

## **Board 22: Systemic Transformation of Evidence-based Education Reform (STEER)**

### **Prof. Scott W Campbell, University of South Florida**

Dr. Scott Campbell has been on the faculty of the Department of Chemical & Biomedical Engineering at the University of South Florida since 1986. He currently serves as the department undergraduate advisor. Scott was a co-PI on an NSF STEP grant for the reform of the Engineering Calculus sequence at USF. This grant required him to build relationships with engineering faculty of other departments and also faculty from the College of Arts and Sciences. Over the course of this grant, he advised over 500 individual calculus students on their course projects. He was given an Outstanding Advising Award by USF and has been the recipient of numerous teaching awards at the department, college, university (Jerome Krivanek Distinguished Teaching Award) and state (TIP award) levels. Scott is also a co-PI of a Helios-funded Middle School Residency Program for Science and Math (for which he teaches the capstone course) and is on the leadership committee for an NSF IUSE grant to transform STEM Education at USF. His research is in the areas of solution thermodynamics and environmental monitoring and modeling.

### **Dr. James Franklin Wysong Jr, Hillsborough Community College**

Dr. James Wysong has served as the Dean of Associate of Arts (Mathematics and Sciences Division) at the Dale Mabry Campus of Hillsborough Community College since August 2013. The division encompasses the biological and physical sciences, college-level mathematics, and developmental mathematics programs. In addition, Dr. Wysong is Co-P.I. on the NSF - STEER Grant in partnership with the University of South Florida, and has oversight of the Title III HSI STEM grant – Math Success, a \$5.9 million, 5 year award. Dr. Wysong is also a Co-P.I. on the NSF - LSAMP grant - "Tampa Bay Bridge to Baccalaureate."

Dr. Wysong's academic background is in the Geosciences. He earned his undergraduate and Master's degrees from the University of South Florida in Tampa, Florida. He also holds an Ed.D. in Higher Education Leadership from the University of the Cumberland in Williamsburg, Kentucky. His dissertation topic was: Developmental Mathematics Education Reform Initiatives in Florida: Impacts, Consequences, and Changes at a Large Metropolitan Community College.

### **Prof. Peter Stiling, University of South Florida**

Dr. Stiling is currently Assistant Vice provost for Strategic Initiatives at the University of South Florida and leads the University STEM Collaborative. He is also Director of the USF in London Summer Programs and Director of the USF Office of Sustainability. Dr. Stiling is an ecologist by training and was formerly Chair of the Department of Integrative Biology.

### **Dr. Gerry G. Meisels, University of South Florida**

Dr. Gerry Meisels is a native of Vienna, Austria. He received his Ph.D. at the University of Notre Dame and worked for Gulf Oil and Union Carbide before joining the faculty at the University of Houston in 1965. He became department chair in 1972, and moved to the University of Nebraska-Lincoln in 1975, where he became Dean of Arts and Sciences in 1983. He joined the University of South Florida as Provost in 1988, a position he held until 1995 when he established the Coalition for Science Literacy. He continues to serve as its Director. He has worked on strengthening Science education in both the K-12 and post-secondary environments, and has led the development of the project "Systemic Transformation of Education Through Evidence-based Reforms", which he submitted to NSF; it was approved by NSF in 2015 (NSF-DUE 1525574). He now serves as PI of this 5-year, \$3,000,000 IUSE project that seeks to get faculty in a research intensive university to adopt evidence-based teaching practices, and to change the system to one that values and rewards both teaching and research, with an end result of increasing graduation rates and numbers in the STEM disciplines

### **Dr. Robert L Potter, University of South Florida**

Robert Potter is Senior Associate Dean for Academics and Professor of Chemistry in the College of Arts and Sciences at the University of South Florida (USF). He has been actively involved in promoting more effective STEM instruction K-16 for over 20 years. As such he led or co-led multiple collaborative National Science Foundation and Department of Education funded projects to improve student outcomes in STEM. The most recent being the NSF funded "STEER" project (Systemic Transformation of Education Through Evidence-based Reforms) DUE 1525574 , a partnership between USF and Hillsborough Community College aimed at changing the culture of STEM teaching in a research intensive institution to achieve improved student success.

## Systemic Transformation of Evidence-based Education Reform (STEER)

It is generally accepted that a growing fraction of U.S. job openings will require STEM competency [1-3]. However, while the number of bachelor's degrees awarded in STEM disciplines has increased over the past ten years [4], the retention of students in these programs is still quite low (less than 40%) [5]. While some students leave a STEM major because of poor academic performance, many have grade point averages that are as high as those of students who stay in their major [6]. This latter group leaves for a variety of reasons, including lack of self-confidence [7-8], and lack of engagement with faculty and other students [7]. However, a significant fraction leave because they are dissatisfied with the instruction they receive [9].

Here, we report on a project (STEER) that uses a multi-pronged approach to improving STEM instruction at University of South Florida - a large, research intensive, university. Goals of the project are to increase student retention and preparation in STEM by incentivizing faculty and graduate students to apply evidenced-based teaching (EBT) methods in their teaching and to foster a culture within academic departments that values a balance between student-centered instruction and research. The five-year, NSF-IUSE (Improving Undergraduate STEM Education) implementation project is in its fourth year and follows upon an NSF-WIDER (Widening Implementation & Demonstration of Evidence-Based Reforms) planning grant.

University of South Florida (USF) has a student population of approximately 31,000 undergraduate and 11,000 graduate students. About 35% of the undergraduate students major in a STEM discipline (Biology, Chemistry, Physics, Math, Geosciences, or Engineering). Approximately half of the undergraduate students have transferred from another institution and about half of these have come from one of the five primary campuses of Hillsborough Community College (HCC).

The leadership team for the project consists of twelve to fifteen people (some members rotate in and out) and includes deans, department chairs, faculty, professionals from the office of teaching and learning, a director of advising, and a member of the Provost's staff. The external advisory board is comprised of seven nationally and internationally recognized experts in STEM education and institutional change and project evaluation is conducted by Horizon, Inc. The STEER team has developed a synergistic approach to meeting the project goals that includes student and faculty support mechanisms, revamping of relevant university policies and facilities, and building a case for change within the university community. The structure of the project is described below along with details about the individual components.

### **Promotion and facilitation of evidence based teaching methods**

As the major goal of the project is to improve STEM education, many of the thrusts involve promoting and facilitating adoption of effective instructional strategies and methods, including use of flipped classrooms, learning assistants, clickers, inquiry-based learning, group activities and others. The mechanisms described below focus on faculty or graduate students at the individual level:

*(a) Course redesign*

STEER provides grants to faculty who propose adopting an EBT method for a particular course. Grant funds typically are used for summer salary but can also be applied to support graduate and undergraduate assistants and to purchase materials. Proposals are reviewed by the leadership team, who offer constructive suggestions to instructors selected for funding. Proposers who receive funding are required to submit a report after implementation. Twelve such course redesigns have been funded and include a flipped classroom approach in an introductory Biology course, introduction of clickers into General Chemistry I and adoption of peer-led learning in Chemical Engineering Computations.

*(b) Department level program*

The department level program was adopted in the third year of the project on the recognition that department chairs often had the best vantage point for determining the instructional needs of a department. In this thrust, a department chair recommends to the STEER leadership team a faculty member who is interested in adopting an EBT method. The faculty member is paired with a mentor (another faculty member) who already uses that method and is coached by the mentor through implementation. Graduate assistant support is provided to the adopting faculty to free up time to develop and implement the method and two weeks of summer salary are provided to the mentor. Four faculty were supported during the third year of the project including two in Integrative Biology (IB), one in Cell Biology, Microbiology and Molecular Biology (CMMB) and one in Chemistry. The common theme among all four redesigns is to introduce active learning methods into a course. For example, one instructor is adopting a CURE (Classroom Undergraduate Research Experience) approach in a Microbial Physiology Laboratory course and another is introducing workstations and group challenges in a Cell Biology course.

*(c) Peer observation program*

Like the department level program, the peer observation program was introduced in the third year of the project. Here, faculty volunteers are placed in groups of three and each member of the group observes a course meeting of each of the other two. In addition, all three group members attend a course meeting of a separate faculty member who uses an EBT method. The goal of this thrust is for each participant to learn (in a non-evaluative environment) more about instruction both as an observer and by being observed. Group composition is interdisciplinary, so that class observers will focus more on pedagogy than on content. A training workshop held at the beginning of the semester incorporates videos and role-playing in coaching participants on how to be effective observers and how to provide collegial and useful feedback. Later in the semester, after all members of a group have completed their observations, each group meets to provide feedback to one another. Finally, each participant submits a reflection paper at the end of the semester. Eleven faculty (including three from Hillsborough Community College) participated during year three and thirteen more are set to participate in spring 2019. Participants are provided a stipend of \$500.

*(d) Training for graduate assistants in laboratory courses*

Prior to the start of a fall semester, three to four days of training are provided to graduate students who are assisting in laboratory courses. The morning sessions are led by STEER personnel who model active learning strategies, classroom management, culturally sensitive teaching and inquiry-based laboratory facilitation. A follow-up meeting later in the semester allows participants to report on their use of these approaches and to seek additional guidance. In fall 2016, sixty-five graduate assistants in Integrative Biology (IB) and in Cell Biology, Microbiology and Molecular Biology (CMMB) participated in the training. Subsequent offerings in 2017 and 2018 were expanded to include Chemistry and Physics. Forty-eight graduate assistants participated in 2017 and fifty-five in 2018.

*(e) Faculty travel grants*

Travel grants are provided by the project to faculty who attend professional meetings for which education is an important component. The utility of this thrust is two-fold: It allows faculty to gain knowledge and skills that will allow them to adopt EBT methods and it allows for dissemination of EBT methods applied at our institution. STEM faculty who wish to apply for a travel grant must submit an application in which they describe how they expect the meeting to shape their approach to teaching. Up to \$1000 may be requested from STEER and a match of at least 25% is required from the applicant's department. By the end of year three, 16 travel grants have been awarded. Recent grantees include a mathematics instructor who wished to learn about advances in the teaching of gateway courses at the John N. Gardner Gateway Course Experience, a chemistry instructor who attended the 2018 Conference in Green Chemistry to learn how to develop a green organic chemistry laboratory, and a geosciences instructor who attended Esri's Southeast Users Conference to receiving training in GIS software that she wishes to introduce in her courses. Recent grantees that presented at meetings include a chemistry instructor who attended the recent Biennial Conference on Chemical Education to speak in the "Discourse Frameworks in Active Chemistry Classrooms" session and an instructor in Chemical Engineering who presented about her use of peer-led learning at the annual meeting of the American Institute of Chemical Engineers.

*(f) STEM Scholar awards*

While there are numerous ways for faculty to be recognized for outstanding research, there are comparatively fewer ways to be recognized for effective teaching. To this end, STEER has instituted a STEM Scholars award at USF with the goal of exemplifying effective use of EBT to university faculty. To receive this award, a nominee must demonstrate the effective implementation of an evidence based teaching strategy. Nominations for the award are solicited from STEM department chairs and from previous award winners and a maximum of four awards are made each year. Award winners (selected by the leadership team) receive an honorarium of \$2000 and funding to present their methods at a local educational conference. By the end of year three, twelve STEM faculty had received STEM scholar awards, representing the departments of Integrative Biology, Cell Biology, Microbiology and Molecular Biology, Chemistry, Computer Science, Mechanical Engineering and Electrical Engineering.

## **Retreats**

The project thrusts described above are most helpful to faculty who are already knowledgeable about EBT and might even have an idea of which method(s) they wish to apply. There are a number of faculty though who have little knowledge of EBT and who must be provided background information before they can think of applying it. To this end, STEER has instituted two different types of faculty retreats:

### *(a) Departmental retreats*

STEER personnel attend departmental retreats at the invitation of department chairs. Typically, they are allowed 1.5 to 2 hours to present an overview of EBT practices and evidence of their validity. After the overview, several practices are generally highlighted including peer led learning, group learning, flipped classrooms, and clickers. In advance of the retreat, STEER personnel meet with the department chair to identify specific content that will meet the department's needs. On occasion, this might result in including a discussion of curriculum mapping and streamlining. By the end of year three, STEER has participated in four departmental retreats including those for Mathematics and Statistics (20 faculty participants), Electrical Engineering (23 faculty participants), Industrial & Management Systems Engineering (16 faculty participants) and a subset of Chemistry and CMMB faculty who teach Biochemistry and/or Biochemistry and Cell Metabolism (5 faculty participants).

### *(b) Interdisciplinary retreats*

The intent of an interdisciplinary retreat is to bring together faculty who teach gateway science and math courses, with the goal of integrating transdisciplinary content between courses - thereby increasing their coherence and relevance to students. Proposals for resulting course redesigns are then developed within follow-up work groups and departmental committees. This approach was used in the 2016 interdisciplinary retreat, which was attended by 34 STEM faculty, including 8 from Hillsborough Community College. The 2017 interdisciplinary retreat had a stronger emphasis on demonstration of EBT methods and discussion of learning science and more strongly encouraged continued collaborations. Of the 38 attendees (10 from HCC), 21 formed interest groups that resulted in the submission of nine course redesign proposals.

## **Support for transfer students**

While advocating and facilitating adoption of EBT methods is a strong focus of STEER, a broader goal is to create a culture of student-centered instruction in our STEM disciplines. This requires a view wider than that of the classroom and includes revision or enhancement of all policies and processes that affect student learning. Here, we address some STEER efforts to assist transfer students. In the next section, we will describe other efforts related to policies and facilities on the USF campus.

Almost half of STEM majors at USF transfer in from elsewhere and about half of these come from one of the Hillsborough Community College campuses. Transferring from a community college to one of the largest campuses in the nation can be a daunting experience and STEER has implemented approaches to allow these transfer students to hit the ground running.

*(a) STEER Peers*

The project has enacted a STEER Peers program in which students who previously transferred to USF are recruited to serve as peer mentors to students currently in the transfer process. STEER Peers are trained by professional advisors in the College of Arts and Science and the College of Engineering and provide advice to transfer students in orientation, course selection, tutoring facilities and admission. These peers also provide advice prior to transfer by skyping with students at HCC or by visiting its STEM Transfer Center. There are typically nine to ten STEER Peers at any time and they work about 10-12 hours per week. In 2017-18, they provided 2140 hours of peer advising including 297 sessions at HCC.

*(b) Course alignment between institutions*

Another way to increase the success of transfer students is to ensure that pre-requisite courses taken at the community college are similar in content and rigor to those taken by students who entered the university as freshmen. During year one of the project, chemistry faculty from USF and HCC met on three occasions to align content and sequencing for the general chemistry and organic chemistry sequences. Eleven to twelve faculty attended each meeting and were evenly split between the university and community college. During years two and three, three HCC faculty, two USF faculty, the USF lab manager and a facilitator met six times to align the Biology I course between institutions.

**Institutional policies and facilities**

Adoption of EBT methods may be hindered by a lack of appropriate classroom facilities and by policies that do not support them. Examples of STEER efforts to address some of these problem areas are given below.

*(a) Student assessment of teaching*

Anecdotal evidence suggests that many students feel that they have learned substantial amounts of new material in active learning classrooms but don't particularly prefer the modes of course delivery to that of a standard lecture. The current instrument used for student assessment of instruction at USF consists of eight items that probe impressions of course delivery and characteristics of the instructor but not impressions of how much students think they have learned. Consequently, this provides a disincentive to adopt EBT methods by faculty who are concerned about the effects of student assessment results on tenure and promotion.

After STEER leadership advocated to the university senate that the assessment instrument be modernized, three members of the STEER leadership team were included in a university committee that was given that charge. Their work is in progress but it is likely that recommendations will include a new set of core questions that probe learning rather than instructor characteristics, allow instructors to add additional questions so that they may receive feedback on new instructional approaches they adopt, and allow for more open-ended responses from students.

*(b) Facilities*

One member of the STEER leadership team serves on a university facilities committee that offers recommendations to revamp classrooms so that they are more appropriate to EBT instruction. So far, two lecture facilities with fixed seating have been converted to a tables/wheeled chairs format. Secondary screens and projectors have been added to two large lecture halls and wrap-around white boards have been added to another classroom.

*(c) Tenure and promotion*

Recently, USF revised its criteria for tenure and promotion. Departments were given more leeway in defining what they mean by outstanding teaching and in deciding how they would assess teaching. Members of the STEER leadership team were active in college and department meetings where these criteria were developed. Subsequently, STEER performed an analysis of the evidence that different departments would use to assess teaching and found a trend towards acceptance of documentation of EBT methods. STEER is developing exemplars (via the STEM Scholars presentations) of these methods to assist faculty in preparing the teaching section of their tenure/promotion applications.

**Building momentum for culture change**

As described earlier, departmental and interdisciplinary retreats are used to provide faculty an exposure to EBT methods and evidence for why these methods are useful. STEER uses other mechanisms to provide this exposure to the larger university community, which includes administrators, advisors, staff, and graduate and undergraduate students, in addition to faculty.

*(a) STEM speaker series*

A seminar series sponsored by STEER features nationally known speakers who disseminate current knowledge about institutional change, EBT methods, and best practices in STEM education to the university community. During their campus visits, speakers meet with faculty and administrators who have a strong interest in the seminar topic and with the STEER leadership team to discuss implications of their work to the STEER project. Some examples indicating the range of presentation topics are:

Dr. Adrianna Kezar; University of Southern California. *STEM Education, Shared Leadership, and You*

Dr. George Kuh; Indiana University. *Fostering STEM Student Engagement: What Matters*

Dr. Shirley Malcom; Head of Education and Human Resources Programs at American Association for the Advancement of Science (AAAS). *Undergraduate STEM Education: Moving Diverse Populations from the Margins to the Center*

Dr. Linda Slakey; Senior Advisor for the Association of American Universities (AAU) STEM Initiative, former Director Undergraduate Division National Science Foundation (NSF). *Making Student-Centered Teaching the New Normal: Are We at a Tipping Point?*



Dr. Melanie Cooper; Michigan State University. *Evidence-Based Approaches to STEM Education*

Dr. Noah Finkelstein, Professor of Physics at the University of Colorado Boulder. *Taking a Scholarly Route to Institutional Transformation: Theory, Practice, and Tools to Support Educational Improvement.*

Dr. Keith Weber, Professor of Mathematics Education at Rutgers University. *Reasons Why Students Do Not Learn STEM Practices from Their Lectures*

Dr. Marco Molinaro, Assistant Vice Provost for Educational Effectiveness at University of California Davis. *Using Data to Inform, Drive and Scale (STEM) Instructional Reform*

Dr. Davis Jenkins; Columbia University. *Strengthening Community College STEM Baccalaureate Transfer Pathways*

It should be noted that many of the speakers above were invited during the planning phase of the project. Since the implementation phase started in 2016, ten speakers have presented to a total of 386 attendees.

*(b) Provost's STEM workshops*

In spring 2018, the Provost sponsored a workshop on High Impact Practices (HIP) in STEM Instruction. The leader and three members of the planning team were STEER personnel. During the workshop, 120 faculty rotated between sessions focusing on collaborative learning, undergraduate research, internships, community engagement and study abroad. A second workshop is in planning for 2019. It will have five workshops on additional HIPS that were not covered in 2018 and will have two plenary addresses by Nobel Laureate Dr. Carl Wieman.

## **Evaluation**

Project evaluation is conducted by Horizon, Inc., which provides substantial formative feedback to the STEER leadership team. Members of the evaluation team observe workshops, training events, retreats, leadership meetings and the annual advisory board meeting for the project. They conduct surveys and interviews of the leadership team, retreat participants, STEER peers, and attendees of workshops, seminars and training events. They conduct case studies of the extent to which STEER impacts STEM instruction within particular departments and administered a baseline survey on learning-centered teaching strategies to STEM faculty. Some of the feedback presented in their annual reports to the STEER leadership team is summarized below, along with some additional data compiled by the leadership team.

Surveys of eight attendees of the 2017 Interdisciplinary Retreat indicated “overwhelmingly positive impressions” of the experience. Attendees appreciated the organization of the event and the fact that facilitators modelled the behavior they were describing in their presentations. Aspects of the retreat singled out as particularly valuable include an exposure to learning sciences and an opportunity to have informal discussions with colleagues in other departments or at other institutions. All interviewees planned to introduce into their courses a concept or method that they learned about at the retreat. Suggestions for improvement included a slower

pace that allowed more time for informal discussion and one or more follow-up events so that participants could report on implementations they made in their courses.

Interviews of eight participants in the first offering of the peer observation program indicate that all thought positively of the experience. There was general satisfaction with the training session and several specifically mentioned that the videos and role-playing were useful. Five specifically indicated that the opportunity to observe an EBT method in practice was valuable. Most, but not all, thought that the feedback they received from their group members was helpful and that the feedback they provided was appreciated. All interviewees indicated that they expected to make changes to their teaching based on the experience and several had already done so.

Surveys of 45 participants in the training program for graduate laboratory assistants indicate general satisfaction with the training, with 90% moderate to strong agreement that the facilitators discussed and modelled effective teaching strategies. Role-playing, active learning and classroom management were cited by participants as the most valuable aspects of the training. Suggestions for improvement included allowing additional time for classroom scenarios and role-playing. The evaluation team concluded that the workshop was of high quality but left some participants concerned that they would not be able to apply the knowledge they gained in their courses.

Interviews with five STEER peers indicate satisfaction with the training and support that they received. These interviews also indicated that, beyond their duties described earlier, STEER Peers also addressed with their advisees such topics as undergraduate research, internships, extracurricular activities, and the importance of networking and student organizations. A concern of several was the high turnover in peers due to graduation and they suggested hiring additional peers or perhaps recruiting them as juniors so that they would be available for two years rather than just one. Surveys of students who have been advised by STEER peers at the HCC STEM Transfer Center indicate they were pleased with the experience. Of 175 surveyed students, 100% indicated that their questions were answered and the average level of satisfaction was 4.9 on a five-point scale.

The evaluation team conducted a review of course redesign proposals from the first round of submissions and concluded that the somewhat open-ended nature of the request for proposals was useful for increasing faculty buy-in and ownership but resulted in several submissions for which the proposed interventions were not central to the project goals. Their report also indicated that details were sometimes lacking, particularly for how success would be measured and how the work would be sustained.

With respect to classrooms suitable for EBT, the evaluation team noted that progress has been made but there is still much to do and that, according to their baseline survey of STEM faculty, lack of appropriate facilities is a major reason why more faculty don't adopt EBT methods.

### **Modifications and realignments**

In a project of this magnitude, and with this many moving parts, it is critical for the leadership team to continuously assess the program and make course corrections as needed. The annual evaluation reports from Horizon, Inc. are valuable for making program changes but the team also

relies heavily on feedback from subcommittees in charge of each thrust and on advice from the project advisory board. The leadership team meets biweekly and a substantial fraction of the meeting time is spent discussing improvements to existing approaches and the implementation of new ones. In addition, a leadership team retreat held in December 2017 and facilitated by Horizon personnel led to a number of modifications and realignments to the project. Some examples of course corrections to the project are described below.

Many aspects of the program are bottom-up, in that they require buy-in from individual faculty. This is important, and this group remains the strongest focus of the program. However, the leadership team has come to realize, through one-on-one discussions with department chairs, that departments are also important stakeholders in culture change and that different departments have different cultures and needs. The department level program, discussed at the leadership team retreat and implemented in year three, is a response to this observation and it provides a different mechanism for course redesign. It allows department chairs (who are likely most aware of a department's teaching needs) to be involved in the recruitment of faculty for implementing EBT methods. Likewise, departmental retreats are now preceded by a discussion between STEER personnel and the department chair (and often the undergraduate program coordinator) about the specific goals of the STEER portion of the retreat.

The peer observation program is an example of an intervention that wasn't even included in the original project proposal. Its addition in year three resulted from the continued reading and research into STEM instruction by members of the leadership team. Discussion at the leadership team retreat resulted in a recommendation to pilot the program in spring 2018, and the success of the pilot led to it being renewed for spring 2019. Changes for the spring 2019 orientation session include additional guidance on mechanics of the classroom observations and the delivery of feedback to other team members.

Other modifications to existing thrusts have been made to increase synergy with other components of the program. For instance, participants in the peer observation program and interdisciplinary/departmental retreats are recruited to submit course redesign proposals. Faculty who demonstrate success in course redesign are encouraged to apply for a travel grant to disseminate their results. Some go on to become STEM Scholars.

Likewise, the criteria for the STEM Scholars awards were adjusted to emphasize that award winners must demonstrate the successful use of an EBT method. However, to provide exemplars of documented EBT approaches to faculty applying for tenure and promotion, they are now required to present their instructional approaches at a local STEM Education conference.

Still other modifications have been made simply to increase the effectiveness of existing components of the program. In response to an evaluation report indicating that course redesign proposals did not always align with project goals, the request for proposals was re-designed. It now requires proposers to indicate explicitly how their plan is based on cognitive science and which specific EBT methods will be applied. Additionally, it requires plans for sustaining the work and a plan for evaluating whether the project was successful.

Because participants in the first training session for laboratory assistants indicated some lack of confidence in applying the techniques they learned about, a follow-up workshop was added to the second and third offerings of the training sessions. This allows for attendees to share their

experiences in applying EBT methods with the other participants and to seek guidance from workshop facilitators for modifying and improving their approach.

## Conclusions

STEER is a system wide approach to improving STEM Education at University of South Florida. As described above, STEER intervenes at all levels, from the student to the provost's office, to support a learning-centered environment in STEM. One goal is to provide incentives (and remove disincentives) to the adoption of EBT methods by faculty and graduate students by supporting course redesign, encouraging peer observation, modifying how teaching is evaluated, holding workshops for graduate assistants and by advocating for classroom modifications that support EBT. Another focus is to foster a culture of student-centered learning within the university STEM community by inviting inspiring speakers, holding departmental and interdisciplinary retreats, aligning courses between institutions and providing peer mentors to transfer students. Evaluations indicate that the project is making progress in meeting its goals but that challenges still exist, particularly in improving classroom facilities and in recruiting and management of STEER peers.

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