ASEE AMERICAN SOCIETY FOR ENGINEERING EDUCATION

Paper ID #40718

Using a Collective Impact Approach to Establish a Center for Equity in Engineering Focused on Graduate Education: Lessons Learned from Phase I

Dr. Teirra K Holloman, Virginia Tech Department of Engineering Education

Teirra Holloman is a postdoctoral associate in Engineering Education at Virginia Tech. Teirra received her Ph.D. in Engineering Education and M.Eng. in Industrial and Systems Engineering from Virginia Tech and her B.S. in Industrial Engineering from Clemson University. Her research interests include organizational resilience; organizational change; diversity, equity, and inclusion issues in engineering and global education programs.

Natali Huggins,

Natali Huggins is a PhD student in the Higher Education program at Virginia Tech. She holds a masterâ€™s in public administration from the National Experimental University of TÃ¡chira in Venezuela. She has several years of experience in higher education a

Julia Machele Brisbane, Virginia Polytechnic Institute and State University

Julia Brisbane is a Ph.D. student in the Engineering Education Department at Virginia Tech. She received her M.S. in Biomedical Engineering from the Virginia Tech-Wake Forest University School of Biomedical Engineering and Sciences Engineering and her B.S. in Bioengineering from Clemson University. Her research interests lie in undergraduate research experiences in engineering, racial health disparities, and broadening participation in engineering.

Dr. Walter C. Lee, Virginia Polytechnic Institute and State University

Dr. Walter Lee is an associate professor in the Department of Engineering Education and the director for research at the Center for the Enhancement of Engineering Diversity (CEED), both at Virginia Tech.

Dr. Michelle D Klopfer, Virginia Tech Department of Engineering Education
Dr. David B Knight, Virginia Polytechnic Institute and State University

David Knight is a Professor in the Department of Engineering Education at Virginia Tech and also serves as Special Assistant to the Dean for Strategic Plan Implementation in the College of Engineering. His research tends to be at the macro-scale, focused on a systems-level perspective of how engineering education can become more effective, efficient, and inclusive, and considers the intersection between policy and organizational contexts. Knight currently serves as the co-Editor-in-Chief of the Journal of Engineering Education.

Dr. Tremayne O'Brian Waller, Virginia Polytechnic Institute and State University

Tremayne O. Waller is the Director of Graduate Student Programs at Virginia Tech. Dr. Waller facilitates the recruitment, retention, and success of graduate scholars with a focus on those from backgrounds historically underrepresented in engineering. Prior to joining Virginia Tech, Dr. Waller was Interim Director of the Office of Academic Diversity Initiatives at Cornell University. In this role, he was responsible for building academic and professional-development support and resources for undergraduate students who are traditionally underrepresented and/or underserved in higher education. Dr. Waller was the inaugural lecturer and director of the Ronald E. McNair Postbaccalaureate Achievement Program at Cornell University. Dr. Waller began his career in student affairs and undergraduate education at Averett University, Radford University, and the University of South Carolina.

Dr. Jeremi S London, Virginia Polytechnic Institute and State University

Dr. Jeremi London is an Associate Professor in the Engineering Education Department at Virginia Polytechnic Institute and State University. London is a mixed methods researcher with interests in research impact, broadening participation and instructional change.

Using a Collective Impact Approach to Establish a Center for Equity in Engineering Focused on Graduate Education:

Lessons Learned from Phase I

CoNECD 2024

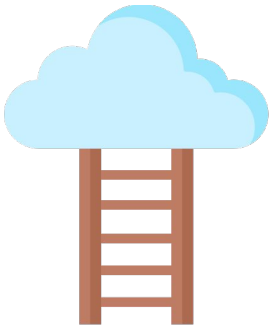
The agenda for today's presentation is as follows:

- ❑ **Motivation** What is PROTEGE? Why are we building it?
- ❑ **Theory** What is Collective Impact?
- ❑ **Methods** How are we applying Collective Impact?
- ❑ **Insights** What change efforts have been made?
- ❑ **Implications** What lessons have we learned?
- ❑ **Discussion** Where do we go from here?

This is plan for what will be discussed in this presentation. We want to review how PROTEGE came to be, our approach to change in graduate education, what we have learned from the first year of change efforts through this center, and how we plan to move forward.

Agenda icons created by Freepik - Flaticon

MOTIVATION



First, lets discuss the motivation for how this center came to be.

NSF created a unique opportunity to do something different by updating the Broadening Participation in Engineering (BPE) solicitation.

IMPORTANT INFORMATION AND REVISION NOTES

Revision Notes

- This solicitation builds upon the prior Broadening Participation in Engineering (BPE) Program Description (PD 19-7680) and encompasses multiple pathways for engaging the engineering community:
  - *Track 1: Planning and Conference Grants,*
  - *Track 2: Research in Broadening Participation in Engineering,*
  - *Track 3: Inclusive Mentoring Hubs (IM Hubs), and*
  - *Track 4: Centers for Equity in Engineering (CEE).*

"Through this track, the BPE Program seeks to catalyze (through the development of Centers for Equity in Engineering) a culture change in the education of next generation of engineers as it relates to creating equitable and inclusive practices which both recruit and retain a diverse community of students. Proposers to this track must consider the cultural, organizational, structural, and pedagogical changes needed to transform their institution's College of Engineering..."

4

This project was created in response to an updated NSF BPE solicitation, specifically a Track 4, phase 1 grant with the aim of creating a Center for Equity in Engineering.

Phase I projects are focused on establishing the infrastructure necessary to "stand up" the CEE within their College of Engineering

- ★ Expected to have a duration of at least 24 months
- ★ Proposed budget not to exceed $1.2M.
- ★ Require an Institutional Letter from the Dean (or equivalent)

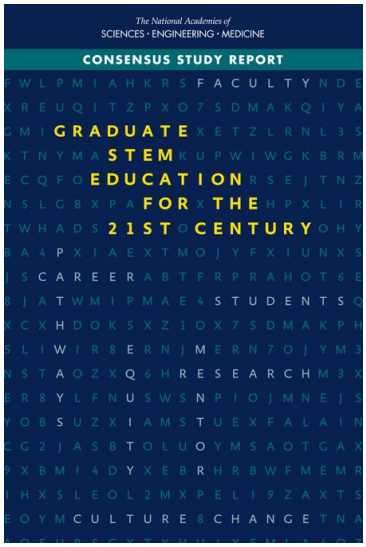
This first phase of this grant is to establish the infrastructure necessary to implement a center. NSF criteria included an expected phase 1 duration of 24 months, proposed maximum budget of $1.2 million, and required an institutional letter from the Dean to ensure institutional support.

As a result, we created ***PROTEGE***

Partnerships and Research
On The Equity of Graduate Education
in Engineering

As a result,PROTEGE was created.
[Explain the acronym for the center]

We were motivated by the National Academy's vision for AN IDEAL GRADUATE STEM EDUCATION



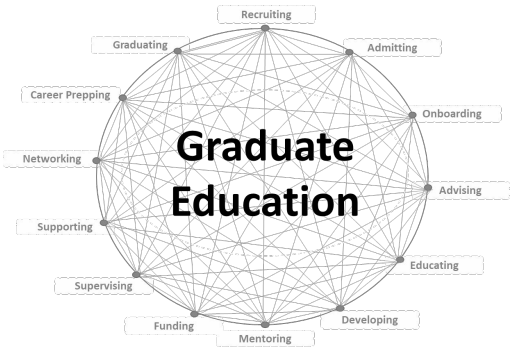
"Students from all backgrounds would fully participate and achieve their greatest potential during their educational experience through transparent institutional action to enhance diversity and promote inclusive and equitable learning environments."

National Academies of Sciences, Engineering, and Medicine. 2018. Graduate STEM Education for the 21st Century. Washington, DC: The National Academies Press. https://doi.org/10.17226/25038.

This center was in part motivated by the National Academy's vision for an ideal graduate STEM education.

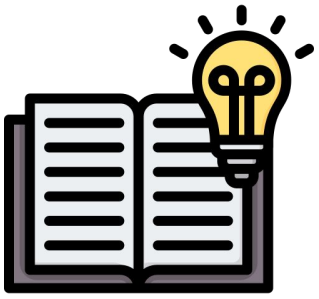
PROTEGE'S goal is to transform graduate education in engineering through organizational change.

Our vision is to catalyze **more equitable and inclusive graduate engineering education**, where student experiences and outcomes are not predicted by demographic variables, and every graduate student is provided with opportunities to develop their technical and professional skills, establish their identities as professional engineers, and be included and engaged in the community.



The goal of PROTEGE is to transform graduate education in the college of engineering at an R1, predominantly white institution.

THEORY

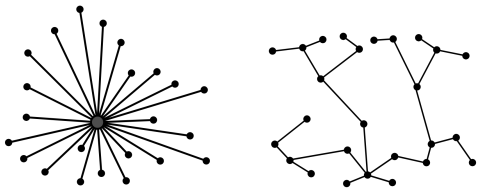


Now, we will discuss the theory informing our approach to transformative change.

We are taking a collective impact approach to increase the success and efficiency of organizational transformation related to equity.

Five Conditions of Collective Impact

1. Common Agenda
2. Shared Measurement System
3. Mutually Reinforced Activities
4. Continuous Communication
5. Backbone Support

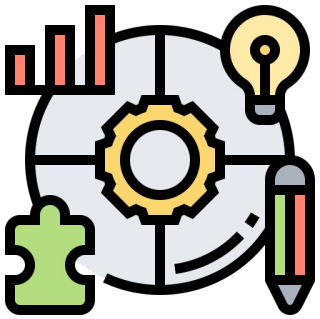


Decentralised system. (2023, August 13). In Wikipedia. https://en.wikipedia.org/wiki/Decentralised_system

10

We are utilizing the collective impact (CI) approach (Kania & Kramer, 2011; Kania & Kramer, 2013; Kania et al., 2014; Kania et al., 2022). CI emphasizes the need for cross-sector collaboration and partnership, where many organizations commit to a common agenda for lasting, effective social change. CI consists of 5 conditions. We will discuss each of the conditions and how we translated them in the graduate education context.

METHODS



Now we will discuss our practical application of CI and establishment of PROTEGE'S infrastructure.
Method icons created by Eucalyp - Flaticon

We formed a team including College leadership, education researchers, engineering faculty and graduate students.

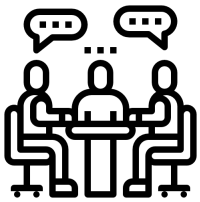
12

[Discuss the center team, their roles at the university and how they contribute to the center]

We have spent the last year or so working to translate the collective impact approach to this particular context.

Phase 1 Activities

- ❏ Team Meetings
- ❏ Audit Trails
- ❏ Backbone Activities
- ❏ Reflection Activities
- ❏ Advisory Board Meeting
- ❏ Mini Projects



This is a list of the different types of activities we have engaged in to establish the center's infrastructure and learn from our initial efforts.

Example Activities

- ★ Audit Plan for Graduate Policies and Procedures
- ★ Identifying and Strengthening Accountability Mechanisms

- ★ Mapping Existing Resources and Organization
- ★ Graduate Assistantship Support Task Force

- ★ Survey to Identify Readiness for Equity-Focused Change
- ★ Equity-related discussions with graduate program directors/coordinators

- ★ Transparent Data Sharing
- ★ Graduate Student Council

INSIGHTS

Next, we will discuss our engagement with each of the 5 conditions.

Over the past year we have engaged in each of the five conditions

Five Conditions of Collective Impact

1. Common Agenda
2. Shared Measurement System
3. Mutually Reinforced Activities
4. Continuous Communication
5. Backbone Support

As a reminder, these are the 5 conditions.

1. Common Agenda

How: Conducted reflection activity amongst research team

Output: Executive Summary which establishes

- Shared Understanding of the Problem
- Guiding Principles
- Prioritization of System Components the PROTEGE can address

[discuss how we created a common agenda and the components of the common agenda that we created.]

Our understanding of the problem broke into four areas.

Missing Equity

Lacking Skills

Unaddressed Inequity

Competing Values

18

From the common agenda, we have a shared understanding of the problem that the center aims to address.

Our approach to change follows five guiding principles.

Equity through Organizational Change

The College's Responsibility

Lasting Impact

Empowering Graduate Students

Leveraging Existing Information & Assets

19

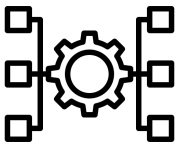
From the common agenda, these are the guiding principles we have agreed guide our change efforts.

2. Backbone Organization

How: Continuous discussion amongst PIs and broader research team to gauge capacity

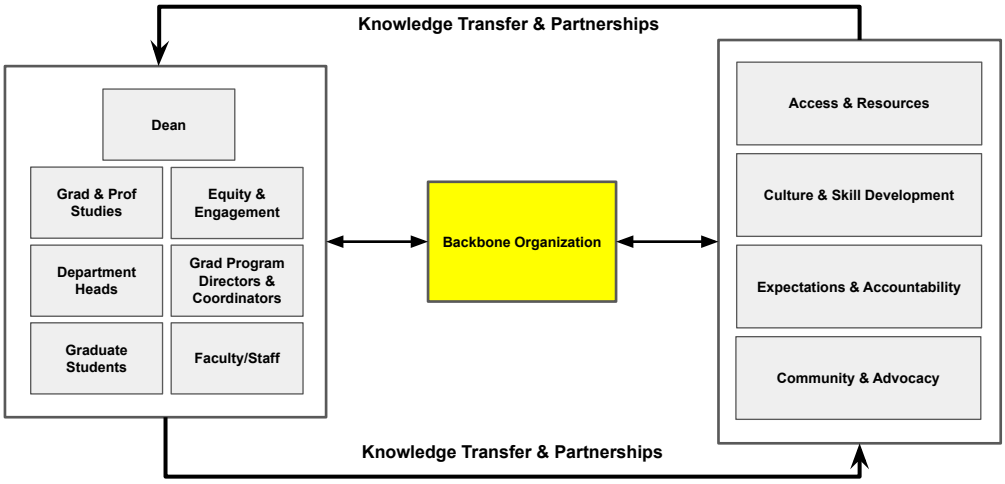
Output: PROTEGE structure and a clear description of what PROTEGE is and what it is not. We serve three roles:

1. System Changers
2. Leadership Developers
3. Direction Providers



[discuss how we created a backbone organization and how our approach to organization structure has changed.]

Our organization structure is designed to enable partnerships and knowledge transfer.



21

[discuss our current organizational structure.]

3. Mutually Reinforcing Activities

How: Continuous reflection on alignment between the identified issues and opportunities in the system, established goals, and system levers

Output:

- Refined processes for PROTEGE's implementation of change efforts
- Developed approach to change based on increased understanding of system and interrelated subsystems
- Developed language for what PROTEGE is and is not

[discuss how we ensure change efforts are mutually reinforcing and benefits of doing so.]

Our change efforts are organized around focus areas and system levers.

Focus Area	System Levers
Expectations & Accountability	F/S Responsibility Documentation F/S Accountability Mechanisms F/S Incentive Structures 
Access & Resources	GS Recruiting Practices GS Admitting Practices GS Funding Practices 
Culture & Skill Development	GS Advising Practices GS Supervising Practices COE Socialization 
Community & Advocacy	Dept. Lead Involvement GS Involvement F/S Involvement 

[Discuss an example of how we ensure alignment]

Our change strategies will be both top-down and bottom-up.

"Advocacy can point out problems and recommend solutions, while managerialism has a role in implementing change" - Julie R. Posset (Equity in Science, p. 141)

Focus Area	Change Activities (Management and Advocacy)		
	COE Leaders (Top Down)	**Dept Leaders** (Middle Out)	**The Public** (Bottom Up)
Expectations & Accountability	F/S Responsibility Documentation F/S Accountability Mechanisms F/S Incentive Structures	F/S Responsibility Documentation F/S Accountability Mechanisms F/S Incentive Structures	F/S Responsibility Documentation F/S Accountability Mechanisms F/S Incentive Structures
Access & Resources	GS Recruiting Practices GS Admitting Practices GS Funding Practices	GS Recruiting Practices GS Admitting Practices GS Funding Practices	GS Recruiting Practices GS Admitting Practices GS Funding Practices
Culture & Skill Development	GS Advising Practices GS Supervising Practices COE Socialization	GS Advising Practices GS Supervising Practices COE Socialization	GS Advising Practices GS Supervising Practices COE Socialization
Community & Advocacy	Dept. Lead Involvement GS Involvement F/S Involvement	Dept. Lead Involvement GS Involvement F/S Involvement	Dept. Lead Involvement GS Involvement F/S Involvement

[Discuss an example of how we ensure alignment]

4. Shared Measurement System

How: Conducted reflection activity amongst research team

Output: Understanding that our approach to monitoring must capture metrics for monitoring the College of Engineering and PROTEGE efforts

[discuss how we created a shared measurement system and how we approach monitoring multiple systems.]

Internally, we are connecting our work to the COE Strategic Plan.

VT COE Strategic Plan

Strengthen Community:

1. Recruit top talent from a diverse population to lead tomorrow's workforce.
2. Develop and retain talent.
3. Foster an inclusive culture that supports a healthy work-life balance.

Build Infrastructure and Resources:

2. Grow and diversify revenue streams.

Align Research & Education for Impact

1. Offer world-class, affordable educational experience at scale.
4. Expand the COE reputation nationally and internationally.

Potential Metrics (Benchmarks = TBD)

1. Student experiences (student satisfaction)
2. Types of assistantships
3. Involvement and interest of faculty
4. Retention, graduation, and time to degree
5. Compositional diversity
6. Investment in students development and well being
7. Diversity of applicants
8. Treatment of applications; offers and yield
9. Adjustments in systems, policies, manuals, and handbooks
10. Communicated expectations

[discuss our approach to a shared measurement system]

5. Continuous Communication

How: Reflection activity that identified PROTEGE communication goals, key messages, communication principles, and potential communication strategies

Output: Shared understanding of PROTEGE approach to communication and what messages matter the most in the first year of establishment

[discuss our approach to creating a communications plan]

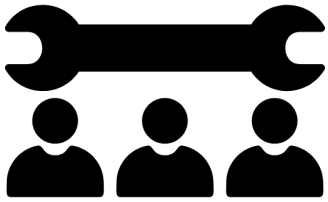
Our communication plan must focus on actively reaching out.

Planned Strategies

1. One-one-one meetings w/ key stakeholders
2. Website content
3. In-person events
4. Social media posts
5. Face sheets/infographics
6. Presentations/briefings
7. Community forums

[discuss our shared understanding of useful communications strategies.]

IMPLICATIONS



Next, we will discuss the lessons we've learned from engaging with each of the 5 conditions.

Lessons Learned: Collective Impact in Grad Ed

- The challenge of organizing large change efforts
- The value of guiding principles
- The utility of understanding College priorities and operations
- The centrality of the student-employee tension
- The importance of optimism

[discuss lessons learned from translating collective impact in graduate education.]

DISCUSSION

Discuss next steps for PROTEGE.

- How we are incorporating what we have learned in our efforts moving forward.
- Impact of learnings on Phase 2 proposal

Informing Phase 2

Our activities and lessons learned from Phase 1 have led to two major considerations for Phase 2 goals:

1. Need for more **subject matter experts**
2. Designing and acting with **sustainability** in mind

Phase 2 Goals

GOAL #1: Transform VT's COE through organizational change so that it can become a proof-of-concept for the Collective Impact approach to transforming graduate education.

1-1: Develop and review VT policies and documented procedures
1-2: Evaluate and improve VT processes across the graduate student life cycle
1-3: Establish equitable resource allocation at VT
1-4: Improve interpersonal relationships between VT faculty/staff and graduate students
1-5: Create long-term partnerships with leadership, faculty/staff, and graduate students

Phase 2 Goals

GOAL #2: Expand the PROTEGE Collective through partner institutions
2-1: Advance campus-specific change initiatives 2-2: Translate and contextualize solutions across engineering graduate education contexts 2-3: Create long-term partnerships whereby ideation and implementation of equity-focused change initiatives for engineering graduate education can be accelerated

Phase 2 Goals

GOAL #3: Advancing and translating knowledge to become the premiere resource hub and network for supporting organizational transformation of graduate education for COEs nationwide

3-1: Advance knowledge of organizational changes focused on equity in graduate engineering education

3-2: Translate equity-focused research on graduate education for engineering change agents to accelerate the research-to-practice and practice-to-research cycles

3-3: Share easily accessible resources with change agents via Engineering Graduate Education Institutes and the PROTEGE website as well as building and leveraging existing communities of practice of graduate student support networks such as program directors and coordinators

What's next?

- Continue Phase 1 activities and projects and ensure sustainability
- Continue to publish Phase 1 process and outcome related results
- Await Phase 2 proposal decision

Discuss current projects, activities, and publications in progress or accepted

Acknowledgements

This work is supported by the U.S. National Science Foundation award EEC-2217640. Any opinions, findings, and conclusions or recommendations expressed in this material are those of the authors and do not necessarily reflect the views of the National Science Foundation.

In addition to the authors of this presentation, this work is also supported by the many members of the PROTEGE team Drs. Mark Huerta, Holly Matusovich, Frederick Page, Bevlee Watford, and Dean Julie Ross. Phase 1 activities were also supported by many graduate assistants Taylor Johnson, Brian Chan, Hannah Glisson, and Crystal Pee.

Thank You!