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

University of South Florida

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.

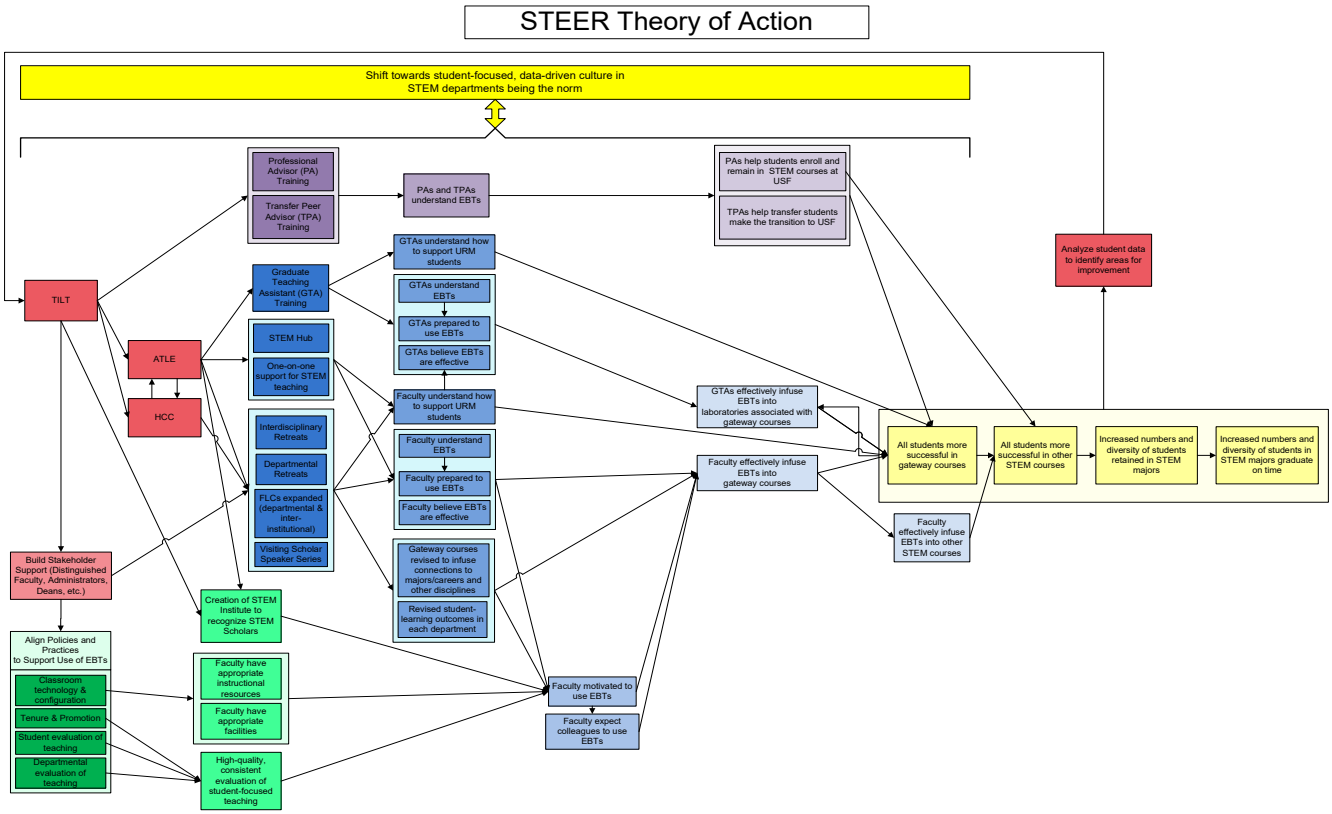
STEER is guided by a well-connected, influential, and knowledgeable leadership team and has a strong support and advice from a highly respected and engaged external Advisory Board, and regular formative advice from Horizon Research evaluators.

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.

[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

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