Engaged Practices Innovation (EPI) Grant Program

Mentoring Matters: Faculty Development to Enhance and Improve

Undergraduate STEM Research Mentoring at UVM

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Introduction and Background

Conducting research can be a transformative experience for undergraduate students and is a High Impact Practice (McGee and Keller 2007; Kuh 2008). Research experiences provide numerous short- and long-term benefits to student including skill development, active learning, preparation for graduate school, and engagement and long-term success in STEM disciplines (Kardash 2000; Hunter et al. 2007; Lopatto 2007; Russell et al. 2007). Moreover, the mentor-student relationship is the major factor determining the quality of research experience, with strong mentorship linked to enhanced self-efficacy (Bland et al. 2010; Cho et al. 2011; Feldman et al. 2010; Garman et al. 2001; Palepu et al. 1998), persistence in science (Sambunjaket al. 2010; Gloria and Robinson Kurpius 2001; Solórzano 1993), research productivity (Steiner et al. 2002; Wingard et al. 2004), high career satisfaction (Schapira et al. 1992; Beech et al. 2013), and enhanced recruitment of underrepresented minorities (Hathaway et al. 2002; Nagda et al. 1998). Consequently, excellent mentoring ensures that undergraduate research is truly a High Impact Practice.

Not all undergraduate research experiences, however, are created equal and inadequate mentoring can decrease engagement in STEM careers or pose obstacles to obtaining future funding, particularly for underrepresented minorities (Helm et al. 2000; Thomas 2001; Morzinski et al. 2002; Ginther et al. 2011). Further, funding agencies are trending toward improved mentoring practices at multiple levels. NSF has established undergraduate research and mentoring programs, and has instituted post-doctoral mentoring plans in grant applications. NIH has a number of mentoring programs including Mentored K Awards, Clinical and Translational Science Awards - Focus on Mentoring, Individual Development Plans (IDPs),

BUILD (Building Infrastructure Leading to Diversity) and the National Research Mentoring Network (NRMN). Faculty who have participated in mentor training and/or who include mentoring programs in grant applications are likely to be viewed more favorably by review panels when competing against other proposals of equal intellectual merit (NRMN Workshop, Minneapolis, MN; February 2015).

Project Description

We propose to offer an inaugural faculty development opportunity on mentoring undergraduate STEM researchers during Fall 2015. The training would include a 4-hr kickoff workshop the week prior to start of classes, and then four 1.5-hr meetings throughout the fall semester. This model follows the highly successful curriculum of Pfund et al. (2014a), and will be based on case studies, extensive discussions, reflection, and action plans. Both Stockwell and Dupigny-Giroux are well-positioned to lead this type of professional development for faculty. In 2015, Stockwell attended a "train the trainer" NRMN workshop on this curriculum, run by the authors at a research-intensive university, and is fully versed in the curriculum and its delivery. Dupigny-Giroux has extensive experience in delivering professional training through her multi-generational mentoring from high school students to post-doctoral fellows, especially as part of the NSF-funded Diversity Climate Network that she spearheaded. Dupigny-Giroux and Stockwell have already partnered to design and deliver faculty mentoring, having recently led a 1.5-hr Mentor Diversity Training workshop for VT EPSCoR RACC.

The target number will be 12 faculty, including confirmed participation by two new tenure-track faculty if the program is offered. The Center for Teaching and Learning (CTL) has agreed to host and support this seminar (see letter of support from Director J. Dickinson), including space,

snacks, scheduling, advertising and delivering the seminar, and disbursing professional development funds, thus providing significant direct and indirect cost share.

We anticipate the seminar to be self-sustaining once started. Stockwell plans to incorporate the seminar as part of his service to the university each year and CTL provides a permanent infrastructure to support the delivery of the seminar in the long-term, much like other professional development opportunities CTL supports. Further, experience at other universities indicates once these programs are implemented demand grows quickly, ensuring an audience for regular seminars and the potential for incorporating funded training components into grant proposals (C. Pfund and J. Branchaw, person. comm.). The curriculum is structured such that new faculty can be trained over time, thus creating a network of UVM faculty capable of training other faculty. Finally, subsequent seminars can 1) include post-docs, providing professional development opportunities that are often required for grants with post-docs, and 2) be modified to a graduate-level course to develop professional skills. Even though we plan to focus on STEM students, good mentoring operates on basic, universal principles that also apply to arts and humanities. Demand for this training is likely to come from all disciplines across campus in the future.

Impact on Student Engagement, Success and Retention

Expected impacts on student engagement, success, and retention are heavily documented in the Introduction and Background section. We also expect impacts on faculty – effective mentoring saves time and is professionally rewarding. Research indicates that research mentor training changes behavior of mentors, including increasing communication and establishing expectations with students, addressing diversity issues in mentoring, assessing student

understanding and fostering independence, discussing mentoring with colleagues, and reflecting on mentoring philosophy (Pfund et al. 2006, 2013, 2014b). Federal agencies are calling for evidence-based mentor training and the use of IDPs – we expect that professional training to improve mentoring skills will directly translate to an increase in the number of successful research proposals to NSF, NIH, and other competitive funding institutions.

Assessment Plan

We will use the Mentoring Competency Assessment (MCA) tool (Fleming et al. 2013) to evaluate our project. The MCA evaluates self-reported gains by mentor training participants in six mentoring capacities. As part of the MCA, we will conduct a pre-survey of mentors to establish a baseline and a post-survey six months after training to evaluate mentors' skills. An additional survey is conducted immediately after completing the training to assess satisfaction with the training program itself. Stockwell has access to the MCA as part of his affiliation with NRMN.

Budget and Budget Justification

We request support in the form of professional development funds (PDF) to incentivize the initial cohort of faculty participants ($250 per faculty for full participation). We also request PDF for both instructors ($500 each) for development of the seminar. Direct cost share will be in the form of lunch for the initial 4-hr workshop and texts of the curriculum. CTL Director Dickinson indicated food is an effective way to encourage participation. CTL will also be providing in-kind cost share through its infrastructure.

Item	Requested Funds	Cost Share
Professional development funds for participants	12 x $250 = $3,000	
Professional development funds for instructors	2 x $500 = $1,000	
Food for initial 4-hr workshop		14 x $20 = $ 280
Text		12 x $46 = $ 552
Total Direct Funds	$4,000	$ 832

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To: The Student Success and Satisfaction Committee
Re: EPI Grant Proposal to develop a mentoring training program/faculty seminar
Date: March 18, 2015

I am writing with wholehearted support for this EPI Grant proposal to develop and implement a faculty seminar program that will improve and enhance undergraduate research mentoring at UVM. As the Director of the Center for Teaching and Learning (CTL), I have a good perspective on availability and gaps in professional development opportunities for faculty, and how the gaps in particular can affect the institutions ability to promote high impact practices. This program, proposed by Drs. Jason Stockwell (RSENR, ENSC) and Lesley-Ann Dupigny-Giroux (CAS, Geography) will provide training that will serve the entire campus community and promote the key High Impact Practice of undergraduate research by improving mentoring experiences for both faculty and students.

The mentoring relationship between faculty and student is the critical factor separating undergraduate research opportunities that are mere "resume boosters" from those that are transformative educational experiences. Good mentoring is the most important factor in determining students' long-term engagement and success with the sciences; poor mentoring turns students off from the sciences. Mentoring also directly benefits departments and colleges: good mentoring practices lead to increased lab productivity, more training for graduate students and post-docs in mentoring practices of undergraduates, and, increasingly, having a clearly established mentoring training program can play a deciding role in which grant proposals are funded. For example, major government funding agencies like NSF and NIH are developing and asking for mentoring training plans and capabilities from the researchers that they fund. Providing UVM faculty with a seminar on undergraduate research mentoring will position them to be more productive, deliver more effective training to undergraduates doing research, and potentially lead to more successful research efforts and grant proposals.

I have met with Jason to discuss the plans for the seminar and his experience in the National Research Mentor Network's "train the trainer" workshop and believe this program will be of immense value to the entire UVM community. While his training was designed by WISELI (Women in Science & Engineering Leadership Institute) and has been supported by NSF and NIH, the fundamentals of effective mentoring hold across disciplinary boundaries. During our conversation, it became clear that the available materials could easily be expanded to include

case studies and faculty experiences from across disciplines. The core mentoring skills addressed and developed in this program can transfer from the sciences to the arts, and even prepare faculty for better mentoring of graduate students, new staff and junior faculty. During our meeting it became clear that UVM needs a program like this, and that Jason and Lesley-Ann are the ones with the materials, training, expertise, and drive to carry it out effectively. To that end, I have offered CTL's wholehearted support for this initiative, including assistance in promoting and delivering the seminar, providing advertising, registration, meeting space, and scheduling assistance for the group.

I strongly encourage you to provide support for this EPI proposal. Support at this juncture will help establish this mentoring training program on campus, and lay the groundwork for expanded training with other constituencies, such as graduate students. I believe that over time, this seminar will play a critical role in improving campus-wide competency and build faculty confidence in mentoring students, increasing the number and quality of high impact undergraduate research opportunities.

Sincerely,

Director, Center for Teaching and Learning
University of Vermont

The University of Vermont

April 15, 2015

Brian Reed, Associate Provost for Teaching and Learning
Student Success and Satisfaction Committee
CAMPUS

Dear Associate Provost Reed and Student Success and Satisfaction Committee:

I am writing to express my excitement and full support for the attached EPI Grant proposal to develop and implement a faculty development program to improve and enhance undergraduate research mentoring at UVM. Undergraduate research is an important High Impact Practice that helps to develop the critical thinking skills of young professionals and prepare them for their careers. The program proposed by Drs. Jason Stockwell (RSENR, ENSC) and Lesley-Ann Dupigny-Giroux (CAS, Geography), will provide training that will serve the entire campus community and advance best practices for STEM education.

Strong mentoring relationships between faculty and students are essential for preparing students to successfully engage in complex problem solving. Research has shown that good mentoring is the most important factor in determining students' long-term engagement and success with the sciences; poor mentoring turns students off from the sciences. Strong student mentoring directly benefits the university because it leads to increased student success, research and lab productivity, and granting success by principal investigators. Competitive government funding agencies such as National Science Foundation and National Institutes of Health, require mentor training plans and expect these capabilities from the researchers that they fund. At present, no similar program exists on campus.

Co-PI, Jason Stockwell has participated in the National Research Mentor Network's "train the trainer" workshop. We believe this program will be of immense value to the entire UVM community. Dr. Stockwell's training was designed by the Women in Science and Engineering Leadership Institute, an NSF FIRST Awardee at the University of Wisconsin-Madison. Having recently been a faculty member on the UW-Madison campus for 19 years I can attest to the positive impacts of this program on both faculty and students; it is clear that UVM would benefit from a program like this. Professors Stockwell and Dupigny-Giroux are well-prepared to lead this effort.

As dean of the Rubenstein School, I am pleased to offer support for this effort and foresee that it will become an expected element of our new faculty mentoring program in the school. A jointly sponsored program, between two schools and colleges, and at a relatively low cost, will pay big dividends campus-wide. Thank you for your consideration.

Sincerely,

Nancy E. Mathews

Nancy Mathews, Dean

THE RUBENSTEIN SCHOOL OF ENVIRONMENT
AND NATURAL RESOURCES
George D. Aiken Center, 81 Carrigan Drive, Burlington, VT 05405-0088

The University of Vermont

14 April 2015

Professor Brian Reed
Associate Provost for Teaching and Learning
Office of the Provost
Waterman Building

Dear Brian:

I am writing to express the support of the College of Arts and Sciences for the Engaged Practices Innovation (EPI) grant submitted by Professors Lesley-Ann Dupigny-Giroux of CAS's Department of Geography and Jason Stockwell of the Rubenstein School. Their proposal to inaugurate a faculty mentoring program for undergraduates who are involved in STEM research is very promising and its positive effects are supported by broader studies. The training effort they propose seems sound in its design, and they have both worked together on other faculty mentoring programs. Stockwell, in particular, seems well suited to what they will hopefully undertake, having been a part of an effort at another university, and, as they note, "is fully versed in the curriculum and its delivery."

If the EPI grant is approved, I anticipate a very successful effort of great benefit to our students. As well, the proposed mentoring program will have positive impact on our faculty. Of special note is their effort to incorporate into the proposed effort both a pre- and post-training tool—the Mentoring Competency Assessment [MCA]—to gauge programmatic success and improved mentoring capabilities.

Sincerely,

John P. Burke
Associate Dean and
John G. McCullough Professor of Political Science

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