEI. This period may be among a handful of times in research development that multiple agencies will intentionally and synchronously address DEI and underserved populations through integrated policy and programming instead of isolated funding mechanisms and deficit-oriented programs and requirements.

As a baseline for the magnitude of the amount of funding in the system, in 2020, the entire U.S. Research & Development (R &D) Ecological System was a thriving $656 billion (Boroush, M.; NSF NCSES, 2021; Gibbons, M.; NSF NCSES, 2021), and the U.S. Academic Research & Development Ecological System (ARDES) was $86.3 billion (Figure 1). Nearly half of the funding was awarded to higher education institutions through federal agencies (Boroush, M.; NSF NCSES, 2021; Gibbons, M.; NSF NCSES, 2021). With the projected increases, there will be many opportunities across multiple federal agencies, particularly the top six agencies for grant awards, for all faculty. According to the NCSES, in FY 19, 53% of the highest growth in R &D was in biological, biomedical, and health sciences followed closely by engineering (NSF NSB, NSF, 2020).

Figure 1: Academic R&D Ecological System (ARDES) Expenditures



Note. Data from NSF NCSES HERD, 2021; Castañeda-Kessel, 2021.

The new Executive Orders have uniformly defined diversity, equity, and inclusion (E.O. 13985, 2021). Diversity is defined as "the practice of including the many communities, identities, races, ethnicities, backgrounds, abilities, cultures, and beliefs of the American people, including underserved communities" (Exec. Order No. 13985, 2021). Equity is defined as "meaning the consistent and systematic fair, just, and impartial treatment of all individuals, including individuals who belong to underserved communities that have been denied such treatment" (Exec. Order No. 13985, 2021). Inclusion is defined as "the recognition, appreciation, and use of the talents and skills of employees of all backgrounds" (Exec. Order No. 13985, 2021). The importance of these intentional, unified definitions was to propel and make diversity, equity, and inclusion efforts for all people. It created transparency by providing a defined standard for all agencies and awardees.

Conceptually, diversity, equity, and inclusion are not new in research development, but the progress has been incremental due to many factors. One of the Government Accountability Office (2018) observations was that agencies and awardees had not counted participants uniformly. During the last twenty years, multiple funding mechanisms and solicitations across the top six federal agencies in STEM have impacted many lives to create awareness, access, and develop career pathways in healthcare, engineering, computer science, and others (Boroush, M.; NSF NCSES, 2021). These projects have met with mixed results depending on their implementation, evaluation, and reporting. As with anything, getting the grant was half the journey. Implementing, evaluating, reporting project impact were unique processes requiring much stewardship. However, some believed these mechanisms had done little to erode the systemic challenges of women, 'people of color,' those who have been

underserved, marginalized, and adversely impacted by poverty or inequality (Exec. Order No. 13985, 2021). These critical gaps between project acquisition scope of work goals and closure and policy on the ground were why Executive Orders and legislation harnessing the resources of these federal agencies were needed if an intentional systemic change was to occur.

GRANT DEVELOPMENT AND DIVERSITY, EQUITY, AND INCLUSION IN THE NATIONAL CONTEXT

Grant development has provided opportunities for collaboration to develop complementary partnerships and elements that can build capacity, support students, and develop new knowledge. As a result, grant proposals have required some thoughtful consideration to integrate research and teaching elements effectively. This can be enabled by successfully identifying and narrowing targeted components, time management, and reviewing previously awarded projects in the portfolio. Searching through an award portfolio saved early-career faculty time and helped them get a sense of what has been funded and is fundable in a particular agency program.

Within the top six federal agencies for STEM, many solicitations encouraged DEI environments through direct engagement with the target populations (National Science & Technology Council [NS&TC], Interagency Working Group on Inclusion in STEM [IWGIS], 2021). However, it was essential to consider what made sense within the local context and research. Federal agencies have sought the creation of sustainable, equitable opportunities for minority and underserved populations. For example, at the National Science Foundation we see new programs like Racial Equity in STEM Education which "seeks to support bold, ground-breaking, and potentially transformative projects addressing systemic racism in STEM. Proposals should advance racial equity in science, technology, engineering, and mathematics (STEM) education and workforce development through research (both fundamental and applied) and practice" (NSF, 2022). What this looked like will vary from location to location due to the context, although there are persistent national trends. At the Department of Energy (DOE), "the Equity in Energy initiative is designed to expand the inclusion and participation of individuals in underserved communities, such as minorities, women, veterans, and formerly incarcerated persons, in all the programs of the Department of Energy and in the private energy sector" (DOE, 2022, para. 1). As research development professionals, most of us have consistently believed in, recognized the values, and enabled equitable and inclusive practices that benefit everyone with improved productivity, innovation, and transparency.

On the other hand, many faculty members have believed in DEI but are not sure what behaviors or attitudes they personally can foster in their classrooms or labs that demonstrate this support. One interesting study that provided insight about DEI implementation was learned from companies attempting to understand innovation and gain market share. Research in academia has been all about innovation, and we do not usually turn away market share. According to Hewlett et al. (2013), two kinds of diversity were identified after surveying and engaging 1,800 professionals, 40 case studies, focus groups, and individual interviews: inherent and acquired. "Inherent diversity involves traits you are born with, such as gender, ethnicity, and sexual orientation. Acquired diversity involves traits you gain from experience" (Hewlett et al., 2013, para. 3). Companies with at least three inherent and three acquired diversity traits were 45% more likely to report growth in market share over the previous year and 70% more

likely to capture new markets. RD has created opportunities to create win-win situations for the entire campus and community.

In other words, firms with more diversity "out-innovated and out-performed others." Inherent diversity was not enough; there were six behaviors which "fostered innovation," and these behaviors are replicable to classrooms or lab settings: a) Creating opportunities for everyone to be heard, b) Making it safe to propose new or unusual ideas, c) Giving team members decision-making authority, d) Sharing credit for success, e) Providing actionable, clear feedback, and e) Implementing and providing feedback within the team (Hewlett et al., 2018, p. 47). "These findings constituted a powerful new dimension of the business case for diversity." These six behaviors provided helpful context for how a grant will build capacity and respect for the inter- and intra-team interactions. Furthermore, it may set the stage before the grant to create an environment that will attract people who are diverse.

Below are two observational case studies of how a research development professional, the first author, engaged with early career faculty (second and third author) to create DEI-centered opportunities within their grants and the process that led to their success and impact in their initiatives. There is also a third observation describing when the research development professional, the first author, worked with administrators to reposition a rejected proposal for a more appropriate grant opportunity "fit" to achieve DEI-centered initiatives.

Observation 1: Have an Open Door & Create Connections

"Got a minute?" Dr. Berke poked his head around my door. He is an Assistant Professor in Mechanical and Aerospace Engineering. He is interested in the role that environments play on a material's ability to withstand heterogeneous failure mechanisms. This included the mechanical characterization of solids and structures in challenging environments and high temperatures.

"Of course!" said the first author. He described how he had attended an Allies Training on Campus. Allies on Campus is two pieces of training for students, faculty, staff, and community members to show their support and commitment to LGBTQIA+ people (USU Allies, 2021). He wanted to participate in the training because he had various orientations and backgrounds in his classes and lab. He wanted to let them, and others know via the post-workshop sticker that he had been trained and provided a safe and inclusive learning environment. The workshop asked participants to sign a behavioral contract; a key premise is that respect and support are for all people regardless of race, ethnicity, gender identity or expression, age, disability, national origin, religion, and sexual orientation.

The seed of inspiration was planted for Dr. Berke via the workshop, but he wanted to personalize it, to make it his own. He began to look for resources but found that there was not even a national organization for students who were LGBTQIA+ in engineering. Disappointed, he had come to talk and ideate. "I just want to help my students, let them know that they are safe and welcome." We both realized that organizationally, you have to start with what you have in your context, which may be directly tied to a specific college or major.

Figure 2: USU Allies on Campus sticker used to designate safe spaces (top) and DIC plot of the resonant bending mode of a vibrating plate (bottom) which shares many visual elements the sticker from Dr. Berke's Lab.

"How would you feel about collaborating? We leverage your engineering background, knowledge about the field, career pathways, lab and invite someone who has similar strengths with a social science background."

"Would it be possible to collaborate with someone who specializes in LGBTQIA+ studies?"

"Sure. Let's do a little research and talk to a few people." We found a fantastic collaborator, Dr. Renee Galliher, and later we found the evaluator for our project. It was clear that this would be fundamental research about an underserved population in engineering. This project problem statement was about defining basic questions about the target population. Initially, the project's purpose was to explore career development and professional identity trajectories of the LGBTQIA+ to pursue careers in engineering. The specific objectives were to (1) assess the prevalence of engineering disciplines as a career path for LGBTQ+ college students; (2) explore in greater depth the professional and personal identity development of LGBTQ+ students in engineering, with a specific focus on perceptions of inclusiveness vs. alienation/marginalization; and (3) identify the barriers and support systems which promote or discourage LGBTQ+ participation in engineering. The approach is sequential mixed methods. To date, the project has surveyed 412 students in different regions of the U.S. in seven significant fields, including engineering, to determine the similarities and differences (i.e., General Measures, LGBTQ+ Climate Inventory, Career measures, Discrimination & Depression, Qualitative) among the students.

Drs. Berke and Galliher did not win on the first submission; it did not stop us. We met again and went through the reviews: they wanted more detail about who the potential participants were, what departments they would come from potentially, and more detail in the evaluation. We also talked to the Program Officer for some insight. We revised and resubmitted. We waited. Then, we finally received the Recommend. "Investigating the Career Development and Professional Trajectories of Disadvantaged Students in Engineering" was funded by the National Science Foundation (Proposal ID #1828227). This nationwide survey of LGBTQ+ college students from all majors determined no statistically significant differences between colleges/majors (Galliher et al., 2019, Galliher & Berke, 2021; Lea et al., 2019). In other words, everyone felt equally "discriminated

against and depressed" based on survey metrics (Berke et al., 2019; Cragun et al., 2019; 2020). Although the data was preliminary, this data was helpful information as the university and others began to scaffold supports and develop retention strategies for students.

Upon closer inspection, a statistical latent profile analysis (Parmenter et al., 2021) revealed that the survey respondents sorted relatively cleanly into four categories: Vocational Identity-Focused, Sexual Identity-Focused, Intersectional Achieved (i.e., focused on both identities), and Intersectional Diffused (i.e., struggling with both identities). Among these categories, respondents were much more likely to belong to the sexual identity-focused category (46%) as opposed to vocational identity-focused (8%) or intersectional achieved (21%), suggesting that sexual identity may form a "bottleneck" that LGBTQ+ populations must overcome before establishing and addressing career goals, which may discourage participation in fields like STEM where students must commit to a major early in order to complete course sequences with many prerequisites (Parmenter et al., 2021).

The next survey will be a nationwide survey of LGBTQ+ college students in engineering. They will look for trends and conduct interviews. It will open this fall for engineering students from all over the U.S. to participate. This has not been an easy or predictable journey. COVID-19 impacted the dissemination of the second survey, and bots tried to get the human incentives. These are all a part of working with students and technology, and for the following survey, we are ready for them.

The P.I. speaks authentically in his broader impacts in other projects now, having worked in this project. It has given him fresh insight into the human factors and their impact on student lives. The feedback and engagement from working with non-engineering collaborators have expanded his vision and ability to articulate the impact of work on an at-risk student population. Dr. Berke and his students started the first Utah State University (USU) Out in Science, Technology, Engineering, and Math (oSTEM) chapter too. Authentic engagement has a positive ripple effect in the context.

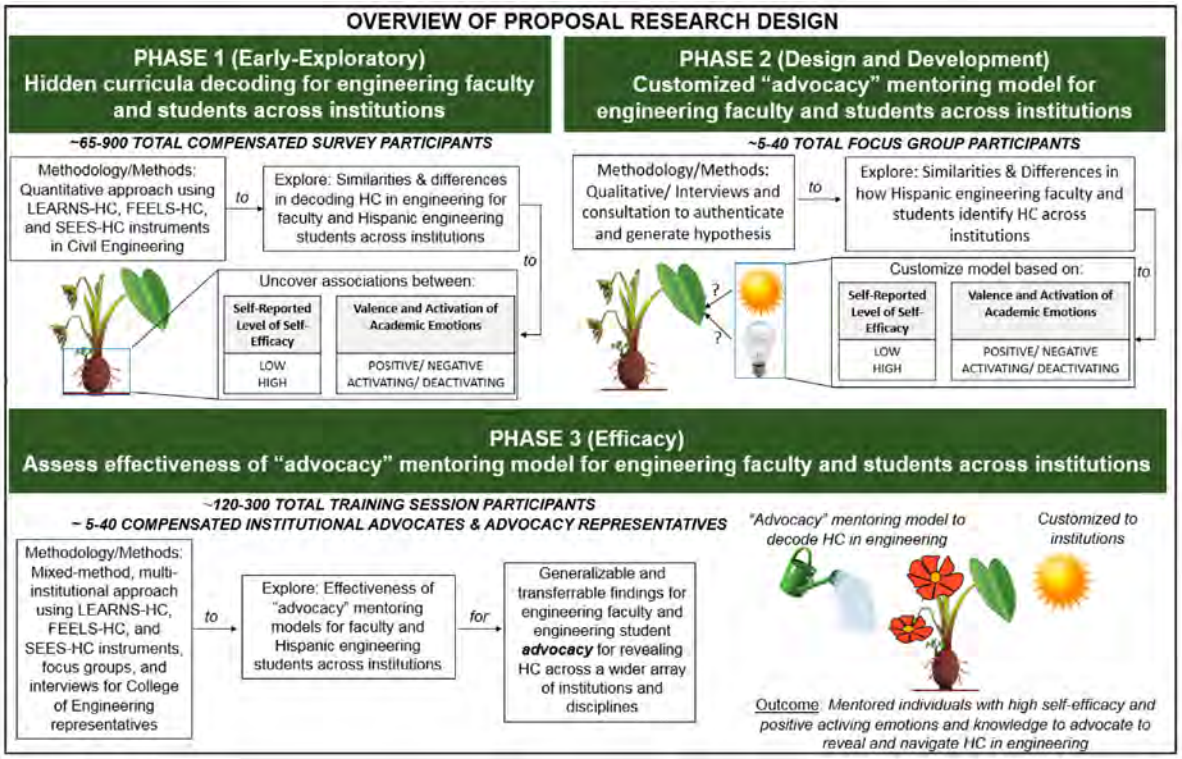
TIP: Authentic engagement and cross-disciplinary collaboration are a winning combination for everyone.

Observation 2: Big Vision Requires Mapping and a Plan

Many early-career faculty have visions for what they would like to see happen in their careers or labs, but not all of them will create the time and space to map a plan to move toward their goals. Dr. Villanueva exemplified planning and diligence by making herself a vision and planning mini-goals to work toward those routinely. We both loved a good plan, and this was where dialoguing with your research development professional could bring a new perspective to your proposal. She created a writing schedule and set up a routine check-in to discuss progress. Dr. Villanueva recognized that the complexity of her CAREER (Proposal ID #1653140 and 2123036) project involving Primarily White Institutions (PWIs), Hispanic Serving Institutions (HSIs), and Historically Black Colleges and Universities (HBCUs). It included a national model to understand how hidden curriculum (messages systemically transmitted and structurally supported and sustained) influence underserved minority groups in their decisions and actions in engineering. To successfully navigate these levels of input she felt she required an advisory board and mentors to help her develop the necessary leadership and researcher skills she envisioned in the grant. Her ability to engage strong advisory board members and dialogue with them about potentialities has become a hallmark of her collaborative style. She has

created a new level of transparency for herself and others by discussing her challenges with her potential advisory members. She was also deeply committed to her participants at the institutions and making sure that they were both seen and heard. She wanted to ensure that the participants had full contributions no matter their rank or position. Dr. Villanueva actively gathered the insight and wisdom to distinguish her research. We actively talked about an anchoring graphic that helped clarify the proposed work's direction and purpose. It provided reviewers with a map of the proposed research and narratively foreshadowed what would be elucidated in the grant. She hand-drew the original graphics later finalized (Figure 3).

Figure 3: Dr. Villanueva Alarcón's NSF CAREER Map Example (Proposal ID#1653140 and #2123016)



One of the benefits of drawing the critical points of the workplan early in the grant process was that many STEM professionals, particularly engineers, are already trained to draw. Mentally, as a trained engineer, Dr. Villanueva was able to see her project with more clarity, and as an educator, she knew that her participants' needs were paramount. When she vetted the graphic and received feedback from her advisory board, their questions became about the participants, not the research. This was a shift and allowed her to move forward with detailing the objectives and tasks (Villanueva et al., 2018, 2019, 2020; Mejía et al., 2018). As a result of her work, she became the first person to ever receive a Presidential award, PECASE, at the home institution where she submitted this grant. She continues to map out her visions and expansions of this work, to this day.

TIP: Create a map for your vision and work to articulate the vision clearly.

Observation 3: Don't Be Afraid to Reposition Your Work

Several years ago, I worked as a grant writer for a partnership between a large hospital system and a Dean of Health Sciences and Human Services. I routinely applied for and received healthcare funding. There was a particular grant that the Dean wanted. She wanted the Health Services Resources Administration grant. We applied for it and scored well, but it didn't win; the Dean felt something wasn't quite right. She reached out to another former Dean and asked her to look at our proposal. She did. I remember being nervous because I had never seen a nursing CV as long and varied as hers. She didn't find much; she suggested a few more citations, and so she and our dean decided she would "have a listen." I was surprised, but she came back and told us that they didn't believe our rural Primarily White Institution (PWI) could implement a diversity grant of $750,000 despite all our partnerships. We got our reviews back, scoring well, but we didn't win. I knew what to do. I asked the Dean if she minded if a different agency funded the concept. She said, "No, we need to do this." Our region had a 25% nursing shortage, had many rural health provider shortage areas, and had a large emerging Latino population. I applied to another federal agency, added more partnerships, including more hospitals. Long-story-short, we won over $1,459,411 (grant) and additional leveraged cash match ($680,000) (Proposal #CB-15163-06060) because we didn't give up. That project served 2,200 participants with seven high school partners, five hospitals, and long-term care centers.

TIP: Your context and problem are unique. Find the right fit to succeed, and don't be afraid to reposition. If you need to improve your document, then do the work.

FIVE POTENTIAL DEI PARTNERS FOR COLLABORATION

There are at least five potential hubs in STEM to build DEI capacity, engaging minority and underserved populations in a continuum of engaged scholarship and participation in research development. These are not comprehensive but rather suggestions for places to start. A primary mechanism for fostering welcoming and diverse research environments in science and engineering is supporting underrepresented STEM groups in your research grant project. This can be done in various ways. However, one of the most effective is knowing who the student organizations' advisors are for the target population you are interested in recruiting. By connecting with these advisors and the student officers, you can learn about student events and opportunities to recruit and disseminate information. Another is to post your recruitment publicly and electronically. For example, the recruitment and onboarding of diverse S&E undergraduate and graduate personnel for the project might occur through the usual channels as well as professional organizations such as Society for Women in Engineering (SWE), Society for Hispanic Professionals in Engineering (SHPE), National Society of Black Engineers (NSBE), Success of Chicanos/Hispanics and Native Americans (SACNAS), and Out in Science, Technology, Engineering, and Mathematics (oSTEM). There are parallel professional organizations in other STEM fields.

TIP: The recruitment and dissemination to underrepresented and underserved populations are essential elements for faculty to describe in the grant using narrative or visual data.

A second partner, some often underutilized stakeholders in STEM, are Minority Business Enterprises, Minority-Owned Businesses, and Women-Owned Businesses. Small

business entrepreneurs often are innovators in their fields. Some solicitations require collaborations led by small businesses. In 8(a) programs, disadvantaged businesses can compete for set-aside and sole-source contracts and other items (U.S. SBA, 2021). This is something explored in advance to develop relationships with people with similar interests. Small business centers, Women's Business Centers, and other incubators can connect you to these innovators. Some universities have engaged industry liaisons who help faculty develop these relationships since they are mutually beneficial.

TIP: Start early and allow some time to provide support and explanation from your Business Manager about the forms, particularly if the small business does not have a federally negotiated indirect cost rate.

The federal national laboratories are the third partners in STEM that support a diverse array of science and engineering. The national labs have an inclusive work environment maximizing talents and innovation. As leaders, they have three primary ways of creating awareness, engagement, and sustaining support for diversity, equity, and inclusion: a) Engage Minority Serving Institutions and Associations for STEM Training and Education; b) Provide employees Diversity-focused Education Programs; and c) Working with Minority-Owned Businesses to ensure and promote diversity throughout operations (NREL, n.d.-a). In addition, DOE's substantial student internship programs for project participants focused on selecting underrepresented groups nationwide. These programs place internships across the DOE laboratory system and are often funded through grants (NREL, n.d.-a). This can be a long-term win for students determining different career pathways. In a recent survey, NREL found that 52% of its personnel had completed internships at national labs prior to employment (n.d.-b). This approach provides an excellent opportunity for students to become familiar with laboratory work, laboratory health and safety protocols, research planning, execution, and information dissemination. In many cases, students have been hired after graduation.

TIP: The national laboratories have robust, inclusive programming and routine cycles for application. You need to collaborate to effectively participate.

The fourth partner in DEI activities development and capacity building were the MSIs, HBCUs, HSIs, and TCUs that serve thousands of students in STEM nationally. According to the U.S. Department of Education, approximately 20 years ago, an Executive Order enacted MSIs. There are 102 HBCUs established primarily before 1964 to educate African Americans in the U.S. (E.O. 13532, 2017), which was Promoting Excellence, Innovation, and Sustainability at Historically Black Colleges and Universities. There are 274 HSIs in the U.S. that enroll and educate 40% of the Hispanic students (E.O. 13935, 2021). Tribal Colleges and Universities (TCUs) include 35 public and private institutions to respond to the higher education needs of American Indians. (E.O. 14049, 2021) White House Initiative on Advancing Educational Equity, Excellence, and Economic Opportunity for Native Americans and Strengthening Tribal Colleges and Universities was enacted TIP: Partner with MSIs, HBCUs, HSIs, and TCUs because they have excellent students and faculty and are located all over the U.S.

The final mechanism was to partner with land-grant university extension programs. Their ability to engage special populations was a part of their service delivery because they were county-based. These were generally statewide and served a continuum of learning across the lifespan. "Cooperative Extension provided county-based educators (most of whom have graduate degrees) who work

with local citizens and interest groups in a variety of program areas including 4-H Youth Development (4-H, 2022), Agriculture, Family & Consumer Sciences, Health and Nutrition, Community Development, Water and Natural Resources, Forestry, Emergency, Climate Variability, Volunteerism, and some Human Services" (APLU, n.d.-a). According to the Association of Public and Land-grant Universities (APLU), "215 campuses and 26 university systems, including 79 land-grant institutions including 19 HBCUs" are direct access points (APLU, n.d.-b, para. 2, 4).

TIP: Extension programs may be a secret weapon to successfully serving minority and underserved populations because the infrastructure has existed statewide for years. Extensions have programming for all ages and are in all U.S. states.

CONCLUSION

Faculty are engaged in research, teaching, and service as they have always been but what has changed are the opportunities to engage with the environments, agencies, and participants. Research collaboration has occurred throughout their careers, and it was a pivotal time to make a professional difference by creating space for those less well-represented. No one entered or stayed in academia by accident. People generally sought some level of mastery to be experts in their fields or at the least to contribute to something novel (Lewis, 2014). If faculty are engaged in capacity building at a microsystem level within an organization, why not provide the resources and best practices for engaging within their fields with agencies and funding? Research development professionals, administrators, and others can actively work with faculty members to build their research visions and helped them to connect to groups and organizations.

Many early-career faculty members and research development professionals have sought pragmatic ways to integrate diversity, equity, and inclusion into their STEM areas of expertise. DEI is complex, and it can easily be overwhelming. However, authentic engagement has been made one act at a time. One grant at a time. From the brief examples, DEI concepts were conceptually powerful when there was unity in the efforts, direction and purpose for the work, and clarity if the research vision was reflected upon beforehand. The purpose of this piece was to provide a critical resource as a stepping-stone on the journey to inform and support early-career researchers a priori. This is not intended to be a comprehensive list of examples but rather a starting place for early-career STEM faculty members seeking potential ways to authentically engage and integrate diverse students and participants, support equity, and develop inclusive practices and environments. It is also a description of ways that research development professionals and administrators can imbue DEI principles as they support early-career faculty and others.

Incorporating diversity, equity, and inclusion into research is possible and likely to lead to high levels of innovation by introducing new perspectives and insights. To support this process, we have identified **eight** proven recommendations to successfully integrate these into research:

1. Authentic engagement and cross-disciplinary collaboration are a winning combination for everyone.
2. Create a map for your vision and work to articulate the vision clearly.
3. Your context and problem are unique. Find the right fit to succeed, and don't be afraid to reposition. If you need to improve your document, then do the work.
4. The recruitment and dissemination to underrepresented and underserved populations are essential elements for faculty to describe in the grant using narrative or visual data.

5. Start early and allow some time to provide support and explanation from your Business Manager about the forms, particularly if the small business does not have a federally negotiated indirect cost rate.
6. The national laboratories have robust, inclusive programming and routine cycles for application. You need to collaborate to effectively participate.
7. Partner with MSIs, HBCUs, HSIs, and TCUs because they have excellent students and faculty and are located all over the U.S.
8. Extension programs may be a secret weapon to successfully serving minority and underserved populations because the infrastructure has existed statewide for years. Extensions have programming for all ages and are in all U.S. states.

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