Session 0575

ISSUES INVOLVED IN CROSS-DISCIPLINE COLLABORATION AND OFF-CAMPUS RESEARCH

Dr. Kathryn A. Svinarich, Dr. Cynthia J. Finelli, and Dr. Sandra L. Doty
GMI Engineering & Management Institute

Abstract

Satisfying the research requirements for tenure and promotion at a small, predominantly undergraduate teaching institution can be daunting. This is especially true since the time involved with effective teaching, another key requirement to promotion, typically surpasses a full time commitment. Moreover, the fiscal, facility, and expertise constraints of a small institute limit viable projects, particularly experimental endeavors. To meet the research requirements for promotion, three junior, untenured faculty members (an electrical engineer and two physicists) took the initiative to form a cross-discipline, off-campus collaborative research effort with a senior, tenured physiologist at a mid-sized research university. The junior faculty members contribute their time and technical skills to the project. The physiologist provides mentoring, direction, laboratory space and supplies.

The collaboration involves the waveform analysis of electroretinograms (ERG) in rats. At this early stage of the project, the junior faculty are spending time in the lab learning how to record ERG's and the biochemistry involved in the visual process. They have also upgraded the ERG recording scheme from a strip chart recorder to a digital oscilloscope with a front-end computer. Their technical skills will be instrumental in later stages of the project.

The collaboration addresses many issues simultaneously. These issues include lack of time, funding, facilities and guidance. We will present details of the formation, difficulties and rewards of this cross-discipline, off-campus collaboration.

Introduction

Meeting promotion and tenure requirements at any institution is a daunting proposition. These requirements typically involve maintaining an active classroom experience while simultaneously being an effective committee member and sustaining a viable research program. These tasks become even more formidable for the novice Ph.D. at his/her first position in a small, undergraduate, primarily teaching institution.

In this paper we present our solution to meet the research requirement for promotion and tenure at our institute: the formation of a cross-discipline, off-campus collaboration. We address the problems encountered in our own institution which has just recently begun requiring faculty members to actively engage in research projects. We then discuss the formation of the collaboration, the decision to initiate an off-campus project, and the positive and negative aspects of this solution.

Most institutions require research activity which is documented through grant proposal submissions and peer-reviewed publications. Before embarking on these time-consuming activities, one must first choose a suitable research project. For junior faculty members fresh from their Ph.D. work, this selection process can be discouraging, especially if the research involves experimental studies. Unless their new institution has laboratory facilities similar to their degree-granting institution and a substantial development budget or unless the new Ph.D. already has significant grant money, it is unlikely that the faculty member will continue their thesis work. Often the faculty member must select a new unfamiliar research topic. Several parameters influence the selection process including time constraints, adequate facilities, guidance, and fiscal opportunities. These concerns are not unique to faculty members at small, predominantly teaching institutions, however they are most poignantly felt in institutions with little ongoing research. We addressed these concerns by first forming a collaboration among ourselves and then initiating an off-campus project with a senior researcher at another university.

Two physicists, and an electrical engineer (all junior faculty members) from GMI Engineering & Management Institute and one senior physiologist from Oakland University comprise the members of the collaboration. GMI is a small, predominantly teaching institute that supports a fully cooperative education curriculum under which students alternate between twelve-week terms on campus and at their worksite. Faculty at GMI typically teach three out of the four twelve-week terms per year with average teaching loads varying between 10 - 12 contact hours per term. Although GMI has not typically been research oriented, the research climate at GMI is changing. Research is now a fundamental component of the promotion and tenure process. Unfortunately available research funding is concentrated in the area of automotive research since GMI was once owned by General Motors. Moreover, since it has only been over the past five years that research was not discouraged, there are limited facilities available, minimal grant-monies, few established research groups, and minimal student assistants. There is a small masters program at GMI, but the students are typically completing this degree part-time and graduate assistantships are rare. Undergraduate participation is compromised since students only spend twelve consecutive weeks on campus. The heavy teaching loads, limited money, facilities, guidance and the lack of student assistants make it difficult to fulfill research expectations.

In contrast, Oakland University is a typical mid-sized, public, research-oriented university which is located 50 miles from GMI. Teaching loads are moderate, and tenure-track faculty members are expected to conduct funded research. There is student involvement with research through undergraduate and graduate student research assistantships. Laboratory facilities and the number and expertise of existing research groups is consistent with the university’s size.

Identifying the Collaborative Project

To overcome the drawbacks associated with conducting research at GMI and to capitalize on the nearby facilities and expertise at Oakland University, we decided to form a cross-disciplinary collaboration. Since it wasn't feasible for us to continue with our individual research projects, we chose a new research field. We are all personal friends with compatible personalities and academic backgrounds, so selecting the on-campus collaborative team was quite easy. However, choosing a project was more difficult. Since we decided to work in a cross-disciplinary biomedical research project involving a study of the visual system, selecting a mentor was just as critical as choosing the project. Although each of us has been involved in previous biomedical research to some degree, none of this previous research was in vision and pursuing these past associations was not feasible. To facilitate project selection, we contacted a local noted expert in retinal research. This physiologist had been a reviewer for an unrelated (unfunded) research proposal by one of us. After an initial meeting, he agreed to become an off-campus collaborator and a mutually agreeable project was outlined.

This multifaceted project was designed to capitalize on the expertise of the collaborators. Due to time-constraints, it was also selected to augment, rather than lead, the existing lab focus. The specific project involves analyzing the waveform of electroretinograms (ERG) in rats. An ERG is a valuable tool to investigate the early stages of visual processing by measuring the voltage changes across the retinal photoreceptors as light energy is transduced into neural signals. Diseases and natural metabolic changes of the eye cause alterations in the waveform components of the ERG. We intend to apply techniques commonly employed in engineering and physics (yet uncommon in biology) to analyze the metabolic dependence of the electric potentials of ERG's in isolated rat retinas. We plan to be trained in the technologies and methodologies used in retinal electrophysiology research.

At this early stage of the project, we are spending time in the lab learning the subtleties entailed in recording ERG's in animals, the elctrophysiology of the retina, and the biochemistry involved in the visual process. Being proficient with electronic technology and computer programming, we have upgraded the ERG recording scheme from a 1960's strip chart recorder system to a state-of-the-art digital oscilloscope with a front-end computer. The upgrade exemplifies the benefits of cross-disciplinary collaboration. While the physiologist viewed upgrading the system with trepidation due to his unfamiliarity with the new electronics and his inability to program the front-end computer, we upgraded the system and programmed the computer with ease. These changes have eliminated severe problems inherent in the old data collection system and have had the added benefit of giving the authors a chance to demonstrate their expertise. Experiments with the new system are now underway.

Advantages and Disadvantages

This collaborative arrangement has several advantages over individual junior faculty trying to conduct experimental research. A collaboration increases overall time devoted to a project, involves more people in the art of pursuing grant money, pulls together a large assortment of skills from various disciplines and creates a “think-tank”. This is an excellent way to increase project productivity without increasing the fiscal and time commitments of a single faculty member. Another key factor to the success of this initiative is finding an experienced, funded collaborator willing to provide lab space, supplies, and guidance. Affiliating with a successful grant-writer is extremely beneficial for junior faculty members. The researchers most likely to be funded are those that already have a proven track record (i.e. those that have previously received funding). Learning how to develop well-written grants from an established researcher is much more productive than pursuing the submit-and-resubmit method. Of course there are incentives for a senior faculty member to provide expertise, lab facilities and grant-writing assistance for this undertaking. Additional Ph.D. research personnel are incorporated into the project, enhancing productivity without raising the salary budget, and innovative ideas influx from other disciplines, exposing the senior researcher to new technologies and data analysis techniques.

Nonetheless, this arrangement has not been without a few difficulties. First, the research site is a one-hour commute from our home institution. This precludes using the time between classes as possible ‘research time’. For effective time-management, research time must be scheduled in full day increments. Second, it was initially difficult for the senior researcher to fully appreciate our research capabilities. Having only worked with master’s level students or collaborating with faculty members in physiology, he was unprepared to completely utilize competent Ph.D. researchers embarking on a new research topic. Initially, we were categorized in the area of graduate students, instead of colleagues. Ultimately, this challenge was overcome as we updated the data collection system and our individual capabilities were revealed.

Finally, we faced the problem of a home institution that itself was unfamiliar with full-time research activity. As stated earlier, traditional research at GMI has been largely industrial and automotive in nature. As a result, the administration was not aware of the realities of academic research, i.e., the large array of funding sources that must be considered, the long time frame in obtaining academic grants, and the lead times for publication of academic research in the appropriate publication journals. These initial stumbling blocks have been resolved through a number of efforts. First, we have made our administrators poignantly aware of our research initiative and that we solicited funding from a major granting organization (which entailed negotiating indirect accounting costs since GMI didn’t have an off-campus, indirect cost policy in place). Second, we brought the senior researcher on campus to give a seminar. We benefited from this seminar because our research gained importance, especially for those who have not actively participated in such a academic research (this is the status of the majority of our senior faculty and administrators). It also provided an opportunity for professionals at competing institutions to discuss common issues. Finally, it gave our collaborator an opportunity to see us in a our professional environment and helped him see us as skilled colleagues.

Summary

There are many solutions to the ever-more difficult task of conducting research and still satisfying all the other duties of a faculty member. We have presented at least one way to conquer this problem: form a collaboration and ensure that at least one collaborator is experienced, funded, and enthusiastic about a carefully chosen project. Don't limit your search to in-house projects; explore area universities and colleges.

Biographical Information

Dr. KATHRYN SVINARICH:

Dr. Svinarich has been an Assistant Professor of Applied Physics in the Science and Math Department at GMI since 1992. She obtained her B.S. in Physics from the University of Michigan in 1984. In 1991, she completed a Ph. D. from Wayne State University. Her thesis research concentrated on using picosecond laser pulses to study the elastic properties of thin metallic films.

Dr. CYNTHIA FINELLI:

Dr. Finelli is an Associate Professor of Electrical Engineering at GMI, where she has been teaching sing 1992. She obtained her B.S.E., M.S.E., and Ph.D. from the University of Michigan in 1988, 1989, and 1993, respectively. Her thesis research involved application of adaptive digital signal processing techniques to electrocardiogram analysis.

Dr. SANDRA L. DOTY:

Dr. Doty has been an Assistant Professor of Applied Physics in the Science and Math Department at GMI since 1994. She obtained her B.A. in Chemistry from Wayne State University in 1984 and her M.S. in Physics from Michigan State University in 1989. In 1994, she completed a Ph. D. in Physics from Rensselaer Polytechnic Institute. Her thesis research consisted of modelling optical soliton interaction in dual core fiber systems.