Seeding a Strategic Campaign to Address Root Causes of Inequity in Engineering Education

Dr. Ellen Foster, Purdue University

Dr. Ellen K Foster currently holds a post-doctoral appointment in the engineering education department at Purdue University. She received her doctorate in Science and Technology Studies from Rensselaer Polytechnic Institute in 2017, and holds her BA in Astronomy and Physics from Vassar College.

Dr. Jennifer Karlin, Minnesota State University, Mankato

Jennifer Karlin spent the first half of her career at the South Dakota School of Mines and Technology, where she was a professor of industrial engineering and held the Pietz professorship for entrepreneurship and economic development. She is now a research professor of integrated engineering at Minnesota State University, Mankato, and the managing partner of Kaizen Academic.

Ms. Stephanie Quiles-Ramos, Virginia Polytechnic Institute & State University

Stephanie is a NSF Graduate Research Fellow attending Virginia Polytechnic Institute and State University. She has a BS in Industrial Organizational Psychology, a BA in Sociology, and a Certification in Women and Gender Studies. She is a Virginia Tech Pratt Fellow and a Virginia Tech Graduate McNair Scholar. Her research interest are in Engineering Culture, Institutional Behavior, Women & Racial Minorities in Engineering, Responsible Civic Engagement, and non-traditional Pedagogical Practice in Engineering Education.

Dr. Donna M Riley, Purdue University-Main Campus, West Lafayette (College of Engineering)

Donna Riley is Kamyar Haghighi Head of the School of Engineering Education and Professor of Engineering Education at Purdue University.
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Introduction

This paper is intended to set the stage for a dialogue and participatory event at CoNECD which will consider the current state of the field of engineering education and posit how to seed and organize a directed strategic campaign with and for engineering educators who want to enact structural change that addresses inequity in engineering. We also hope to foster space and openness for dialogue with those who might not yet see the need for structural change in this field, but who are interested in making engineering education better and more accountable to equity, diversity, and engagements with diverse publics and needs. This work is part of an overarching Relational Organizing/Action Research (ROAR) project, in which we are interested in achieving two goals as outcomes of research with and about engineering educators: (1) changing rewards structures in ways that value engineering education research contributions; and (2) enacting structural change that enhances diversity, inclusion, and equity. After establishing the current literature taking on issues of equity in engineering as well as a summary of the network analysis already conducted through our ROAR grant, we will describe our own theoretical framework, initial analysis of outcomes from other educational organizing campaigns, and initially planned actions for the CoNECD event and how it fits into our research.

Background and Framework

Many scholars have explored the problem of equity, diversity, and social responsibility in engineering as a discipline more broadly [1], [2], [3], [4], but there is little work done on the field and positionality of academics in engineering education specifically and their change-making strategies or interests for seeding institutional change toward more equitable educational practice. Using an auto-ethnographic lens, Mel Chua [5] describes the difficulties of built-in structural expectations of her role as a woman-identifying engineer with a disability (now in the field of engineering education) to fix the “leaky pipelines” and roofs of engineering practices and pedagogies. Her argument is that the onus of changing a sexist, ableist, racist, etc. system is put upon those which it harms most, and yet recognition of this labor or the resources to do so are often lacking. In light of such work, during the first step of this ROAR project, we conducted and analyzed interviews to examine what networks and resources are currently available (or unavailable but necessary) for engineering education scholars to feel supported and make structural and institutional change in higher education (see [6]). As we note in an upcoming publication: “distinction [segregation within and between disciplines] removes individuals from easily creating collaborations within their discipline, and even has the ability to create a divide between subdisciplines.” This institutionalization of individualism within the academy, which Bennett [7] elucidates can then have the ability to facilitate faculty isolation.
Similarly, while not focused on the field of engineering, Leslie D. Gonzales’ work on epistemological boundary-making shows clear examples of how women, specifically women of color, subvert boundaries and establish their own ways of knowing or knowledge production in fields of the social sciences and STEM. Yet, again, this work often goes unrecognized or unrewarded at the institutional level. Among her recommendations, Gonzales suggests that tenure review panels give more weight to different forms of labor and practice other than the traditional forms of publications and individualist achievements in order for those with less cultural capital to shift institutional frames and structures of racism, sexism, ableism, and other forms of oppression at the higher institutional level. Currently, we are going back through the data from our ROAR grant, in order to code the visions and hopes that engineering educators shared for how the field might be otherwise, and the resources they feel are needed to do so. This re-coding will help inform the discussion topics and activities we design for the CoNECD session, although the workshop will be equally shaped through conversation among the attending participants. We have also identified, via network analysis, the importance of connections and informal networks across disciplines to create support and enact change. This initial information will help inform our conversations in this workshop and beyond toward our own recommendations of change and ways to establish informal networks.

**Root Cause Analysis**

Due to deep-rooted issues of inequity, as laid out by Gonzales, Chua and many others examining issues of equity and diversity within engineering education and academic institutions more broadly, we are interested in testing organizing models from social movements to assess their potential for achieving change. Specifically, we have assessed and chosen to work with root cause analysis according to the Highlander Research and Education Center’s theory of change [9]. This framework provides analytical methods for moving from identified issues (such as lack of tenure, lack of support for research, lack of funding) toward uncovering greater structural oppressions that foment particular forms of inequity. It thus focuses on a transactional and dynamic analysis for change-making strategies which ties into our initial network analysis for identifying the problems at hand.

Myles Horton, as founder of the Highlander Research and Education Center, was interested in the concept of flexible democracy. Barbara J. Thayer-Bacon’s work that focuses on implications of the Highlander Institute tactics in K-12 schooling, ([10] pg. 19) asks: “what would Horton recommend toward helping teachers and students learn how to overcome their individualism and understand themselves to be transactionally related in a democratic society of their own making?” In re-framing this inquiry within our own project, we ask: how might engineering educators utilize a transactional view of the field to move away from individualism and identify
root causes and the networked resources that could shift structural inequities at the higher education institutional setting?

Another source of our organizational and theoretical framing comes from Saul Alinsky’s work with radical organizing and change-making [11]. One of the key insights we might apply to our work on diversity is his distinction between “issues” and “problems.” Problems are things that people generally agree are vexing, but never do anything about. Issues are specially selected and able to be broken down into small parts, so as to work in a concerted way to small “wins” and build power over time. A “win” is a measurable benefit accruing to participants in a movement; it can be as small as someone in power listening to those raising the issues who was not listening before, or as large as a major legislative victory or cultural seachange. Alinsky might call out STEM interests in diversity for treating ‘diversity’ as a problem, rather than framing specific issues for action campaigns, and for not concretely targeting measurable wins of all sizes. Thus, what we hope to do with our project is to pick an issue on which we can work. Moving forward and in conversation with our participant-researchers, we intend to identify a manageable issue, find where the wins might be, and make progress through focused direction of resources and efforts. Thus, our leading questions become, what are those issues, and how can we design a campaign through which we know we can enact change?

It is important to note that Alinsky did not directly take on racism, sexism, heterosexism, and other forms of structural inequity [12]. Many who use his methods in whole or in part have since recognized this as a major flaw and corrected and redirected his ideas toward explicitly anti-racist, anti-sexist, campaigns. In this vein, we draw on his methods with the recognition that his initial framings are not all-encompassing, and we draw on what is useful with adaptation, modification, and correction.

**Methods**

In line with the Highlander Research and Education Center’s focus on practice-based work, we hope to culminate hands-on doing and practice with engineering educators that goes beyond high-level analysis, theoretical discussions, and written work. This may mean engaging the use of non-conventional methods more generally as we develop our campaign. Specifically in the context of this workshop, we will be leading participants through a brief movement-based mediation incorporating deep listening practices, followed by a directed visionary fiction writing exercises with prompts in relation to hoped for futures and outcomes in engineering education. The first exercise, meant to last about 5-10 minutes, will establish mindfulness, attention to one’s current emotional/physical state, and cultivate presence for the ensuing writing exercise. With the prompt we will have a free write, and then lead a conversation about shared visions,
divergent visions, and intersecting themes with those already identified by interview participants. From here we may form action teams for brainstorming actionable items and strategies for furthering the campaign. It is our intention, like the Highlander Institute, to culminate theory out of the doing. Via Alinsky’s work, we chose to conduct interviews using the “relational meetings” approach which works as a more emergent form of interview rather than one with set questions and intended answers to obtain [13], [14].

We also intend to employ Critical Participatory Action Research (CPAR) as an epistemology (i.e., as in a way to think about how we are creating and sharing knowledge) to partner with participants toward further developing research questions, research methods and strategies, and conduct data analysis with participant-researchers rather than about participant-researchers [15]. The intention with this epistemology/methodology is to empower participant-researchers to seek change via the research conducted and to take ownership of the data for more critically-engaged and social justice movement-based outcomes. The implication is that successful research outcomes are not narrowly defined as peer-reviewed articles, but instead preferred to be actions in the world with and for participant-researchers and the acknowledgement that attention to these struggles have existed and are ongoing. CPAR’s interest in “action in the world” and movement-building ties in well with the Highlander Institutes root cause analysis and action-based strategies. It is important for us to use not one method, but an amalgamation of methods specific to context, needs, and resources, much like organizers do when planning and enacting campaign strategies for movements. Overall, in using these frameworks and holding this event (as well as organizing beyond the conference), we hope to build and improve infrastructure to aid engineering educators – especially “lone wolves” who may be disconnected from engineering education research networks – to support change efforts.

**First Steps: Identification and Analysis of Higher Education Campaigns**

Prior to meeting with participant-researchers during CoNECD, we will share and take into consideration campaigns with varying levels of impact or noticeable outcomes within higher education specifically. In this sense, we will start to consider what such actions can look like when successful, and the pitfalls that lead to failure or undesired outcomes. By bringing participant-researchers into this analytical conversation at the onset, we hope to inspire and concretize what interlocutors have shared with us as utopic or desired visions for the future. As a lead-up, in this section we analyze some examples of successful campaigns that we admire, as well as some pitfalls within those that did not reach desired outcomes. This is so that we can see what it looks like for campaigns in higher education to persist and start to identify resources, tactics, and tools that people might need in our own context towards organizing for change.
Although it is in the secondary school setting, and not higher education, one successful and sustained campaign for changing educational practices and standards is the story of the Firefox magazine, which was founded and organized through shifting teacher engagement practices with students in Appalachia starting in 1966. By organizing around a concrete outcome (the magazine) and focusing on local community stories, experiences, and knowledges specific to Appalachia, the Firefox movement (much like Highlander) was able to more directly engage students and give them ownership of their own educations and community expertise. Having a material outcome gained the movement credibility in the public’s eyes and more ground upon which to push its prerogative in the public school setting toward shifting infrastructures previously unsuited for local context and students.

In higher education, movements for change regarding infrastructure include the establishment of women’s and ethnic studies programs, their continued sustenance, and pushes against their closures. These are campaigns led by students, faculty, and administrators, and while enacted through the institution’s structural policies and resource allocations, such campaigns also have a great impact on the campus climate and the knowledge-production practices both enacted by and available to students and faculty. Demonstrative of cross-group collaborations, students will take up initiatives to sustain such programs in a generative form that does not only rely on administrative or infrastructural resources, but also on student engagement, participation, organizing, and networks – as well as faculty support.

The phenomenon of academic isomorphism [16], [17] is a specific trend we noted while looking into successful examples, and which may be helpful for our own campaign. The concept is that, once certain campus landscapes change, others are inspired to shift since institutions want to replicate and follow laudable trending actions of other such groups and institutions. For instance, MIT created an open access policy where all faculty work may be published in a pre-publication repository, and other campuses have or are considering the same due to MIT’s prestige, thus setting a standard and precedence [18]. Meanwhile, in his book *Engineers for Change* Matt Wisnowski [19] details how social movement by students to get defense department funded centers kicked off campuses resulted in the establishment of environmental-centered engineering programs both at MIT and Purdue out of an interest to support other purposes of engineering rather than the previously normalized intention for the military-industrial complex. In line with this tactic for organizing and shifting institutional mindsets and frames, if students started demanding that we talked about race in the classroom, we would have to shift our teaching practices. In this spirit, but with more administrative than class-room repercussions, the student-led fossil fuel divestment movement campaign has also shown how little wins can have larger impacts, as exemplified by the $6.24 trillion raised by the movement toward re-investment in alternative energy solutions -- cited as a 120 times increase over the past 4 years [20], [21], [22].
Another successful campaign in higher education, and engineering specifically, comes out of academic scholars putting in place informal structural measures in retaliation to a specific op ed piece which argued against the presence of the LGBTQ+ community in the engineering field [23]. As part of this response, scholars wrote many official reactions and started to organize safe zone training for every branch of ASEE for each year proceeding. Concerned engineers also built a virtual community of practice (VCP) where participants could share what they were doing on their specific campus for the LGBTQ+ community and thus formulate shared practices, including the establishment of ‘safe zone’ mechanisms.

Some campaigns within higher education do not go well, and it is important to learn from these examples as well. For instance, in Illinois, fans arguing a case for “tradition” still want to hold onto their mascot, Chief Illiniwek, which has culturally appropriative and racist implications [24]. Here, there is staunch resistance to change not coming from the institution, but instead from the public, alumni, and student interests. In other cases, some issues have gone from being shifted or “won,” only to be shifted back in the direction of corporate interest or previous oppressive systems. Such continuing struggles include getting sweatshops out of campus merchandising, removing confederate monuments from campuses, and getting or keeping the Sodexo food industry off campuses [25], [26]. These examples demonstrate that such campaigns are never “won” nor static, but instead ongoing conversations with shifting structures, power relations, norms, identities and visions for diverse futures. Meanwhile, there is also possibility for the co-optation of certain campaigns that originally had good or radical intentions for change at the structural level. This includes food-waste management on campuses, the ‘greening-washing’ of campuses, green buildings, and the general institutionalization of environmental sustainability and social justice.

In conclusion, we are interested less in evaluating a success/failure binary within these movements, and more so in the aspects that work and do not work in different campaigns toward sustaining change-making efforts in, as Myles Horton called it, “the long haul” [9]. As we move forward with these examples in conversation with our initial framework, methods, and participants, we aim to focus on an issue instead of a problem, to cut it up, and work on many wins, angles, and tactics for change.

**Initial Proposed Event Description**

Although the structure of the event, its promotion, and how we aim to set the stage is subject to change between submission of this paper and CoNECD, we would like to give an initial description of what this session might look like. Generally, we are planning to have a round-table
discussion that may involve quick writing exercises, collective brainstorming, movement-based practices, and other methods of engagement that participant-researchers may elect to use. From this event we hope to better elucidate: what does a campaign in Engineering Education even look like? What are the tools we use for organizing either via physical meetings, social media, through creating our own website, or otherwise? Having identified that the network of engineering educators interested in seeding change at the institutional level is broken, how do we fix this to create stronger networks and relations? Who are good connectors in the field?

Thus far, we have engaged 32 interlocutors with whom we will follow up prior to the event to elicit their interest in taking part, start sharing our own examples of successful campaign tactics and strategies, and gather their own thoughts on questions to propose during the session and commentary or suggestions on the activities we are proposing. We also have contacts from a mailing list generated at a previous ASEE presentation about the initial ROAR proposal where audience-participants were asked to share their contact details if they were interested in becoming a part of the project. Thus, we will open up the shaping of the event to those who have self-identified and have given their emails for contact, with the possibility for newly interested participants to engage the conversation and take part at CoNECD. We will promote the event using Twitter and through our email list – as well as through fliers made for distribution during the conference.

**Conclusion: Next Steps Beyond CoNECD**

Our projected intention with this initial research and subsequent event is to create strong networks, an impetus to bolster social media and website efforts for organizing, and establish a basis out of which the group can realize creative outputs (i.e., ‘zine, videos, dioramas, plays, musical performances, reading lists, and other non-traditional formats). Further, we hope to shift institutional resources and formulate policy demands toward changing the engineering classroom. Continued efforts beyond the CoNECD meet-up may also entail working with current organizations and specifically student groups such as NSBE, SHPE, SWE, etc. It may also mean partnering with non-engineering campus-wide diversity organizations, or possibly forming an organization that is separate, intersectional, and brings together already existing organizing entities into deeper conversation. Our intention beyond this meet-up will be to reflect and listen to suggestions and participant interests in terms of the directions we might take, create stronger networks with participant-researchers, and foment these toward change-making tactics and strategies for seeding the movement and sustaining its practices.

**References**
[6] Joint submission at ASEE conference, omitted for blind review since these professional communities overlap.


