PROCEEDINGS FROM 2017 SMTI/ASCN

WORKSHOP ON DIVERSITY AND INCLUSION

Planning and Institutionalizing Change

ASSOCIATION OF PUBLIC & LAND-GRANT UNIVERSITIES

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Planning and Institutionalizing Change

Proceedings from 2017 SMTI/ASCN Workshop on Diversity and Inclusion

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Introduction

This summer, ASCN partnered with the Association of Public and Land-Grant Universities (APLU) to organize the 2017 SMTI/ASCN Workshop on Diversity and Inclusion. The APLU Science and Mathematics Teaching Imperative (SMTI) is a community of faculty, department chairs, deans, and provosts who are engaged in improving STEM teaching and teacher preparation.

Workshop Goals

Inclusion and diversity must be at the heart of systemic change efforts and included in the broader goals of the undergraduate STEM reform. It is impossible to transform institutions without addressing underlying issues of inequality that are deeply rooted in history. The goal of the 2017 SMTI/ASCN Workshop on Diversity and Inclusion was to advance a dialogue on diversity and inclusion in undergraduate STEM education between practitioners transforming institutions and researchers who are studying systemic change at higher education institutions. Ideally, workshop participants would then return to their institutions with new ideas to foster an inclusive campus environment, and share the dialogue with colleagues. More specifically the workshop aimed to provide participants with opportunities to:

- Share and reflect on best practices and lessons learned about facilitating change initiatives around diversity;
- Learn about different change theories, ways to measure success, and other topics to aid in advancing systemic institutional change;
- Participate in discussions on potential solutions to common challenges in creating and implementing diversity initiatives.

Case Studies

The workshop featured five case studies of institutions that are making progress on increasing diversity and inclusion on their campuses. Texas A&M University's case on "Creating an Institutional Culture of Accountability to Ensure Diversity and Inclusion in STEM Fields" was presented by Dr. Timothy Scott, Assistant Provost for Undergraduate Studies to illustrative institutional level change efforts at TAMU.

The remaining case studies were used to stimulate discussion amongst all participants on what is working or not on their campuses, and are included in this publication. These cases covered a variety of STEM interventions from focusing on successful recruitment, retention, progression and graduation of diverse first-time-in-college and transfer students; to developing strategies for recruiting and engaging students with disabilities in undergraduate research; and multi-institutional efforts to recruit and retain women scientists. These cases collectively highlight the complexity of systemic change efforts to advance excellence in undergraduate STEM education.

In Preparation for the Workshop

APLU institutions were invited to submit a case study proposal focused on initiatives on their campuses that build more diverse and inclusive STEM learning environments. Five of the submitted proposals were chosen to write full case studies for the workshop. Prior to the workshop these full case studies were shared with ASCN Working Group members who reviewed them and provided written feedback on the written narrative and further questions on the projects themselves. Case study institutions were given the opportunity to address this feedback prior to the workshop. Case narratives were made available online to all workshop participants.

The Workshop Outline

The workshop began with a plenary session, where Dr. Timothy Scott presented institutional level change efforts (Dr. Christine A. Stanley, Vice President and Associate Provost, who was originally set to present, was not able to attend). The plenary session was followed first by a short presentation of each of the other four cases, and then by sixty minutes of small group discussion. Each of four small group discussions was led by an experienced facilitator and focused on an individual case. Workshop participants were invited to join the discussion group of their choice. During these discussions, each group was tasked with keeping a list of takeaways that was shared with the larger group in a plenary session following the small group discussion.

In the afternoon, new discussion groups formed based around ASCN working group topics, which all related to large-scale change; theories of change, costs and benefits, leadership, and measurement and communication. At the end of this second discussion session, takeaways were shared in a plenary session. Following the workshop, the case studies and discussion notes from all the sessions were made available online to workshop participants.

Shared Learning Experiences

This case analysis allowed for individual and group reflections and facilitated discussions. It also led to collective aggregation of ideas in small groups, which in turn revealed some overarching issues and questions with regard to diversity and inclusion. One overarching issue that arose through synthesis of ideas was that defining excellence in traditional ways excludes diversity, which led to the question, "how do we change the conversation around diversity and excellence?" Discussion also brought up the issue of student voices missing in the case studies, which in turn led to the question, "how can students contribute to change?" Moving questions from implicit on participants' minds to the floor for vocalization and discussion created the opportunity to examine how issues impact practice.

New Understandings

This workshop created opportunities for institutional leaders and faculty to have dialogue around challenging issues, allowed them to learn about different perspectives on the same issues, and to reflect on their own perspectives and assumptions and develop new understandings.

Case participants had the opportunity to learn and to reflect on their projects through (1) the feedback received from ASCN Working Group members, many of whom are experienced change leaders and scholars and (2) the small group case discussions during the workshop.

ASCN working group members had the opportunity to contribute to practice by reviewing the case studies and through small group discussions consider where the disconnects between theory and practice, especially regarding issues of diversity and inclusion, and ways to address them.

To continue and expand the conversation on how to advance evidence-based systemic change in undergraduate education, we have summarized some of the shared learning and new understandings. We hope that this will be of interest to both practitioners and scholars.

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Planning for Systemic Change

Creating successful change requires an understanding of, and strategic work at multiple parts of the entire system. The workshop did not provide solutions to addressing diversity and inclusion issues in for the change leaders, however, it provided opportunity to discuss and reflect on many key questions that need to be addressed in order to achieve the cultural change necessary to address these kinds of issues.

The tables below are organized by focus areas of ASCN Working groups and shows key practices, purpose or rationale for using them, as well as questions developed by ASCN working groups. The framework provided in these tables offer one way to understand the complexity of systemic change, and can be used as a guide for planning and organizing change interventions, from early conceptual phases through implementation of activities, to ensure progress toward cultural change and institutionalization of practices. The listed practices and questions are not an exclusive list, but are there to help change leaders to preserve focus on key aspects of institutional change.

Key Approaches, Rationale and Questions by Working Group

Working Group 1: Guiding Theories

Key Approaches
- Identify and select theory of change
- Develop a logic model

Rationale/Purpose
- To question our implicit assumptions
- To make embedded assumptions explicit
- To understand change at individual, local, and institutional levels
- To inform and guide reflective actions
- To move toward a more comprehensive change effort
- To demonstrate connections among inputs, activities, and outcomes

Questions to Consider
- Is there a guiding theory that informs some or all of the initiatives in this project?
- What change theories and/or studies have focus on creating an inclusive higher education environment?
- Are there models for supporting faculty decision making and adoption of evidence-based teaching that align with your project goals?
- What frameworks or change theories have been used in similar projects?
- How have strategies been modified over the course of the grant?

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Working Group 2: Costs and Benefits

Key Approaches

- Determine short and long term benefits of your project, and costs associated with achieving them.
- Identify stakeholders at your institution who would be interested in economic analysis and create a strategy to communicate with them

Rationale/Purpose

- To identify who are the main beneficiaries of the project
- To create awareness regarding perceptions vs. reality of costs and benefits
- To identify up-front costs vs. ongoing costs
- To recognize easily quantifiable benefits vs. those that are not (soft benefits); hard costs vs. soft benefits
- To know what will it cost to continue your program after initial funding runs out
- To provide leadership with evidence of your project's success

Questions to Consider

- What are the financial benefits to institutions of improved student learning and persistence?
- How could you measure the impact of your project in terms of costs and benefits?
- What organizational levels are influenced by specific costs and benefits?
- What is the time cost involved of individual faculty and/or institution to implement a sustainable change initiative?

Working Group 3: Change Leaders

Key Approaches

- Develop relationships with institutional stakeholders and leaders at different levels at your institution
- Identify allies for your project
- When assembling current project team, consider who is at the table and who is not.
- Assess current project leadership strength and identify what types of leaders, grassroots vs top down, are on your team. Both need to be involved to make lasting change

Rationale/Purpose

- Relationships play role in decision making and in resource allocation.
- Cheerleaders and allies can help to make your work more visible, to gain buy-in from various campus stakeholders.
- Diverse voices bring different opinions and perspectives
- Distributing leadership (including advisory boards) can help bridge gaps and reduce impact of when someone leaves

Questions to Consider

- What strategies are being considered to extend the engagement and to create more partnerships with offices on campus?
- What institutional structures will be needed to support the new culture you are creating?
- What strategies will be used to begin to put these structures in place?

> **Working Group 4: Measurement and Communication**
>
> **Key Approaches**
> - Identify who your stakeholders are
> - Recognize students as stakeholders
> - Develop different types of communication for different audiences
> - Consider using in your inquiry intersectionality approaches
> - Consider creative ways to have difficult conversations (e.g. videos, vignettes, role playing)
>
> **Rationale/Purpose**
> - Knowing your audience, will help you to choose what story you want to tell and what metrics you want to share.
> - To tell important story of current culture and climate and change efforts
>
> **Questions to Consider**
> - How will you know if your project has been successful?
> - How will you measure change?
> - How will you communicate project's success to stakeholders?

Institutionalizing Systemic Change

The case studies highlighted what change scholars and practitioners have long recognized - that (1) in order to achieve excellence in undergraduate STEM education for all students, it is not enough to focus just on classroom pedagogical change and/or curricular change at the department level, but that project leaders need to extend their change efforts to cultural change at institutional level and (2) institutional culture and structures shape both challenges and solutions.

First, we present common challenges and offer some tactics from the practices of the case participants, as well as workshop participants, to overcome them. Then we highlight four strategic themes that emerged from the discussions during the workshop and were seen by workshop participants at essential to advance their work towards the goal of achieving excellence in undergraduate STEM education for all students.

Common Challenges

Faculty Perceptions

Faculty play an important role in systemic change efforts. They play an essential role not only in implementing change, but also in advocating for change. Addressing faculty perceptions about their roles and about students is one of the challenges that change leaders encounter in their attempts to widen the reach of their interventions. Often project teams struggle to involve additional faculty beyond early adopters. There are numerous reasons for lack of faculty involvement. It can include, for example, faculty not being on board with the vision and goals of the project, or perception that instructional change is time

consuming and faculty focusing on other aspects of their work believing that they not having time. It also could be related to faculty believing that they do not need to change their teaching or that they are supportive of their students.

Conversations about diversity and inclusion are often difficult. The BSU PERSIST project leadership has found that it is easier to talk with faculty about economic differences rather than demographic differences, partly due to low racial/ethnic diversity in Idaho. The institution has a lot of commuter students, many of whom work full-time. Commuter students may not be available for outside classroom group work so for them to succeed there is a need for more to be happening in the classroom. The project leaders are working on ways not only to help faculty to recognize the diversity of their students, but also help them to identify ways they can help their students to succeed.

Another example is the case at OSU where the team works to recruit students with disabilities for the Research Experiences for Undergraduates (REUs) program at OSU. Some faculty initially had reservations about incorporating students with disabilities into their research groups; there were safety concerns, as well as a fear that students would not be able to move around the lab or operate lab equipment. The project leaders have been able to minimize this by providing faculty with learning opportunities and resources needed for student to participate in their labs. These professional opportunities include learning about common issues, misconceptions, and resources. In addition, project leaders have follow-up meetings with faculty after students have been in their labs for several weeks, allowing them to address specific questions faculty may have.

It is important to recognize that faculty resistance may be not only due to their perceptions of students and cultures, but also as a result of other factors, such as institutional practices that do not put enough value on the teaching role of faculty, systems where reforms are imposed to faculty by top-down methods, or physical infrastructure.

Physical Infrastructure

The stereotyped layout of lecture auditoriums with tables aligned in rows, a podium upfront, and a chalk- or whiteboard far from students is still a reality at many universities, especially in large introductory STEM classrooms. This set up limits student engagement and collaboration, and makes it difficult for faculty to adapt active learning strategies. There is a need to change physical infrastructure, to change classrooms from fixed to flexible layout to ensure that faculty can adapt teaching and learning methods that support success for all students.

The SFU project leadership team recognized the need for flexible classroom spaces to be in place in order for faculty to adapt best evidence based teaching practices, and is working with the vice president for the Office of Student Success to renovate classrooms. Renovation of several classrooms has been completed.

The OSU project struggled with a different type of infrastructure problem, research labs in older buildings were not able to accommodate the needs of students with disabilities. Although the project leaders were not able to change the infrastructure, they were able to identify labs on campus that can accommodate the needs of students with disabilities and matched students with faculty whose labs could accommodate the needs of students.

These two examples highlight the important role that the physical classroom environments play in assuring that all students can be successful.

Institutional Practices

The structure, policies, and culture of the institution all play a role in successful implementation of new practices. This includes having institutional policies in place that support faculty activities – teaching,

scholarship, and service. In addition, the tenure policies often affect how much emphasis faculty place on teaching, hence their willingness to adapt new practices. Case participants and workshop participants recognized that it is important to change how teaching effectiveness is evaluated and measured. There was agreement that student satisfaction surveys are not the right tool, and that there is a need to find different ways to measure teaching effectiveness, as well as how to communicate teaching evaluations. The BSU project team is working with the faculty senate to implement better approaches university wide.

Department culture and practices also play an important role. Buy-in and support from administration were identified as an essential factors impacting project success. Workshop participants agreed that the support of department chairs is especially critical to getting faculty to try new practices, as well as in sustaining institutional changes. For example, USM Gulf Coast ADVANCE project leaders are working on curbing the isolation that many women STEM faculty experience in their departments by offering seminars, fellowships and brown bag lunches around issues for women in STEM. They are working on new grant that would allow them to expand their project to address the institutional policies and professional support for academic leaders.

Sustainability

Most interventions start with grant funding that provides project teams with an average of three to five years to implement their plans. Institutionalization of new practices at higher education institutions takes much longer, hence, one of the common concerns of change leaders is how to gain institutional support to sustain interventions after initial funding runs out. A related concern of change leaders is how to scale-up their efforts to institution-wide adaption of new practices.

Case and workshop participants identified two imperatives to achieve institution-wide adaptation-- (1) the need to align project goals with university priorities and (2) create high-quality practices that are scalable.

The USF STEER team has identified how they can leverage both state and institutional level priorities to advance their work. They have determined that of the 12 criteria that the State Board of Governors

established to chart each university's strengths and progress towards a common goal, three emphasize production of graduates in the STEM areas and therefore align with the goals of the STEER. In addition, USF's plan of a Responsibility Centered Management (RCM) model for budget allocations will include a reward system aimed to encourage departments to focus on student success. The STEER leadership sees this as potential benefit that will help them to partner with more departments and reach a larger number of faculty.

In addition, science focused professional development activities currently supported by STEER after the grant will be continued by the Academy for Teaching and Learning Excellence (ATLE) and will be funded by the university. The ATLE Director is a member of the STEER leadership team and his involvement will help the transition process.

The USM Gulf Coast ADVANCE project leadership has recognized the ways they can continue their initiatives with limited funding available. These include continuing organizing brown-bag seminars and guest lectures.

As for the other common challenges – faculty perceptions, institutional practices, and infrastructure - all contribute to project success and can either hinder or enable sustainability of reform efforts undertaken by change leaders. Sustainability can be seen not only as a more complex challenge, but also as a goal. Through this lens the other challenges can be seen as building blocks for achieving sustainability.

Strategic Themes

As a response to the common challenges, four strategic themes emerged as key elements that are essential to institutionalizing systemic change initiatives and can aid change leaders to reach their goals.

Create and support diversity and excellence for all

The conversation around diversity and excellence needs to change to exclude deficit mindsets and practices that enact them. The vision of excellence has to include diversity, only then can excellence for all be achieved.

Excellence for all means that every student is provided with high quality learning experiences. Change leaders need to persistently create and support evidence-based practices that promote equity, diversity, and academic excellence for all students.

Increase student engagement

Although students are seen as the major beneficiaries of academic reforms, which makes them important change project stakeholders, their voices are often missing not only on project teams, but also in project evaluations. Collecting and using data about students, is not the same as having student voices at the table.

It is important that change leaders increase student engagement in reform efforts and empower students to become advocates for high quality educational practices.

Build connections and relationships

Relationships matter, therefore change leaders ought to take the time to build and maintain relationships across their own institution, at peer institutions, and with community partners. The key is to find others who have similar goals and values, and who recognize the importance of reforms being undertaken, and can be supporters and advocates of them.

It takes time to build trust with key stakeholders and partners. Trust can lead not only to more lasting change outcomes, but also to new opportunities to advance the reform efforts.

Create Change Stories

There is a need to translate data into meaningful and authentic stories about change. Stories that communicate project goals and illustrate both challenges and successes to broader audiences, and facilitate difficult conversations about issues of cultural change.

Authentic stories create an emotional connection, they allow people to relate and connect to messages embedded in these stories. They can inspire reflections and actions. Stories can help to create change.

Conclusion

There is no doubt that inclusion and diversity must be at the heart of systemic change efforts and included in the broader goals of the undergraduate STEM reform. The 2017 SMTI/ASCN Workshop on Diversity and Inclusion created opportunities for institutional leaders and faculty to have dialogue around challenging issues, allowed them to learn about different perspectives on the same issues, and to reflect on their own perspectives and assumptions and develop new understandings with regard to diversity and inclusion and the complexity of systemic change efforts to advance excellence in undergraduate STEM education. We hope that the dialogues started at the workshop will be continued with colleagues at home institutions and will lead to new ideas on how to foster an inclusive campus environment.

Resources

Guiding Theories

Henderson, C., Finkelstein, N., & Beach, A. (2010). Beyond dissemination in college science teaching: An introduction to four core change strategies. Journal of College Science Teaching, 39(5), 18.

> The authors state the need to expand focus of change initiatives to include more emphasis on faculty involvement and on the institutional structures. They present four change strategies to scale and sustain change efforts: (1) disseminate curriculum and pedagogy, (2) develop reflective teachers, (3) develop policy, and (4) develop shared vision.

AAU Framework for systemic change in undergraduate STEM teaching and learning (Brochure, 2016). https://www.aau.edu/education-service/undergraduate-education/undergraduate-stem-education-initiative

> Outlines framework developed by AAU to guide institutional commitment to teaching and learning, including cultural change, scaffolding, and pedagogy.

Costs and Benefits Resources

Report by American Council on Education: Instructional Quality, Student Outcomes, and Institutional Finances http://www.acenet.edu/news-room/Documents/Instructional-Quality-Student-Outcomes-and-Institutional-Finances.pdf

> There are not many resources available that look at instruction, student outcomes and institutional finances. This paper looks at impact of improved instruction on student outcomes such as postsecondary degree attainment, engagement, and satisfaction on institutional revenue. It includes several cases.

Change Agents and Leaders

Eckel, P.D. & M. Hartley. 2008. Developing academic strategic alliances: Reconciling multiple institutional cultures, policies, and practices. The Journal of Higher Education 79(6): 613-637

> The authors show the importance of developing and maintaining partnerships in implementing educational initiative.

Measurement and Communication

Wieman, C., & Gilbert, S. (2014). The Teaching Practices Inventory: a new tool for characterizing college and university teaching in mathematics and science. CBE-Life Sciences Education, 13(3), 552-569.

> This inventory can be used by departments and institutions to look at teaching practices used in science and mathematics courses. It can also be used by faculty to help them reflect on their teaching.

Survey of Undergraduate Research Experiences (SURE) (Survey). https://www.grinnell.edu/academics/areas/psychology/assessments/sure-iii-survey

> This is a survey for undergraduates who have recently completed a summer undergraduate research experience. SURE, and the related tool, the Classroom Undergraduate Research

Experiences (CURE). The CURE may be used as a pretest-posttest or posttest-only survey to measure student experiences in "research-like" or other science courses.

Armstrong, M. A., & Jovanovic, J. (2015). Starting at the crossroads: Intersectional approaches to institutionally supporting underrepresented minority women STEM faculty. *Journal of Women and Minorities in Science and Engineering*, *21*(2).

The authors of this paper explore opportunities and challenges of using intersectional approach to achieving equity through institutional change and discuss how intersectional approaches might be applied to institutional reforms aimed at advancing success of underrepresented minority women.

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Case Studies
University of South Florida

Systemic Transformation of Education through Evidence-Based Reforms (STEER)

University of South Florida

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http://www.usf.edu/atle/steer/about-us/index.aspx

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Project Summary

The University of South Florida (USF), a large public "Research I" university, in collaboration with Hillsborough Community College (HCC), a large Hispanic serving Community College, has embarked on an ambitious project to transform the culture of teaching in science, technology, engineering and mathematics (STEM) departments (Systemic Transformation of Education Through Evidence-Based Reforms, STEER).This partnership aims to establish a thriving and inclusive community of practice, which develops and supports a student-focused teaching culture among their STEM departments. The project is led by a knowledgeable, diverse, and influential leadership team bridging both institutions. Together the team has developed a multipronged approach to developing an environment that promotes high quality STEM teaching at USF and HCC. The team has leveraged grant resources to institute systemic change by addressing three key components: faculty, students, and the institutional environment in which they interact. This project utilizes multiple, simultaneous initiatives to approach each of these components and develop a culture of student-centered, evidence-based teaching. Systemic Transformation of Education through Evidence-Based Reforms (STEER) is supported by the National Science Foundation under Grant Number DUE 1525574.

Project Description

Team

Two years of planning supported by NSF through a WIDER grant began in 2013. This was preceded by several years of cooperative initiatives among various team members at USF and HCC. These small but significant networks of faculty, advisors and university administrators versed in student-centered instruction, had developed over several years and in some cases more. These connections that are strengthened by bi-weekly leadership team meetings, have built trust and respect, which have been indispensable in moving this ambitious project forward.

The Transformation Implementation Leadership Team (TILT) consists of representatives from the Provosts office, Dean's office, STEM department chairs, and tenure-earning STEM and STEM Education faculty.

The TILT team has met consistently (bi-weekly for 1.5-2 hours) throughout the WIDER planning grant as well as the current STEER implementation grant. The meetings have agendas with action items suggested by members of the team. Updates are provided for individual projects, and any needed modifications are discussed and decided upon with the TILT team members and the person(s) responsible for the outcomes. Intellectual debates occur frequently, due to the fact that not all parties may agree with any given potential course of action. However, decisions are made by consensus, and there is a willingness to take risks, and learn from exploring new possibilities. Since individuals on the team respect the experience and expertise of each other, and there is trust, the process has worked. Thus, the team members generally display a positive attitude when trying new ideas to see how they work.

The team has remained essentially the same with the exception of the loss of two full professors from The College of Education in 2016. Dr. Kersaint left to become Dean of the College of Education at the University of Connecticut and Dr. Feldman, who left to focus effort on two new grants. Dr. Sears who was recommended by Dr. Kersaint and joined TILT in 2016, bringing her expertise in mathematics education and diversity issues. Dr. Goodwin, who is responsible for student success initiatives in the college of engineering joined TILT in 2015, and heads the STEER Peer Advisor effort in engineering.

STEER is guided by a well-connected, influential, and knowledgeable leadership team and has a strong support and advice from a highly respected and engaged external Advisory Board, and regular formative advice from Horizon Research evaluators.

Logic Model
In conjunction with Horizon research representatives, using improvement science systematic approach of plan, do, study, act (PDSA) cycles (Bryk, Gomez, Grunow, and LeMahieu, 2015), a logic model was developed to explicate the theory of action to achieve the overarching goal of the project, and to frame the nature of the PDSA cycles. Improvement sciences allows to draw on general knowledge of the subject, as well as profound knowledge of the organization (Lewis, 2015). Hence, in this case, the general knowledge considers the tenets of evidence-based teaching, and the knowledge of the organization is provided by faculty who worked at the institution for an extended period of time, and is well-versed in the institutional norms and policies that can have implications on what is considered acceptable pedagogical practices, and the value placed on "teaching" across multiple departments. Thus, the project sought to use the administration's influence and to capitalize on the knowledge of practitioners that interact with the students, that is, to use a bi-directional (top-down, and bottom-up) strategy in our change initiative efforts.
The logic model (Figure 1) identifies key personnel and the roles that they would need to fulfil in order to achieve the project's overarching goal. By articulating roles and responsibilities for key personnel, the project is better able to monitor our progress to implement a transformative shift, using practical and balancing measures (Lewis, 2015). Thus, all stakeholders (key personnel) contribute to the overarching goal being actualized. By employing an improvement science systematic approach, the project can address variance among faculty within department, across programs and institutions, and the needs of a diverse student population. This model utilized

expertise that have far ranging impact, which is critical to the change idea becoming an institutional norm.

Figure 1. Logical Model: STEER Theory of Action
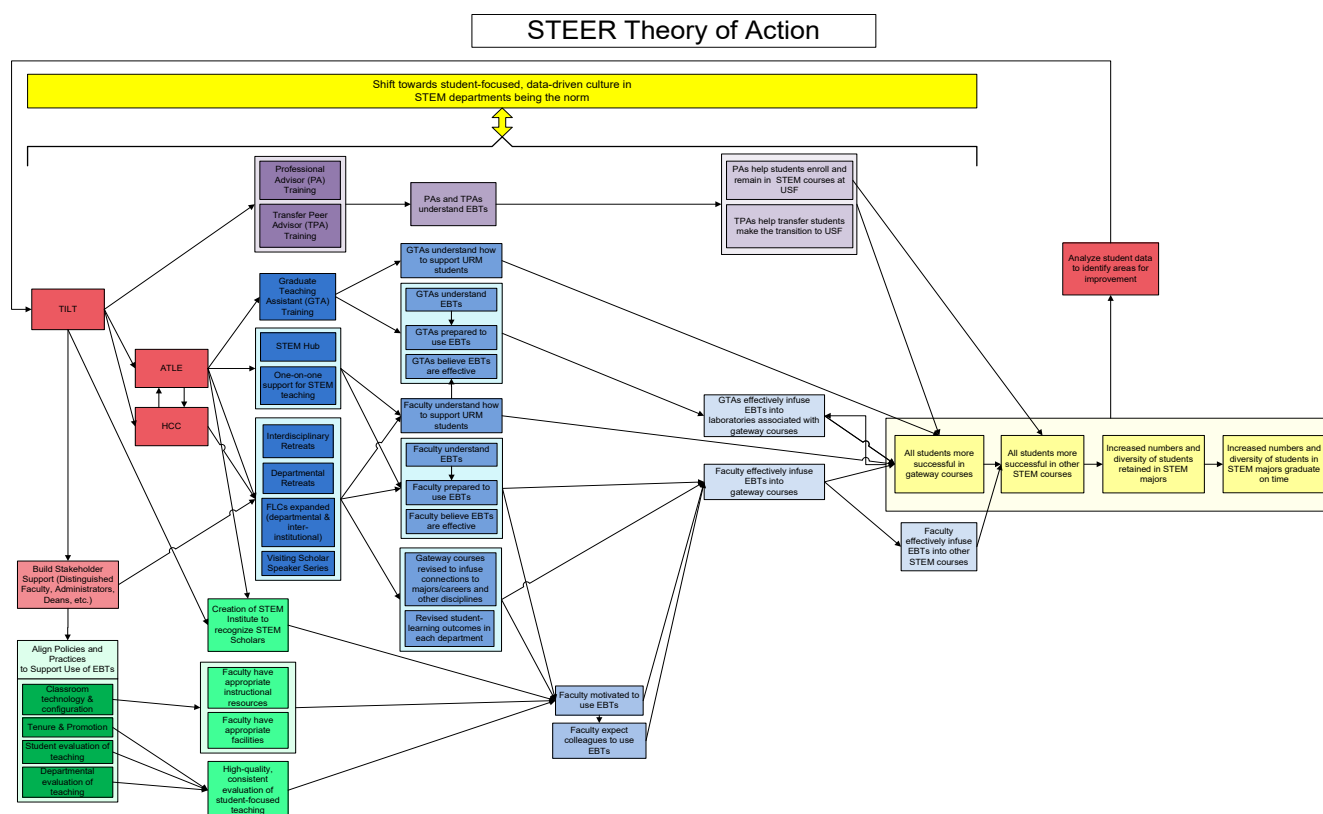
Project Initiatives

The team has leveraged grant resources to institute systemic change by addressing three key components: faculty, students, and the institutional environment in which they interact. This project utilizes multiple, simultaneous initiatives to approach each of these components and develop a culture of student-centered, evidence-based teaching. Project initiatives include: Departmental Retreats to share evidence-based pedagogies and create curricular alignment; Interdisciplinary Retreats to integrate content across disciplines and connect faculty from our partner institutions (USF and HCC); Graduate Teaching Assistant training to establish a long term culture of evidence-based success in science laboratories and beyond; Transfer Peer Advising both at USF and HCC to improve the STEM transfer student experience; Promoting Institutional Policies in support of evidence-based teaching such as tenure and promotion, classroom configuration and evaluation of teaching; Faculty Learning Communities to share evidence-based teaching practices and support implementation; and the STEM Scholars Teaching Awards to recognize faculty who effectively use evidence-based teaching to improve student success.

Context

The project was designed to address the high attrition of undergraduate STEM students among both FTIC students at USF and transfer students from HCC. Although the Education Trust[1] (2017) report indicate that USF is ranked number one in Florida, and sixth in the nation, for eliminating the completion gap between White and Black students, greater efforts are needed to promote student success, especially for underrepresented groups in STEM.

Table 1. Gender demographics of undergraduates at USF-Tampa (Fall, 2016)

Demographic Information	USF	College of Arts and Sciences	Integrative Biology	Cell, Micro, Molecular Biology	Chemistry	Chemical and Biomedical Engineering	Civil and Environmental Engineering	Mathematics and Statistics
Male	14,012	5,523	239	336	1408	288	227	182
Female	16,538	8,841	568	528	2010	134	60	103
Not reported	1	0	0	0	0	0	0	0
Total	30,551	14,364	807	864	3,418	422	287	285

Table 2. Ethnic demographics of undergraduates at USF-Tampa (Fall, 2016)

Ethnographic Information (Fall 2016)	USF N = 30,551	College of Arts and Sciences N=14,364	Integrative Biology N=807	Cell, Micro, Molecular Biology N=864	Chemistry N=3,418	Chemical and Biomedical Engineering N=422	Civil and Environmental Engineering N=287	Mathematics and Statistics N=285
White	49.68%	48.29%	58.24%	43.87%	38.59%	45.97%	52.61%	56.49%
Hispanic	20.85%	21.60%	22.68%	19.79%	22.26%	20.85%	19.16%	17.19%
Asian	6.83%	8.15%	4.96%	14.00%	16.41%	7.58%	4.53%	5.26%
Black	10.35%	11.56%	6.81%	9.03%	11.18%	8.78%	4.88%	8.07%

The ties between HCC and USF are strong, with a long history of collaboration. Many HCC faculty have obtained at least some portion of their education at USF. HCC also provides about half of all transfer students to USF and transfer students make up about 60% of the USF undergraduate population. The STEER Peer Advisors synergize with a new inter-institutional program called FUSE that facilitates the transition of students from HCC into the USF community. Students are admitted provisionally to USF while at HCC and provided information and advising on the courses needed to be on track for timely graduation post transfer. Students admitted to this program have access to all facilities available to USF students. The STEER Peer Advisors specifically works with STEM transfer students.

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[1] The Education Report can be viewed online at https://edtrust.org/wp-content/uploads/2014/09/A-Look-at-Black-Student-Success.pdf

Currently, USF institutional priorities include supporting students' success and promoting quality STEM education. Thus, many of the efforts supported by STEER, are to be continued by the Academy for Teaching and Learning Excellence (ATLE), which provides instructional support for faculty members. The ATLE Director is a member of the STEER leadership team and science focused professional development will continue to be supported in this university funded unit post grant. It is anticipated that the new university student success centered budgeting models, changes to teaching evaluations, along with continued improvements to classroom configurations will also support the shift to sustainable evidence based teaching.

STEER stands to benefit substantially from recent actions by the statewide Board of Regents and USF's own Board of Trustees. First, the Regents established 12 criteria to chart each university's strengths and progress towards a common goal. Three of the twelve criteria emphasize production of graduates in the STEM areas. Second, the Trustees approved USF's plan to develop its own version of a Responsibility Centered Management (RCM) model for budget allocations that is closely aligned with the university's strategic plan. USF expects to implement RCM in the fall of 2018; RCM is expected to include a reward system that will encourage departments to focus on student success and document the effectiveness of their effort. While details are still evolving, the university and its colleges have been moving in this direction for 3-4 years in anticipation of the model's formal adoption.

Evaluation

Since culture change is a process significantly influenced by context, project is aware of the need to chronicle both our process and the contextual elements influencing our outcomes. Indicators that are currently being examined are: departmental vision, e.g., mission, faculty views about effective teaching; nature of instruction, particularly in introductory courses; policies, practices, incentives, and resources to support learning and retention; and student outcomes, including attitudes, achievement and retention.

In order to document the important changes happening at the department level and examine the perceived impact of the STEER project on teaching and learning, case studies will be conducted with faculty from USF and HCC. The external evaluator, Horizon Research Institute (HRI) will interview faculty as well as the department chair/program coordinator from Chemistry, Cell Biology, Microbiology and Molecular Biology, Integrative Biology and Mathematics. HRI will also interview students enrolled in some of the department's key introductory courses, students near to completing the major, and also students recruited from organizations for underrepresented populations who are enrolled in the department's courses. Data will be collected during the next several months and again in years four and five.

The project is starting systematically collect and examine data relative to student success and retention in STEM courses. This includes looking at DFW (D, Failure, Withdrawal) rates by course (and instructor) over a three-year period to try to identify the specific areas where students are struggling or being successful in fourteen gateway courses in biology, chemistry, physics, and mathematics. These same data are also being parsed by ethnicity and gender to identify any challenges specific to subgroups. This information can be used to begin conversations with chairs and faculty about where students are doing well and ways to improve student outcomes where they are not. STEER then provides support for the change.

Challenges

Adoption of evidence-based practices

Based on the outcome of numerous studies showing that evidenced based teaching (EBT) strategies significantly aid STEM learning among underrepresented groups, we initially anticipated that infusing EBT throughout the curriculum would be sufficient to bring about improved student success among these groups. However, after numerous discussions, reading books, and listening to speakers' presentations on the role of implicit bias on student success, it was recognized that there is a need to provide additional training and guidance to faculty and graduate students on means to provide equitable learning opportunities, and strategies that can be used to embrace diversity within the classroom setting.

Being cognizant that many of our faculty and graduate students are from different cultures themselves, the project is considering means to promote culturally relevant pedagogies, and facilitate reflective dialogues that can make individuals aware of their own bias and the extent it can impact the learning environment. Some strategies discussed include: identifying role models and motivators that can address diversity issues; considering means to create safe spaces for all parties to feel welcome; and facilitating conversations where ideas can be exchanged regarding instructional approaches that are used to provide equitable learning outcomes. Nevertheless, it will be a challenge to identify means to sustain difficult dialogues about diversity and equity beyond a professional development training.

Faculty incentives and support

Furthermore, it is a challenge to evaluate the extent to which faculty place an emphasis on teaching during tenure and promotion evaluations, and secondary merit evaluations. The evaluation of teaching is generally limited in scope and is usually centered on student evaluations. Hence, the project leadership is working with the faculty senate to implement better approaches university wide.

Buy-in and support from administration

The influence and support of department chairs is critical to getting faculty to try new things and sustaining institutional changes. To date, we have had two STEER sponsored departmental retreats - Mathematics and Engineering, which were both well received, and well attended, because of very strong support and involvement from the respective department chairs. The faculty from USF and HCC who attended the two interdisciplinary retreats sponsored by STEER, provided positive feedback regarding their experiences, yet the project still is having trouble scheduling departmental retreats with other STEM departments. Hence, expanding the network to include active participation of department chairs is vital to our project sustainability.

Physical infrastructure

The physical configurations of many STEM classrooms, which are large lecture halls that have desks and chairs aligned in rows, makes it difficult to facilitate collaborative activities. Thus, the seating arrangement adds another obstacle to instructors who may want to change the way they teach. Therefore, the project has been working with the vice president for the Office of Student Success to renovate several large lecture hall classrooms. So far, a few classrooms have already been reconfigured with movable tables and chairs.

Student voices

It has been a challenge to involve student voices in the project, as suggested by our Advisory Board. We are going to reach out to our STEER Peer Advisors to gather initial feedback. The grant evaluators will also be convening STEM student focus groups to gather input on their experiences.

References

Bryk, A. S., Gomez, L. M., Grunow, A., & LeMahieu, P. G. (2015). Learning to improve: How America' s schools can get better at getting better. Harvard Education Press. Cambridge, MA.

Lewis, C. (2015). What is improvement science? Do we need it in education?. Educational Researcher, 44(1), 54-61.

Boise State University

Promoting Educational Reform through Strategic Investments in Systemic Transformation (PERSIST)

Boise State University

https://ctl.boisestate.edu/wider-persist

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Project Summary

Boise State University's Promoting Educational Reform through Strategic Investments in Systemic Transformation (PERSIST) project is focused on fundamentally changing how STEM courses are taught by applying a change model (Dormant's CACAO Model) to propagate the use of Evidence-based Instructional Practices (EBIP) among STEM faculty, departments, and curricula at Boise State while assessing the impact of increased use of EBIP on student learning and retention. The project uses a range of strategies to reach across college and departmental boundaries to provide leadership for shifting teaching norms to support the exploration and implementation of EBIPs. This includes Faculty Advocates for STEM Transformation (FAST) Team members who are department liaisons and promote dialogue around teaching and learning within their department, Partner Projects where individuals or groups of faculty are empowered to redesign courses to include EBIPs, Communities of Practice to support ongoing use of particular pedagogies, and much more. Project assessment and evaluation activities are measuring institutional changes, supporting pedagogical reform, and driving continuous improvements in teaching. The ultimate impact of the project will be 1) increases in STEM majors and bachelor's degrees, especially among women and other underrepresented groups in STEM, 2) persistence in STEM disciplines, and 3) a university culture that sustains long-term efforts of continuous improvement in STEM pedagogy. Boise State's PERSIST is providing a testing ground for how to drive institutional change in teaching practices.

Project Description

PERSIST is a Boise State project in the National Science Foundation WIDER program, which stands for Widening Implementation and Dissemination of Evidence-based Reforms. WIDER aims to substantially scale up evidence-based instructional practices (EBIPs). WIDER's ultimate goals are improved student learning and retention, and increased number and graduation of STEM (science, technology, engineering and mathematics) majors, including under-represented students. Boise State PERSIST extends WIDER's goal across the university.

PERSIST Vision Statement: The culture of teaching and learning at Boise State will be characterized by
- Ongoing exploration and adoption of evidence-based instructional practices
- Faculty engaged in continuous improvement of teaching and learning
- Dialogue around teaching supported through a community of practice

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•   Teaching evidenced and informed by meaningful assessment

The fulfillment of this vision will enhance our learning-centered culture and will result in increased student achievement of learning outcomes, retention, and degree attainment; especially among underrepresented populations.

The Use of a Formal Change Model: Affordances and Challenges

In order to accomplish NSF's goal of transforming institutions to support STEM faculty's adoption and use of evidence-based teaching and learning practices[2] at our institution, PERSIST is adapting the CACAO Model for change, a theory-based change model originally developed to support organizational change in business environments.[3] We chose this model in large part because we had campus expertise in it use and our team could see how it would help us frame the work we wanted to do.

The CACAO model has helped frame our work in the following way:

- The model prompted us to be clear about the change we sought, which led us to create a vision statement (below). This allowed us then to use this statement to ground and guide our efforts and also formed the foundation for our communication strategy (see next section for more about this).
- The model led us to collect departmental data which allowed us to see barriers and drivers to achieving the vision at both the departmental and institutional level. While some barriers and drivers are similar across departments, there are many distinct differences between departments. These nuances are significant enough to have guided us to use a combination of strategies, some of which have been tailored to each department.
- The model helped us to identify the different types of actors who needed to be engaged in the institutional transformation process. We have observed that strong departmental opinion leaders and change champions are critical in our efforts. Departments with faculty who can play these roles appear to make more progress toward our vision. The identification of different actors directly impacted our data collection and communication strategy
- The model incorporated useful theories that helped us to see that there are different stages and rates of adoption among individual and groups of faculty. Faculty at different stages have different needs, and strategies should be adopted accordingly to reach different populations of faculty.

However, since the CACAO model was developed to be used in a business setting, we needed to make adaptations for it to work in our academic context:

- The model specifically provides signals for when a leadership team should abandon (or not venture into) a transformation project because it may not be completely successful. In our

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[2] National Science Foundation. (2006). Widening the Implementation and Demonstration of Evidence-based Reforms: Program Solicitation. Retrieved from https://www.nsf.gov/pubs/2013/nsf13552/nsf13552.htm.

[3] Dormant, D. (2011). *The chocolate model of change*. San Bernardino, CA: Author.

setting, once you receive funding, you proceed even if the foundational cultural work has not been completed. Further, we see that incomplete progress toward our goal is still progress.

- In a business setting, there are more direct ways to achieve buy-in amongst the employees and others who are impacted by the proposed change. In the academy, the levers of change are subtler and in this context working with tenured faculty requires more time and coaching. Therefore, relationship building, embedding teams within departments, and allowing a higher level of individualization for how the change will proceed are all necessary elements of the transformation process. Here is an example: As part of our efforts to nucleate activity within each department, we engaged a department liaison from each STEM department. These individuals, members of the "FAST team" (Faculty Advocates for STEM Transformation), were charged with communicating information between their department and the larger project, as well as stimulating dialogue and explorations of teaching practices. While the CACAO change model suggested the Leadership Team, as the primary change agents, should create an action plan to help adopters learn about and incorporate changes, we chose to direct action planning at the department level by supporting FAST Team members to work with their chairs and other faculty to create action plans to promote dialogue and exploration within the department around teaching, learning, assessment, and EBIPs.

Project Initiatives
The project uses a range of strategies to reach across college and departmental boundaries to provide leadership for shifting teaching norms to support the exploration and implementation of EBIPs. This includes Faculty Advocates for STEM Transformation (FAST) Team members who are department liaisons and promote dialogue around teaching and learning within their department, Partner Projects where individuals or groups of faculty are empowered to redesign courses to include EBIPs, Communities of Practice to support ongoing use of particular pedagogies, and much more.
Faculty involved in funded projects serve as leaders in stimulating change in the teaching culture within their department or unit. This can include sharing ideas, knowledge, and best practices regarding innovating teaching practice with colleagues and by participating in brown bags, workshops and other venues.
Due to this need for greater attention to relationship building and embedded projects that met the needs of the individuals in the different departments, the communication strategy for the project was of utmost importance. There were several elements of this strategy:

- *Continued, high level engagement:* The leadership team has met nearly every week for four years, facilitating the process of keeping this work "front and center." This also allowed the Deans on the team to integrate the vision message into everything else they did – from working with departments and individual faculty to their work on university-wide efforts (like promotion and tenure policies, faculty offer letter templates, and program review processes). In every setting, campus constituents heard about the PERSIST project and its vision and activities.

- *Department meetings:* The project team met with the faculty of each STEM department to collect data about their perceptions of barriers and drivers pertaining to the change.

However, beyond data collection, these meetings served to communicate with all STEM faculty the elements of the PERSIST project and its goals.

- *Calls for projects and funding opportunities:* After articulating our vision of change and collecting data related to faculty's perceptions of barriers and drivers pertaining to the change, we began to identify initial strategies that would help create momentum toward the change. For example, faculty reported "time constraints" as a barrier to change. Thus, faculty were invited to submit proposals outlining projects focused on adopting EBIPs in a particular course or department and then PERSIST would buy the faculty's time so they could complete their project. These "Partner Projects" have engaged over 125 faculty (~30% of STEM faculty), impacting 62 courses and 3,500+ students.

- *Town Hall Meetings:* As the project past its midpoint, the leadership team held town hall meetings to learn from the STEM faculty and administrators where they felt more resources and attention were needed. Once again, while this was advertised and served as a data gathering exercise, it also was a communication event where the faculty were reminded of the PERSIST vision and goals.

Context

For more than a decade, there have been efforts to support effective teaching in STEM at Boise State. Over this time, activity moved from being focused mostly in engineering, to activity which built partnerships between and among faculty and leaders in engineering, math, science, and our Center for Teaching and Learning, and broadened to focus on the success of all STEM students. The most immediate foundation for the current project was laid by focusing on faculty development and course design as part of an NSF-funded STEP award. However, while previous efforts had been focused on specific programs (e.g., faculty learning communities), our current project, PERSIST, focuses on using a change model to shift culture around teaching and learning.

The challenges facing our institution that led to the PERSIST project include low student persistence in STEM disciplines, and high drop, fail, and withdrawal (DFW) rates in STEM courses. The PERSIST team decided to address these challenges by working to create an environment that shifted the dialogue around STEM teaching and learning, and enabled faculty exploration and adoption of evidence-based instructional practices (EBIPs). EBIPs have not only been shown to facilitate learning more effectively, compared to a traditional lecture for students in general, but also significant increases in student success for underrepresented minorities and women have been documented.[4],[5] It has been our goal that these efforts are synergistic with other efforts to support students of diverse backgrounds on our campus.

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[4] Snyder, J., Sloane, J. D., Dunk, R. D. P., and Wiles, J. R. (2016). Peer-led team learning helps minority students succeed. *PLoS Biology*. Retrieved from
http://journals.plos.org/plosbiology/article?id=10.1371/journal.pbio.1002398

[5] Rath, K. A., Peterfreund, A., R., Xenos, S. P., Bayliss, F., and Carnal, N. (2007). Supplemental instruction in introductory biology I: enhancing the performance and retention of underrepresented minority students. *CBE- Life Sciences Education*, 6, 203-216.

Prior to the initiation of the current project, the PERSIST project team had built successful working relationships in the context of a number of other initiatives, including STEM student success efforts, as well as campus general education reform. The team was originally comprised of the Director of the CTL (and faculty in chemistry), the Deans of Arts & Sciences and Engineering, and faculty/staff from geosciences, psychology, and mathematics. In addition, the team welcomed a colleague from our "Organizational Performance and Workplace Learning" program with expertise in the change model we selected for our project. Over time, we added a Project Manager to the leadership team. Department chairs and faculty members have been engaged in the transformation through various project-related activities (see below).

Beyond the team composition, the strong relationships built prior to the start of this project have helped keep the project team engaged for the past four years. Further, the fact that the project team included several institutional leaders, who are well respected on campus, created initial momentum, which also helped to keep the project team motivated. Lastly, all project team members view the work being done on the project as critical to the university's success and therefore, it is naturally part of their role at the institution to contribute to the project and sustain engagement.

Evaluation

Faculty Practice

We survey faculty annually to track faculty teaching practice, indicators of institutional climate, and individual's stage of EBIP adoption using the following instruments: the Postsecondary Instructional Practices Survey (PIPS)[6], the Current Instructional Climate Survey (CICS), and the EBIP Adoption scale. The latter two instruments were developed as part of our project. Four years of data for PIPS and CICS show positive trends in changes to faculty practice; the EBIP adoption scale has only been used once so far. Finally, we are also using the Classroom Observation Protocol for Undergraduate STEM (COPUS)[7] to collect snapshots of current teaching practices. COPUS data, thus far, show that on average faculty are using active learning for 37% of the time in a given class period.

Student Success

We use institutional data and reports to assess the overall impact on student success with an emphasis on underrepresented minorities and women. Common measures of student success include Drop, Fail, and Withdrawal rates, pass rates between critical course sequences, student persistence within disciplines, retention, and degree attainment. For example, Computer Science (CS) faculty incorporated Team-based Learning (TBL) into the first introductory course in a three-course sequence. With the help of the Data Team (a collaborative multi-unit team created by this project and charged with helping faculty assess teaching) we were able to demonstrate increases in

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[6] [3]Beach, A. L., Henderson, C., Walter, E. M., & Williams, C. (n.d.). *Post-secondary Instructional Practices Scale* (NSF #1256505). Kalamazoo, MI: Western Michigan University.

[7] Smith, M. K., Jones, H. M., Gilbert, S. L., & Wieman, C. E. (2013). The Classroom Observation Protocol for Undergraduate STEM (COPUS): A New Instrument to Characterize University STEM Classroom Practices. *CBE- Life Sciences Education, 12*, 618- 627.

student success. The adoption of TBL in CS resulted in nearly a 10% increase in pass rates as well as a 12% increase in pass rates for the subsequent course in the sequence for students who had the TBL classes compared to those students who did not. These results led all other faculty who teach in the course sequence to incorporate TBL in their courses. In addition, assessment of a project to reform Calculus I yielded decent gains in post calculus retention for students who took the reformed Calculus courses. These gains were especially prominent among women and URM students in STEM fields[8]. These results indicate that our project is not only addressing student success rates, but it is also creating classroom conditions that support diversity and inclusion.

Institutional Culture around Teaching
In addition to the framing of our project that emerged from the CACAO Model, we have also used the four-quadrant model (Henderson, Beach, and Finkelstein, 2010)[9] to help us consider the strategies we are using. This analysis revealed that we had relatively few strategies that were related to policy which subsequently led the team to discuss the impact of current policies as they related to our vision and identify additional strategies focused on aligning institutional policies and our project goals.

Changes in institutional policies and procedures now provide evidence of our project's impact on the institutional culture around teaching. For example, new faculty candidates in engineering, science and math are now specifically asked about their current teaching practices and experience with EBIPs. Further, all offer letters for tenure track faculty members now include the following: "Faculty members are expected to adopt evidence-based instructional practices, develop and demonstrate twenty-first century teaching methodologies…" And finally, one college has revised their tenure and promotion policy to require the departmental review process to incentivize and reward experimentation with and implementation of EBIPs, and other colleges are beginning to follow suit.

Challenges

Maintaining Momentum
The CACAO model uses Rogers' *Diffusion of Innovation* to describe how the adoption of innovations spreads through a population starting with innovators, then early adopters, early majority, late majority, and finally reaches the traditionalists. Further, the CACAO model builds on Rogers' Diffusion of Innovation to describe the typical stages through which individuals move as they adopt a change: awareness, curiosity, mental tryout, hands-on tryout, and finally adoption/use. The first few years of our project seemed to connect most easily with faculty already in the mid-late stages of

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[8] Bullock, D., Callahan, J., Cullers, J. (2017). Calculus Reform -- Increasing STEM Retention and Post-Requisite Course Success While Closing the Retention Gap for Women and Underrepresented Minority Students. Paper presented at 2017 American Society for Engineering Education Annual Conference. Columbus, OH.

[9] Henderson, Beach, & Finkelstein. (2010). Facilitating change in undergraduate STEM instructional practices: An analytic review of the literature, *Journal of Research in Science Teaching, 48*(8), 952-984.

adoption. Currently, our team is focused on reaching those faculty in the awareness and curiosity stages to support their movement to the next stage. It is challenging to identify and implement strategies that specifically focus on moving faculty along the adoption curve who are not engaged by our vision for teaching and learning. While some are resistant, there are many that simply chose to put their time and effort into other faculty activities.

Sustainability

In addition, we are committed to continue our efforts and maintain momentum toward our goals, which requires components of our project to be institutionalized. At this point we have been successful in institutionalizing parts of our project, specifically programing that targets various stages of adoption; for example, the CTL will take over the administration of our teaching visits program which targets individuals in the curiosity and mental tryout stages by providing faculty an opportunity to watch one of their colleagues teaching with EBIPs. However, there are other important components of the project that we are still working to institutionalize (e.g., how to incorporate student success reports created by the Data Team into the institution's Program Assessment efforts).

Figure 1. Logic Model for Boise State PERSIST incorporating CACAO Change Model

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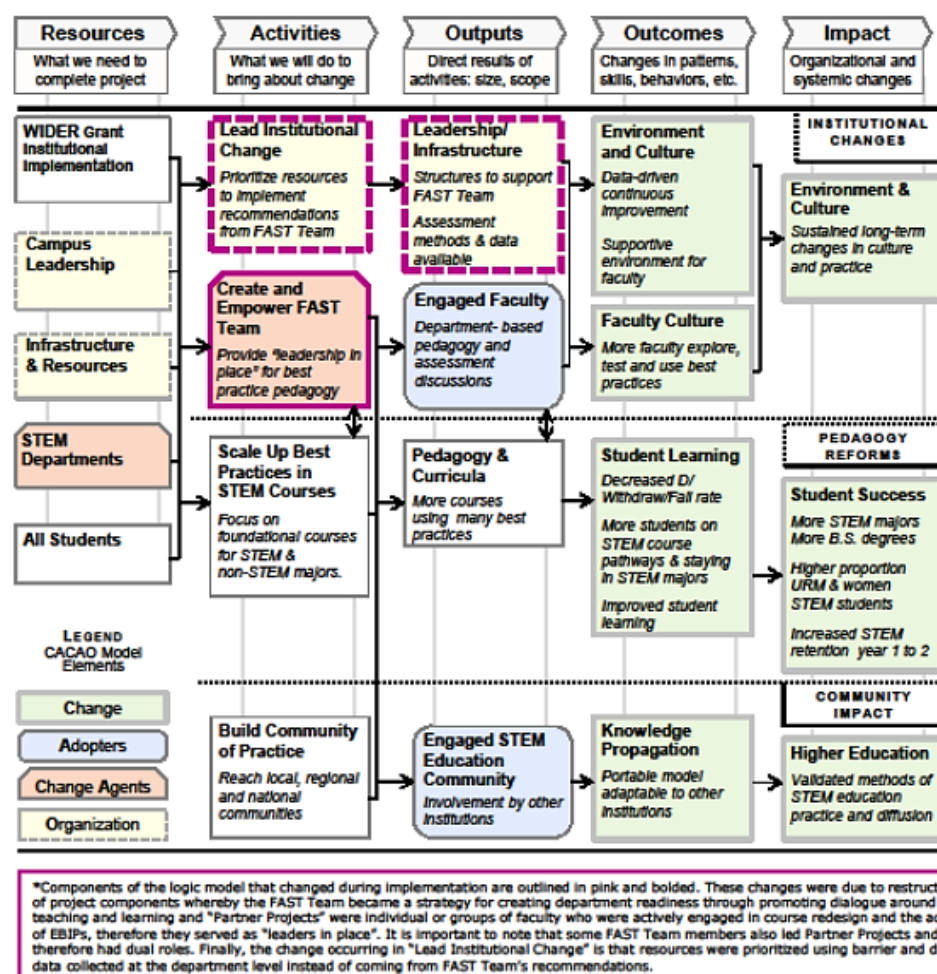
The Ohio State University

Strategies for Recruiting and Engaging Students with Disabilities in Research Experience for Undergraduates, REU, Programs

The Ohio State University

http://cem.osu.edu/education-and-outreach/reu/reu-summer-2015/

Michelle McCombs, CEM Program Manager, Ohio State University
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Project Summary

The Center for Emergent Materials (CEM), a National Science Foundation (NSF) Materials Research Science and Engineering Center (MRSEC) at The Ohio State University (OSU) works to recruit students with disabilities for engaging Research Experiences for Undergraduates (REUs) through the American Association for the Advancement of Science (AAAS) EntryPoint! program and the Ohio STEM (science, technology, engineering, and mathematics) Ability Alliance (OSAA). The NSF REU seeks to increase students' competitiveness for the next steps in their career through participation in the research program. The program offers training for faculty and mentors, asks faculty to commit to providing a supportive atmosphere for students, and seeks out encouraging graduate students to serve as mentors. Support is available for both the faculty and the student in the lab, and, when necessary, includes the office of disability services to provide accommodations or other needs. Faculty mentoring and appropriate accommodations enable students with disabilities to succeed in science and engineering laboratories.

Training for faculty members includes information about common issues, misconceptions, and resources. Follow up meetings with faculty are held after students have been in their labs for 2-4 weeks. For students with visual impairments or physical disabilities, state vocational services or disability services provided support. In internships, students encounter experimental and theoretical research in physics, chemistry and materials science. Part of their training includes working with sophisticated lab equipment.

The faculty mentors and graduate student/post-doctoral mentors benefit because they have the experience of working directly with the student in the program and are exposed to a research perspective completely different from what they have experienced. The Center benefits by building a network outside of Ohio State though national partners while increasing the diversity of the program. The participating students gain a research experience that prepares them to be competitive when applying to graduate school in STEM fields, or when applying for jobs upon graduation.

To date, CEM has had 10 differently abled students complete our research program. Two students are currently in graduate school, three are in careers in STEM fields, four are still at their undergraduate institutions and there is one for which we do not have current data.

Description

CEM runs both an academic year and summer research program. The academic year program runs from November throughout the spring semester. The summer program is a 10-week summer internship where students from around the nation are housed on campus. The summer of 2017 is the 8th year for the summer research program. In the fall of 2014, the Academic Year research program transitioned from a larger program which placed 8 students from both OSU and a neighboring community college in the Columbus area to a smaller program focusing on building the partnership with the community college, and only accepting 3 students per year from the community college.

For the summer program, students apply in early February, are accepted in early March, and the program begins mid-May. For students with disabilities, we ensure they have the information to reach out to the office of disability services. The program coordinator also speaks directly with them (or a guardian) regarding any accommodations they may need. Once a student has been accepted to the program, the selection committee identifies a mentor that would be a good academic and personal match. For students with disabilities, if the student declared the disability on the application, the faculty mentor is informed so they can participate in training or request any resources if they feel they need to.

Ten students with declared disabilities completed the summer and academic year program. Some of these students participated in multiple programs within CEM. These students had a variety of abilities ranging from emotional to learning to physical and others were specifically health-related. These students thrived in a variety of research environments, both theory focused, and experiment focused disciplines/ See figure 1 for details.

Figure 1. Laboratory Assignments in CEM REU
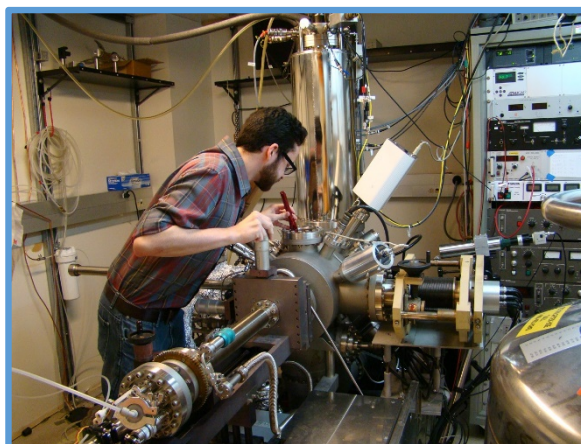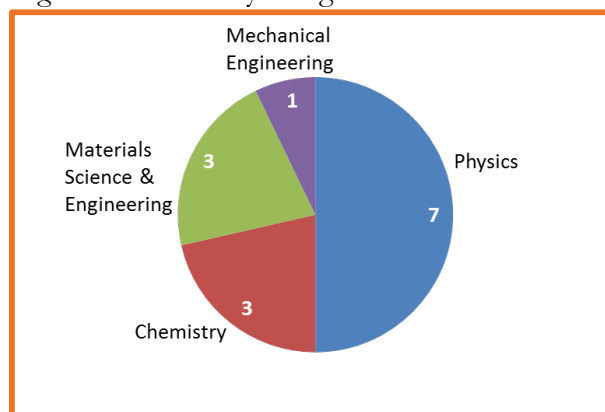
Context

The CEM was funded in 2008. As an NSF Center, a significant portion of the budget is dedicated to Education and Outreach. One of the most successful programs that NSF supports and requires each center to run is a REU program to provide undergraduates with research experiences in preparation for graduate school. Since the Center began, those working to organize the REU program have strived to include students with disabilities. The first education program coordinator, Christopher Andersen, has been instrumental in spearheading and continuing to support this effort. Chris had direct ties to the OSAA program on campus as well as the AAAS EntryPoint! program and worked

to recruit students with disabilities through these programs. As the work load became more demanding for this position, a new education coordinator, Michelle McCombs, was brought in full time and Chris transitioned elsewhere on campus, but maintained ties to CEM to help continue the process of recruiting and engaging students with disabilities in the outreach programs.

OSAA was a program on OSU's campus that provided a variety of resources for students with disabilities in STEM fields, including help placing them in research internships. OSAA is no longer funded, so our primary partner at this point is EntryPoint!. EntryPoint! has a program coordinator that works to place students with disabilities in summer internships nationwide. CEM has worked with EntryPoint! to identify the type of students that best fit our program requirements, and this has been an evolving relationship over the past few years. There has been great success with this partnership and for the last three summers CEM has accepted at least one student from this program per summer for our research internship.

Evaluation

The evaluation done has been predominantly program evaluation, pre and post surveys for both the academic year and summer programs. During the summer, weekly professional development workshops are offered to build students scientific presentation skills as well as networking opportunities and other activities to help their professional growth. There are surveys completed after each session, but they are anonymous, data does not show how these workshops specifically impacted the students with disabilities.

Last summer, CEM conducted an interview with the students for more specific program feedback. CEM requested feedback from faculty mentors as well as graduate student mentors, but most of that feedback has been through informal conversations.

Challenges

Challenges or barriers to systemic change include physical infrastructure, faculty and student perceptions, and succession issues.

Physical Infrastructure

One of the biggest challenges is the physical infrastructure of the university. In the summer 2014 program a student accepted for a materials science research experience had a physical disability and was in a wheelchair. The program coordinator met with the office of disability services and the faculty mentor that was planning to work with this student. They assessed physical accommodations that would have to be made and determined that it would cost too much to bring an older building up to compliance for this student. The solution was to place this student with another faculty member, who was working in a newer building that already met the requested accommodations.

Faculty Perceptions

Some faculty initially had reservations about incorporating students with disabilities into their research groups. These included personal bias and apprehension of having someone with a disability in the lab. Depending on the disability, there may have been an initial perception that the student cannot do the work for safety reasons or even simple tasks such as physically maneuvering around equipment in the laboratory. Since CEM has been doing this for several years and provides

resources as needed, faculty seem to be much less concerned, especially those who have had a student participate in their lab.
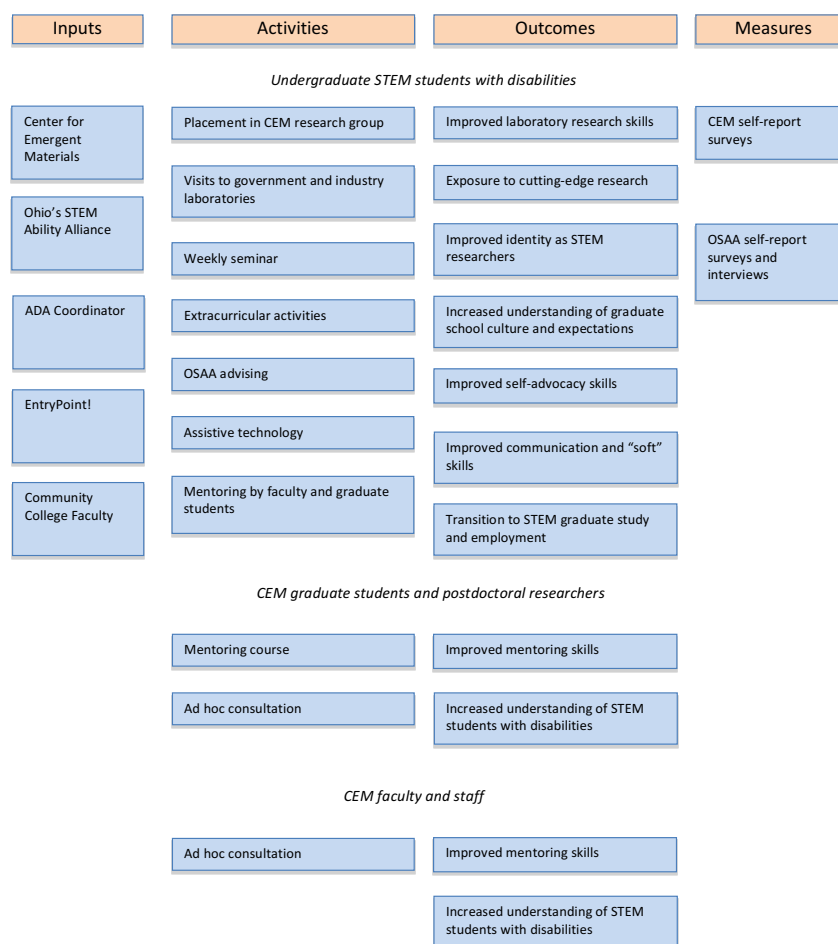
Student Perceptions

Students don't want to disclose their disabilities unless they have to, especially those with "hidden" disabilities. Partly, this is due to lack of self-acceptance of disability, but also fear of professional and personal consequences of disclosure.

Succession of Senior Leadership

Dealing with succession of senior leadership and finding new advocates can be a difficult task. It is great to have a senior administrator (dean, provost, president) as an advocate, but what happens when that advocate leaves? In particular, an administrator who was the fiscal advocate.

Center for Emergent Materials REU Program Logic Model

Inputs	Activities	Outcomes	Measures
Undergraduate STEM students with disabilities			
Center for Emergent Materials	Placement in CEM research group	Improved laboratory research skills	CEM self-report surveys
	Visits to government and industry laboratories	Exposure to cutting-edge research	
Ohio's STEM Ability Alliance	Weekly seminar	Improved identity as STEM researchers	OSAA self-report surveys and interviews
ADA Coordinator	Extracurricular activities	Increased understanding of graduate school culture and expectations	
	OSAA advising	Improved self-advocacy skills	
EntryPoint!	Assistive technology	Improved communication and "soft" skills	
Community College Faculty	Mentoring by faculty and graduate students	Transition to STEM graduate study and employment	
CEM graduate students and postdoctoral researchers			
	Mentoring course	Improved mentoring skills	
	Ad hoc consultation	Increased understanding of STEM students with disabilities	
CEM faculty and staff			
	Ad hoc consultation	Improved mentoring skills	
		Increased understanding of STEM students with disabilities	

ASCN

University of Southern Mississippi

# Cross Institutional Synergy for Women Scientists

University of Southern Mississippi

www.GulfCoastADVANCE.org

Julie Cwikla, Director of Creativity & Innovation in STEM, Office of the Vice President for Research, University of Southern Mississippi

Project Summary

The University of Southern Mississippi's Gulf Coast ADVANCE partnership was forged to (1) Highlight, promote, and encourage the scientific research and accomplishments of 145 STEM women faculty members across four institutions. (2) Curb the isolation women experience in their work by gathering a critical mass of STEM women in the region to serve as a professional support and collaborative network. And (3) Begin conversations to transform the cultural and institutional landscapes so that work-life integration issues for women and families are addressed to shape a healthier, more productive environment for all scientists. Gulf Coast ADVANCE is in its a fourth year and continues its activities, mentoring, brown bag lunches around issues for women in STEM, and policy discussions. Some of leadership team members are in the process of developing the next ADVANCE proposal that would support the same partners, but expand reach and focus specifically on policy work and professional support for leadership around faculty recruitment, tenure review, and retention.
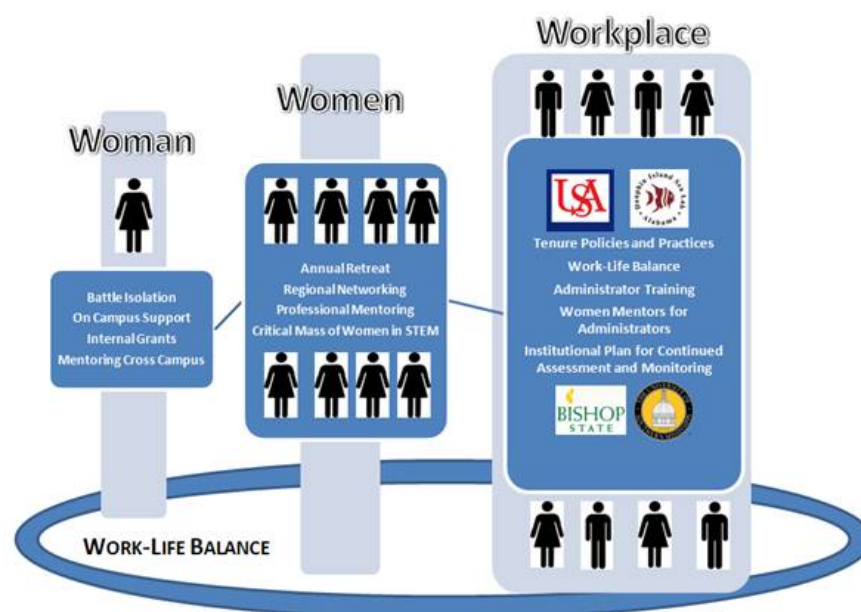
Project Description

The University of Southern Mississippi's Gulf Coast ADVANCE partnership includes the University of Southern Mississippi Gulf Coast campus, the Dauphin Island Sea Lab, Bishop State Community College, and the University of South Alabama. Gulf Coast ADVANCE is just wrapping up a four-year program. Some ADVANCE activities, mentoring, brown bag lunches around issues for women in STEM, and policy discussions are ongoing. $20,000 in Fellowships are given annually. Gulf Coast ADVANCE Fellowships are intended to support women the careers of women STEM faculty across the four Gulf Coast partner institutions. Examples of projects that may be funded include: (1) attending conferences, workshops, or seminars to enhance professional skills, (2) purchasing supplies, equipment, software, or library resources to enhance course development or research, (3) collaborating with a noted scholar, scientist, or educational expert, (4) supporting page charges and other publication costs associated with refereed articles and books accepted for publication by reputable presses, (5) covering costs of pilot research projects.

Some of our leadership team members are in the process of developing the next ADVANCE proposal to support the same partners, but expand to more campuses and focus specifically on policy work and professional support for leadership around faculty recruitment, tenure review, and retention. The next steps include training and professional development for mid and upper level administrators, invited speakers and panelists to address equity issues and financial impacts, a full analysis of current policies with external coaching, among other initiatives.

Context

When Cwikla (PI) was serving as a STEM Center Director at the University of South Alabama she began thinking about ways to support junior women faculty at both USA and USM her former institution. The NSF ADVANCE program has existed for decades and the corpus of work and knowledge around STEM women in the academy is significant. Despite what research tells about supportive work environments for women and families, when women work in departmental isolation, in many cases as the only woman in a department it makes feelings of inclusion and

belonging hard to grasp. Cwikla initiated the partnership while at the University of South Alabama as Founding Director of CISSTEM (Center for Integrative Studies in STEM). This new position was developed to stimulate relationships across STEM colleges and the College of Education as well as community partnerships. With past relationships for 10 years at the University of Southern Mississippi as well as other institutions through STEM outreach programs along the Gulf Coast, the timing was appropriate, the need severe, and the professional relationships in place to begin activities and conversations around women in STEM. Upon her return to USM, she remained PI and the partnership continued to flourish.

Evaluation

An external evaluation firm Education Design Inc. in Boston collected quantitative and qualitative data over the course of four years. These included surveys, event observations, and interviews with institutional leaders, program leadership, faculty participants, and invited speakers. Program impacts and suggestions for next steps are included in the annual and final reports to the NSF. sometimes decided at the IHL level.

Challenges

The challenge as with many programs around diversity is how to: (1) maintain the "stickiness" of effective programs and at the same time grow new training systems, (2) identify and bring the change agents to the table, and (3) eventually change policies, which at a state institution are In addition to these local social challenges, Mississippi and Alabama are southern states nested in a southern culture which has implications for women as does the financial duress both states and hence their institutions face.