AC 2008-2099: MOTIVATING RESEARCH IN AN ENGINEERING TEACHING INSTITUTION

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Dr. Howard Evans was appointed founding Dean of the School of Engineering and Technology, National University, in October, 2003. He received B.S. degrees in Physics and Chemical Engineering from Brigham Young University, and a Ph.D. in Chemical Engineering Science from the California Institute of Technology.

Dr. Evans has over 20 years of executive and senior technical management experience at 3M Company and IBM Corporation, primarily leading multidisciplinary, global technical organizations responsible for R&D; new business and market development; manufacturing engineering; quality; environmental, health and safety; and others.

Before joining National University he acquired 12+ years of voluntary involvement with higher education, including adjunct teaching and research in engineering at the University of Colorado and formal advisory involvement in both science and engineering at the University of Texas. Other past professional and academic activities include being a founding member and officer in the Central Texas Electronics Association; past chairman of IBM’s Materials Shared University Research Committee; Ph.D. Recruiting Coordinator for IBM’s Systems Technology Division; and executive sponsor for 3M division’s student programs. He has published and presented widely in areas of surface science, electronic materials and processes, project management, and industry/university relations. He holds 4 patents and has received awards for excellence in technical innovation (IBM), technical authorship (IBM), teaching (University of Colorado), and scholarship (National Science Foundation).

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Dr. Viswanathan is a Professor and Chair of the Department of Applied Engineering and Lead Faculty on Engineering Management and Homeland Security and Safety Engineering. Lead a six full time and fifty two adjunct faculty members offering three undergraduate and six graduate programs with student population of three hundred students. Dr. Viswanathan is an educator, researcher and administrator with more than twenty-five years of industrial and academic experience encompassing engineering and environmental consulting, research and development, and technology development. Career experience includes teaching at the University level, conducting fundamental research, and developing continuing educational courses.
Motivating Research in an Engineering Teaching Institution

Abstract

This paper discusses multiple ways of motivating and assisting faculty to conduct research and scholarly work at what has traditionally been a highly teaching-focused university. As part of this initiative a number of novel institutional programs have been devised and implemented. This initiative encompasses programs such as creating faculty professional development funds; offering faculty awards in the form of money and time allocation; presenting distinguished scholar awards; publicizing and celebrating scholarly work; formally incorporating research goals in annual plans at the college/school, department, and individual faculty levels; and other incentives. The impact of these efforts has resulted in a significant, measurable increase in research and scholarly work over the last four years. Details relating to the institutional programs and faculty research over this four year period are shared.

Introduction

The success and reputation of any undergraduate or graduate engineering program depends upon whether the students, faculty, facilities, equipment, and initiatives can keep pace with the technological advances of the 21st century and its ability to grab the various opportunities that open up from these changes. To a larger extent, research activities contribute to the reputation of an institution. As long as such support is available, the likelihood of being able to promote research activities is very high. In the last two decades, American universities have experienced increased emphasis and significant research activities in institutions that are considered primarily teaching institutions. Concomitantly, the roles of faculty members have changed to reflect the increased importance of research. Although research output is one key component in the evaluation of salary increases, promotion, and tenure, sustaining active research in primarily teaching institutions can be challenging at best. Furthermore, as research activities in most instances are commonly pursued by the faculty through externally funded programs, obtaining such external funding can be somewhat problematic at teaching – versus research - institutions. This paper discusses multiple ways of motivating and assisting faculty to conduct research and scholarly work at what has traditionally been a highly teaching-focused university.

Role of a faculty member

The three facets of a faculty member in every university are teaching, research, and service. Teaching is a fundamental activity that every faculty member participates in. However, the role of research is becoming more important even in institutions primarily considered as teaching-focused university. Research expectations for university faculty have risen to the extent that research productivity has become a dominant criterion for hiring, tenure, and promotion at many universities. This trend has been driven by several factors, including the universities’ growing dependence on external research funding to support basic operations and the desires of their administrators and faculty members for high national rankings. Faculty involvement in research is recognized as an essential component of a high quality program, primarily because faculty members are considered creators of knowledge and information. Research is also considered as
an important activity for informing teaching. Many members of the faculty see little boundary between teaching and research, as they consider research a means of keeping, preventing, and/or protecting their teaching from becoming stale. Besides the universities, other factors also propel research. The national and international community of disciplinary colleagues drives faculty members’ research. In addition, faculty members who have strong allegiance to their disciplines have active research agendas. However, the quantity of time spent by faculty members in research varies from institution to institution. This is because the extent of the time spent in research activities depends largely on the mission of the employing institutions. This aspect has often made research activity somewhat problematic for faculty in primarily teaching universities.

There are many reasons why faculty members frequently do little-to-no research in teaching-focused institutions. These include personal demands on time and energy, and resource constraints that make it difficult for faculty members to actively engage in research. Faculty members in teaching-focused institutions may have greater teaching and service load requirements than those in research institutions. In addition, hustling grant proposals is a very time consuming and quite involved process. Typically, one has to apply for many grant proposals in order to be successful in a few since the competition is fierce. In addition, research areas are sometimes staked out by colleagues who may feel challenged with others entering their territory, as this may challenge their prominence and even threaten their grant support. Not infrequently, tenured faculty members lose interest in grants and instead accept consulting assignments as their primary source of funds for summer time.

Teachers who actively participate in research communicate their accomplishments by publishing their work and making presentations at conferences and meetings. Evidence indicative of research contributions may include but is not limited to the following:

- Inventions and innovations that lead to patents,
- Publication of research results in recognized professional journals,
- Participation in writing textbooks or professional manuals and design guides,
- Presentation of research results at professional meetings, particularly invited presentations at national or international meetings;
- Receipt of research grants,
- Receipt of research awards, and
- Directing student research.

Of the above mentioned evidences, some are considered more important than others. For example, in some fields the publication of research results in refereed journals is considered an excellent evidence of research accomplishment. However, each institution/faculty group may institute different evidentiary requirements.

**Description of National University and its student body**

Founded in 1971, National University (NU) is an independent, nonprofit institution of higher education. Since its establishment, the university has dedicated itself to providing educational opportunities to a diverse population of working, adult learners. With more than 22,000 full-time students, National University is the second largest private, non-profit California institution of
high education, with a 32-year history of educating traditionally underserved populations. National University is ranked 7th nationally and 2nd in California for awarding degrees to ethnic minority populations. NU is ranked sixteenth out of 3,000 institutions nationwide in awarding graduate degrees to minority students. National University’s central purpose is to promote continuous learning by offering diverse instructional approaches, encouraging scholarship, engaging in collaborative community service, and empowering its constituents to become responsible citizens in an interdependent, pluralistic, global community. National University students earn their degrees in a unique one-class-per-month format, and primarily attend classes at night and on weekends while they can continue to move forward in the workplace. The typical student age is 33-35. Most of the students are employed full time while taking their degrees. In NU, the standard faculty teaching load is eight courses annually. On a 9 ½ month contract, faculty’s time has been roughly segmented as 70% for teaching, 20% for service and 10% for research.

In 2001, the Chancellor of the University appointed a commission to review the requirements and approaches for improving scholarship output by faculty members. This commission made several recommendations including the establishment of a Research Council as a faculty advisory body to the Provost and Vice President of Academic Affairs. This Council’s objective is to provide leadership that fosters a culture enhancing National University’s distinction in research, scholarship, and creative activities among faculty and students. In addition, the Council provides collaborative faculty leadership through mentoring and support for the creation and dissemination of knowledge generated through research, scholarship, and creative activities.

The members of the Council are faculty from each school who are seriously committed to research. The Council is appointed by the Provost on a yearly basis. The Council's responsibilities to the Provost include the following:

- Make recommendations for major changes and improvements in policies about research that represents the concerns and interests of the faculty
- Provide support to faculty in enhancing research, scholarship, and artistic activities including training, mentoring, and support
- Enhance opportunities for quality research and scholarship among faculty and students
- Increase research and scholarship productivity among faculty and students
- Provide an annual written report of the Council's activities including the status of recommendations made by the Council each year and of unresolved issues before the Council
- Advise on the space and other resources supporting research
- Advise on the administrative policies and practices relating to research
- Meet at least annually with the Provost to review the major issues facing the university with respect to research
- Promote the dissemination of research and scholarly activities so that NU becomes recognized as an institution whose faculty and students engage in appropriate, meaningful, and valuable research activities.

As stated in the above mentioned NU mission, the university supports research but considers it only third in importance to teaching and service. At the same time, the university appreciates and
values all research activities and does consider it an important criterion while assessing merit, promotion, as well as contract renewal as can be seen in the requirements listed below:

Scholarship Requirements

1. Publications accepted or published in the years in which you are under review
   Include the full reference citation and state if publication is peer-reviewed
2. Conference presentations completed or accepted for the years under review
   Include statement if peer-reviewed, level of conference, i.e. international, national, regional, state, or local; etc.
4. Grants funded in the year under review
5. Projects such as original literature, art, music, movies, etc reviewed and shown
6. Editing or peer-reviewing the work of others for publication or presentation
7. Any other information that demonstrates outstanding scholarship

Some of the additional support systems put in place are described below.

The faculty development plan

Each faculty member is asked to develop a faculty development plan summarizing the teaching, research and service activities in each year. This includes courses he/she plans to teach; novel teaching tools and processes he/she plans to introduce; new courses he/she plans to create; planned scholarship activities including research publications and presentations, grants preparation, and external peer reviews for professional journals; the university committees he/she participates in; the school and department levels committees that he/she is part of; the type of external professional organizations he/she plans to join; and the specific programs that he/she plans to lead. This detailed plan is reviewed by the respective chair of the department and the dean, and then finalized for implementation at the beginning of each academic year. It is also reviewed at the mid-point of the year for feedback and update. Based on performance, faculty members needing help are provided guidance and mentoring to achieve their goals. In addition, faculty members are advised to take special training provided at the university throughout the year. Some of the training programs include how to initiate scholarship activities, write grants, and complete journal publications.

Faculty participation in conferences and presentations

The University encourages faculty members to present at and/or attend professional conferences that will enhance their professional growth and further the mission of the university. Each faculty member has a budget of $2,400 per academic year for this purpose.

Faculty scholarships

A scholarship support system is set up to enhance faculty research, funded internally by the university. The scholarship is awarded to the faculty member(s) who demonstrates that he/she is more deserving of the award than his competitors.
Presidential awards

To support faculty research and/or to assist faculty who are completing their terminal degrees, a special fund is established annually. Faculty members who wish to apply for a grant from this funding source submit their applications to the Provost. A faculty committee reviews the applications and makes recommendations to the Provost, who then makes recommendations to the President of the University, who then determines who will receive an award. Application guidelines are circulated every year. A typical award can range from $2500 - $5000 per year. Typically, approximately 5% of the faculty members receive these awards each year.

Presidential Scholars program

To assist faculty who are engaged in research and to promote research at National University, the Chancellor has established a Presidential Scholars Program that provides faculty with a reduction in teaching load for the academic year. Reductions are for one or two courses and must reflect active research in progress. A call for proposals for participation in this program is made by the Office of the Provost, usually in early spring of each year. Proposals are reviewed by a faculty committee appointed by the Provost, who subsequently reviews the committee’s recommendations. Applicants are notified of their status in time to include any reduction in teaching load in their Faculty Development Plan. Here, also, approximately 5% of faculty members are awarded each year.

Outstanding Researcher Award

The Provost has established an annual Outstanding Researcher Award for faculty. The selection of the candidate is based on the following criteria:

Each College or School Dean recognizes one faculty honoree each year based on his/her outstanding scholarship work during the recently-concluded academic year. Each of these honorees is asked to submit a ‘Research Accomplishments’ paper, of no more than two typed pages, that provides an overview of his/her research accomplishments during the past academic year. The candidate has to attach that paper to any published paper(s), book(s), creative material(s) or other evidence of scholarly contributions. The Research Council ranks the nominees and forwards its recommendation to the Provost. The Provost selects the university-wide individual(s) for recognition as the Outstanding Researcher Award winner at the Fall Faculty Assembly.

Results and Recommendations

With the formation of the Research Council and other support systems, the university’s research output is improving considerably. Table 1 illustrates the research output for the last four years from the School of Engineering and Technology.

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Table 1: Research output from the School of Engineering and Technology

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In conjunction with the above, the following actions have also been proposed or implemented to various extents to encourage faculty research and scholarship at our primarily teaching university.

1. Provide release time from teaching for faculty who engage in research and disseminate their work in appropriate journals and forums.

2. Fund a position for a research mentor who would work with faculty across disciplines. This individual, who will have a strong research and grant acquisition record, would consult with faculty members to assist them in developing a research agenda, conducting appropriate research activities, and disseminating their results.

3. Ensure that all faculty members hired in the future either have a basic background in research or participate in a required introduction to research and scholarship during their first six months of employment.

4. Develop a scholarship mentoring system for all new faculty members, so that new hires are paired with a successful researcher from their discipline.

5. Develop a basic research course for all graduate students from all disciplines so that all of them have a basic working knowledge of research principles. This step would enhance the ability of students to work with faculty on research projects. Topics in the course could include such things as basic statistics, research designs, qualitative and quantitative methods, locating and critiquing appropriate literature, writing a literature review and sampling procedures.

6. Review the Presidential Awards and Presidential Scholar programs and encourage more individuals to apply. Provide assistance for individuals applying for the first time.

7. Develop a series of brief papers or instructional modules that would provide basic information to faculty members and students regarding research and scholarship. Topics may include such things as how to submit an article to a journal, how to obtain assistance from our librarians when doing a literature review, and how to develop a proposal for a book that is appropriate for potential publishers.

8. Ensure that deans of the various schools and colleges recognize the value of scholarship and research, give recognition to those who are successful and give support to those who desire to improve in this area. Deans and department chairs should likewise be expected to engage in scholarship and research activities.
9. Have department chairs hold monthly or quarterly brown bag seminars so that faculty and students may present their research and scholarship for review and discussion.

10. Continue to include and emphasize scholarship and research productivity in the expectations for merit, promotion, and contract renewals.

In summary, multiple factors can contribute to inhibiting faculty in pursuing scholarly research, especially at primarily-teaching universities. As our institution is purposefully moving to encourage more scholarly activity by faculty, it has been found that research productivity can be increased through providing a number of support and recognition programs and structures. The effects of these have been monitored in our School of Engineering and Technology, and while the independent effects of each separate support or recognition activity have not been individually determined, a strong overall positive impact has been observed and measured. Continuous improvements and enhancements to these support and recognition programs are planned, and 10 specific recommendations are proposed for the next cycle of improvements. Faculty members have responded very positively to this heightened emphasis on scholarly activity, and by continuing to support faculty in their work we anticipate ongoing success in this direction.