4-2006

Faculty fear: The misalignment of faculty rewards and universitycommunity partnerships

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“Faculty Fear: The Misalignment of Faculty Rewards and University-Community Partnerships”

by

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This research was made possible with an MSP grant and funding from the National Science Foundation (EHR-0227124).

Abstract

This study examined how science and mathematics university faculty at a Hispanic-serving Institution were engaged in the preparation of future and current schoolteachers. The science and math faculty participation in teacher education was part of a grant from the National Science Foundation. Results indicate that science and math faculty are eager to participate in teacher education activities but are concerned that their participation will adversely affect tenure and promotion decisions.

Introduction

At a recent Thomas Rivera Policy Institute (Thomas Rivera Policy Institute, 2004) conference in Los Angeles, William G. Tierney said,

> If we do not increase college-going, we as a nation will be imperiled. We increasingly need a workforce with greater skills and more post-secondary education. As a state, we have one of the largest economies in the world, and yet we import more workers with science and technology degrees, from other states and from abroad, because we do not have enough individuals in California with these degrees. (p. 16)

California is not alone, of course. In fact, the importance of rigorous content courses, excellent teaching and research, and collaboration at the K-12 and postsecondary levels of education, particularly in science, technology, engineering, and mathematics (STEM) areas, has been a policy imperative in the United States since at least the 1940s (Eisenhower National Clearinghouse for Mathematics and Science Education, 1999; Slobodin, 1977; Stokes, 1996;). In many ways, we are a nation educationally behind both our allies and our enemies. We lag, for example, far behind other countries in the percentage of citizens who receive college degrees in general and in STEM degree areas in particular (Bowen, Kurzweil, & Tobin, 2005).

Indeed, the situation may be worsening. According to recent findings of the Committee on Science, Engineering, and Public Policy (2005), “the scientific and technical building blocks of our economic leadership are eroding at a time when many other nations are gathering strength” (p. 2). The top recommendation of the committee was to “increase America’s talent pool by vastly improving K-12 mathematics and science education” (p. 3). According to the Committee, this, in part, can be accomplished by recruiting America’s brightest students to become teachers and by strengthening the academic skills of 250,000 of America’s current teachers. This is no easy set of tasks.

Thought the recent refocusing of America’s attention on the relationship between the issues of our (broadly redefined) national security and the lack of properly qualified college students and graduates in STEM fields has shed light on our collective educational shortcomings, the situation is far worse for ethnic minority students, particularly African American, Hispanic, and Native American students. Generally, the high school and college dropout rates of minorities (Barton, 2005; Giererich, 2005), are high, the achievement gaps of minority high school and college students are wide when compared to the achievement of Whites and Asian American (Barton, 2003; Berends, Lucas, Sullivan, & Briggs, 2005; Tornatzky, Pachon & Torres, 2003), and the completion rates of minority graduate students is abysmal (Nettles, 1990a, 1990b).

Study Background

In 2001, the National Science Foundation (NSF) began funding a number of Math and Science Partnerships (MSP) to school-university partners throughout the United States specifically aimed at improving,

> elementary and secondary mathematics and science instruction for the purpose of strengthening preK-12 math and science education, improving student achievement, and reducing the achievement gaps among student populations. To accomplish this, the program awards funds to projects in which prekindergarten through 12th grade (preK-12) schools unite with institutions of higher education and other partners to undertake activities such as developing new curriculum and improving teachers' skills. (Math Science Partnership's Learning Network, 2005, paragraph 2)

Each math-science partnership project is required by NSF to integrate five features into its efforts to improve K-12 math and science education. The five features require projects to (a) be partnership driven (i.e., postsecondary discipline faculty in mathematics, science, engineering and education partner with school administrators and teachers), (b) improve the quality, quantity, and diversity of K-12 math and science teachers, (c) provide a challenging set of new math, science, and engineering curricula and courses for K-12 students, (d) design partnerships based on evidence, and (e) fundamentally change math, science, and engineering K-12 teaching and learning through K-20 institutional change and project sustainability (i.e., redirection of resources, designing new institutional policies and procedures) (Math Science Partnership's Learning Network, (2005).

While the five required “features” of the grant are clearly important to all MSP participants and their (internal and external) stakeholders, possibly the feature most relevant to institutions of higher education is the one that mandates institutional change and project sustainability. One could argue, for example, that unless institutions change their policies, procedures, and even their missions, the radical improvement of math and science education at the K-20 level will not occur. The importance of institutional change can be found in the language of the original grant notification from the National Science Foundation (2003):

> disciplinary faculty in departments of mathematics, the sciences and/or engineering with education faculty and administrators in higher education partner organizations [will] join administrators, teachers of mathematics and the sciences and guidance counselors in K-12 partner organizations in efforts to effect deep, lasting improvement in K-12 mathematics and science education. Furthermore, the partner organizations commit to implementing the K-20 institutional change necessary to sustain Partnerships' successes in the long-term; this includes the continued participation of mathematics, science and engineering faculty in work that clearly results in improved K-12 student and teacher learning. (Paragraph 31)

The NSF MSP programs are important to the nation as a whole. According to Business-Higher Education Forum (2005),

> Mathematics and science — and the technological innovation they support — are critical to our country's competitive position in the global economy and to its security in an increasingly perilous geo-political environment. Competence in mathematics and science are thus essential to us as individuals and as a nation. (p. 1)

Yet, the importance of the programs in large minority communities may be even more important: The NSF MSP programs and other programs like it have the potential to fundamentally alter how minorities participate in our society.

Literature Review

The Education of Hispanics

The educational attainment of Hispanics at K-12, undergraduate, and graduate levels is very low compared to other ethnic groups in the United States. In Texas, for example, a substantial educational achievement gap exists between Caucasians and other historic minorities (Linton & Kester, 2003). Nationally, the trends are even more dramatic (Barton, 2003; Berends, Lucas, Sullivan, & Briggs, 2005). Hispanic high school drop out rates, for example, are "quite grave and…[have] serious long-term implications for the education system, Hispanic communities and the nation as a whole" (Fry, 2003, p. iii). In a recent study, the Hispanic high school dropout rate from data collected from 23 states showed that "the high was 74 percent in Louisiana and the low was 42 percent in New York" (Barton, 2005, p. 12).

In 2004, Pew Hispanic Center researchers found Hispanic participation in postsecondary education to be less intense and at lower academic levels than other ethnic groups. The report noted,

> nearly 1.7 million Hispanic students were enrolled in our nation's 4,100 degree-granting colleges and universities in fall 2002. A big share of these students, 87 percent, are undergraduates (rather than graduate or first-professional students). In comparison, undergraduates make up 81 percent of all white college students. (p. 2)

Generally, Hispanic completion of graduate degrees is much worse that Hispanic completion of undergraduate degrees. Hispanics fall far behind the graduate completion rates of other racial and ethnic groups (Fry, 2002). According to Fry (2002), "Among 25- to 34-year-old high school graduates, nearly 3.8 percent of Whites are enrolled in graduate school. Only 1.9 percent of similarly aged Hispanic high school graduates are pursuing post-baccalaureate studies" (p. 4). In a similar finding, Santiago (2004) found that Hispanics earned only five percent of all master's degrees in 2001, only five percent of all first-professional degrees earned in 2001, and only three percent of all doctorates earned in 2001.

There may be many reasons for this comparatively low participation rate in postsecondary education (e.g., Immerwahr, J., 2003; Immerwahr, J. & Foleno, T., 2000). Possible reasons include discrimination against ethnic minorities (Nettles, 1990a), insensitivity to racial and ethnic differences (Educational Testing Service, 1997), low enrollment (Nettles, 1990b), issues of cost (e.g., financial aid, indebtedness, value of degree v. cost) (Giererich, 2005; Nettles, 1987), the challenges of the collegiate recruitment and application process (Brown, Clewell, Ekstrom, & Goertz, 1994) and court challenges to affirmative action admissions (Woodrow Wilson National Fellowship Foundations, 2005), among many others.

University Faculty and Reward Systems

Much has been written about the nature of faculty roles and responsibilities since Boyer's (1990) seminal work on reconceptualizing and redefining the professoriate. Examples include discussions about selectivity and rigor (e.g., Braxton, 1993; Lawler, 2001), the privatization of higher education (e.g., Bok, 2003), grade inflation and the relationships between students and faculty (e.g., Ellis, Burke, Lomire, & McCormack, 2003), and institutional change (e.g., Zambroski & Freeman, 2004).

Yet, one of the most fascinating points of discussion about the role and responsibilities of the faculty emanates from the larger discussion about higher education and its duty to society (Colby, Ehrlich, Beaumont, & Stephens, 2003; Ehrlich, 2000). At issue is the very raison d'etre of postsecondary education and what role all stakeholders have in higher education, i.e., what are the goals and objectives of higher education? Should higher education, for example, be seen mostly as a private good, a public good, or some combination of both?

This national conversation, of course, has major implications for the role of faculty and how they are rewarded (Fairweather & Rhoads, 1995; Glassick, Huber, & Maeroff, 1996). Li-Ping Tang and Chamberlain (1997), for example, in a study of attitudes toward the mission of universities and their faculty reward systems, found that university administrators believed research and teaching were "mutually supportive and that research and teaching are the mission of their university" (p. 221). However, faculty members, according to the authors, while acknowledging the importance of both research and teaching, believed they were rewarded for their research activities but not for their teaching activities. "Both administrators and faculty members agree," according to Li-Ping Tang and Chamberlain, "that rewards influence research productivity. However, administrators believe that professors' teaching effectiveness is rewarded, whereas professors do not." (p. 224).

Ward (2005) has persuasively arguing that if faculty participation in engagement "is not supported, it [faculty engagement] becomes either altruism or an obligation, and either way it's seen as professionally compromising for faculty. Faculty reward structures need to be aligned with institutional priorities for engagement of the public good" (p. 228). Furthermore, according to Ward, "institutions need faculty reward structures that value the complexity of faculty work, including the important and unique contributions of teaching, research, and service that focus on the public good" (Ward, 2005, p. 229).

Study Purpose and Rationale

This study was conducted at one of the many MSP sites across the country. The study was designed to measure the extent to which postsecondary science, technology, engineering, and mathematics (STEM) faculty were engaged in (a) pre-service teacher education (i.e., involvement in the undergraduate education of college and university students preparing to become school teachers), (b) K-12 teacher professional development (e.g., involvement in the MSP Master of Arts in Teaching programs, advising teachers and schools, working in the school-based pedagogical labs), and (c) K-12 science and mathematics education (e.g., teaching in the schools, preparing K-12 curricula).

The university where the study was conducted was founded early in the twentieth century as a postsecondary school of mines. Since that time, the university has developed into a major research university with more than 19,000 students—the vast majority of whom are Hispanic. The university has built on historic strengths in science and technology and now offers degree programs in a wide range of areas at the undergraduate and graduate levels, including more than a dozen doctoral programs. The university is a national leader in producing Hispanic graduates, especially in science and engineering. Recently, the university was recognized as a top engineering graduate school for Hispanics. The university is also among the top producers of Hispanic graduates who go on to receive doctoral degrees.

The findings of the study may inform the discussion about the importance of K-16 collaboration in STEM content, pedagogical, intra-institutional, and inter-institutional areas. Additionally, there may be opportunities for K-12 school and university leaders to positively affect how and what mostly Hispanic minority K-12 students learn in science, technology, engineering, and mathematics content areas. This may have significant influence on the interest Hispanic K-16 students and their families have regarding completion of high school, enrollment in postsecondary education leading to at least the attainment of a bachelor's degree. The results may also provide evidence needed to influence educational policy at local, state, and national levels related to encouraging more Hispanics to participate in math and science postsecondary and occupational opportunities.

Methods

Research Questions

Research Question # 1

To what extent are STEM faculty engaged in (a) pre-service teacher education (i.e., involvement in the undergraduate education of college and university students preparing to become school teachers), (b) K-12 teacher professional development (e.g., involvement in the Master of Arts in Teaching programs, advising teachers and schools, working in the Regional Pedagogical Labs), and (c) K-12 science and mathematics education (e.g., teaching in the schools, preparing K-12 curricula)?

Research Question # 2

What are the attitudes of STEM faculty regarding their engagement in (a) pre-service teacher education (i.e., involvement in the undergraduate education of college and university students preparing to become school teachers), (b) K-12 teacher professional development (e.g., involvement in the Master of Arts in Teaching programs, advising teachers and schools, working in the Regional Pedagogical Labs), and (c) K-12 science and mathematics education (e.g., teaching in the schools, preparing K-12 curricula)?

Definitions

Aligning the curricula was defined as any effort to make the curricula coherent. While completing the survey, STEM faculty were asked to think about preparing future K-12 teachers, working with current K-12 teachers, and working with K-12 schools.

The *Collaborative* is a nearly 15-year partnership between the university and the local school districts in the greater metropolitan region. The primary mission of the Collaborative is to increase the rigor of K-12 education.

Pre-service education was defined as a postsecondary course, courses, curricula, or degree one uses to become a K-12 schoolteacher.

Research Pedagogical Laboratories (RPLs) were designed to integrate a STEM research component into teacher preparation and ongoing teacher development by creating a research-based partnership between teacher education university faculty (both from colleges of education and science), prospective teachers, and in-service teachers. The ultimate goal was to better prepare teachers-researchers in the field of mathematics and science education. Functionally, field-based university and K-12 faculty team-teach to improve STEM content, methods, and pedagogy courses.

Participants

The target population of the study was the 94 faculty members in the university's college of science. The target population included all contingent faculty, all tenure-track and tenured faculty, and all academic administrators. However, only 24 faculty members from the target population participated in this study.

Procedures

This study began in early April 2005 and concluded in August 2005. In April 2005, an introductory cover letter, an informed consent form, and the surveys were sent to 94 faculty members in the chemistry, biology, mathematics, physics, and geology departments at the university inviting them to participate in the study. In addition to all rank and file faculty members, all department chairs, associate or assistant deans, and the dean were invited to participate in the study. In May 2005 and then again in June 2005, follow-up letters were sent to the original 94 participants requesting them, if they had not done so already, to complete and return the survey. By August 2005, 25 of the possible 94 participants had returned completed surveys, a response rate of only 26.6 percent.

Data Collection

The survey questionnaire was constructed by the researcher and reviewed by a local panel of experts (i.e., fellow faculty MSP evaluators) in order to answer the aforementioned research questions regarding pre-service teacher education, K-12 teacher professional development, and K-12 science and mathematics education.

The survey consisted mostly of closed form fill-in questions, multiple-choice questions, Likert and Likert-like questions, and dichotomized yes-no questions. However, several open form questions requested brief written answer questions from the participants.

There were 78 questions on the survey. Thirteen questions were demographic in nature. Six questions focused on participants' beliefs and attitudes regarding tenure and the tenure process. Sixteen questions concentrated on STEM faculty engagement in teacher education, teacher professional development, and K-12 schools. Nineteen questions were concerned with the graduate education of teachers. Another 24 questions dealt with STEM faculty work in K-12 schools.

Data Analysis

After the surveys were collected, the data were entered into a relational database by the author. The data were analyzed to yield descriptive statistics, including measures of central tendency, measures of variance, and correlation.

Findings

Demographics

Twenty-five STEM faculty members returned completed surveys. Sixteen (66.7%) participants are men and eight (33.3%) are women. One participant did not reveal his or her gender.

Two participants (8.3%) are Hispanic, one (4.2%) is Asian/Pacific Islander, and 20 (83.3%) are White. The ages of participants ranged from 31 years old to 73 years old. The mean age was 46.33 years (*SD* = 11.92 years). The average time the participants had been employed at this institution ranged from a brand new professor beginning his or her career to professors who had been at the institution for 40 years. The average time the participants had been employed at the university was 9.63 years (*SD* = 11.32 years). The average teaching experience of the participants in a K-12 educational environment was 2.04 years (*SD* = 6.99 years). The average teaching experience of the participants in a postsecondary educational environment was 14.98 years (*SD* = 12.38 years).

All of the participants had earned doctorates. One participant had earned a Doctor of Education (Ed.D.) degree. The other 24 participants had earned Doctor of Philosophy (Ph.D.) degrees. One participant (4.2%) was a lecturer, 10 (41.7%) were assistant professors, 8 (33.3%) were associate professors, and 5 (20.8%) were full professors. One participant declined to state his or her rank. Four (17.4%) participants were faculty members in the biology department, one (4.3%) was in the chemistry department, six (26.1%) were in the geology department, six (26.1) were in the mathematics department, and six (26.1%) were in the physics department. Two participants did not identify their academic department.

Tenure and Issues of Faculty Reward

Eleven (45.8%) participants said they had received tenure and 13 (54.2%) said they had not received tenure. One participant did not indicate his or her tenure status. Of the 11 who said they had received tenure, only 3 (37.5%) are women. Ten of the 11 (90.9%) tenured faculty members are White. The other tenured faculty member is Hispanic.

Six (25%) of the 24 participants said they were concerned their participation in either pre-service teacher education, professional development of teachers, or activities in K-12 schools could adversely affect their tenure and promotion or other forms of faculty evaluation. Three of the six participants who were concerned about their participation adversely affecting tenure or evaluation decisions were untenured. Table 1 is a contingency table for Question 8 and Question 10. The Pearson Chi-square test for asymmetrical significance was .692. The results indicated there was no indicated relationship between whether participants had tenure (Question 8) and whether they are concerned about their participation (Question 10). Note, however, that two of the cells had counts of less than 5. The minimum expected count was 2.39.

Table 1

Contingency Table for Question 8 and Question 10

		Concern (Q10)		
		Yes	No	Total
Tenure (Q8)	Yes	2 (18.2%)	9 (81.8%)	11 (100.0%)
	No	2 (25%)	9 (75.0%)	12 (100.0%)
	Total	5 (21.7%)	18 (78.3%)	23 (100.0%)

Participants were given the opportunity in the survey to comment further about their beliefs concerning participation and tenure and evaluation decisions. Seven participants who said they were concerned made the following comments:

- "Although a full professor, I do not sense that my colleagues in my department who may evaluate me would value K-12 activities."
- "It seems to me that only publishing and grants will gain me tenure. Any work I do in the schools is seen as 'outreach.'"
- "The university does not seem to value the time and work I put in for these activities for tenure decisions."
- "Especially for tenure. It is important to work with K-12 schools to improve teaching and learning."
- "Time away from research/grantwriting."
- "The current load for teaching, research, committee work is already heavy given the developing infrastructure for research and the special needs of our students in their regular coursework, for example, extra office hours, encouragement, and gaps in background."
- "Feel like second rank (lower status) in my department. Takes me away from what I was trained to do (teach in my field). I have to learn a totally new area of research! So, I became another teacher teaching out of field of specialty and got behind in my research."

Six participants who said they were not concerned made the following comments:

- "Only if time constraints affect teaching and research."
- "It is expected."
- "I'm not tenure track."

- “Any of these activities support relevant research.”
- “It has not, so far; my administrators support this work.”
- “Feel it’s an important aspect of my work.”

Expectations and Time

When asked how they actually spent there time in the context of teaching and research, 41.7% (n = 10) said they spent more time teaching than they did working on research and publishing. Only 12.5% (n = 3) said they spent more time researching and publishing than teaching. Almost half (45.8%, n = 11) said their time was about equally spent between teaching on one hand, and researching and publishing, on the other hand. Interestingly, the majority of tenured professors (7 out of 11 or 63.9%) said their time was about equally spent between the two endeavors. Only one tenured participant (9.1%) said he or she spent more time on research and publishing than on teaching. Three tenured participants (27.3%) said they spent more time teaching than researching and publishing. Not surprisingly, of the untenured faculty participants, the majority (7 out of 13 or 53.8%) said they spent most of their time teaching (See Boice, 1991). Only four untenured participants (30.8%) said they spent more time research and publishing than teaching. Two untenured participants (15.4%) indicated more of their time was spent researching and publishing than teaching.

In contrast to how they actually spent their time, only 8% (n = 2) of the participants said they preferred to spend their time teaching instead of researching and publishing. Thirty-six percent (n = 9) preferred to spend their time researching and publishing rather than teaching while 56% (n = 14) said they preferred to spend about the same time teaching and researching and publishing. Only one (7.7%) untenured participant said they preferred to spend more time teaching. Another four (30.8%) of the untenured participants said they would rather research and publish while eight (61.5%) said they preferred to spend their time equally. Of the tenured participants, one (9%) preferred to teach, five (45.5%) preferred to research and publish and another five (45.5%) preferred to spend their time equally.

As for how the participants believed their academic departments preferred them to spend their time, 60% (n = 15) thought their department wanted them to focus more time on researching and publishing. Ten (40%) said they thought their departments wanted them to evenly balance research and publishing with teaching. None of the participants thought their departments wanted them to spend more time on teaching than research and publishing.

Eighty percent (n = 20) of the participants said they believed their college wanted them to focus more on research and publishing. Only 20% (n = 5) said they thought the college wanted them to focus evenly on research and publishing and teaching. None of the participants said they thought their college wanted them to focus more on teaching than research and publishing.

Seventy-two percent (n = 18) of the participants said they believed the university wanted them to focus more on research and publishing while only 28% (n = 7) said they believed the university wanted them to focus more on a balance between research and publishing and teaching. None of the participants believed the university wanted them to focus more on teaching than research and publishing.

A reliability analysis of the "time and preference" questions (i.e., actual time spent by faculty member, personal preference to spend time, perception of department's preference for faculty, perception of college of science's preference for faculty, preference of university's preference for faculty) was conducted. The results indicate an inter-item reliability scale (Cronbach's Alpha) for Questions 15 through 19 of .7376. A covariation matrix (see Table 2) and a correlation matrix (see Table 3) illustrate the relationships between these questions.

Perhaps noting is that the covariation affecting Question 15 (time faculty actually spend on either research or teaching) is a largely a function of Question 19 (32.25% covariation of what faculty believe the university's preference is for them), Question 17 (31.16% covariation of what the faculty believe their college's preference is for them), and Question 18 (24.28% covariation of what the faculty believe their department's preference is for them). Approximately 11% of the covariation is explained by what they faculty prefer to do as opposed to what they do. In summary, nearly 90% of the time faculty actually spend conducting research, publishing, or teaching is influenced by what they believe their department, college, and the university expects from them. Similar results are found in Table 3: only about 11% of the correlation of Question 15 (actual time spent by the faculty) is explained by Question 16 (how faculty prefer to spend their time.

Table 2

Covariation Matrix for Evaluation and Time Questions

Q15	.9112				
Q16	.1105	.4330			
Q17	.3116	.2971	1.0145		
Q18	.2428	.2355	.5072	.6884	
Q19	.3225	.1558	.1884	.4420	.8623

Table 3

Correlation Matrix for Evaluation and Time Questions

Q15	1.0000				
Q16	.1759	1.0000			
Q17	.3241	.4483	1.0000		
Q18	.3065	.4314	.6070	1.0000	
Q19	.3638	.2550	.2014	.5737	1.0000

Engagement in Pre-Service Teacher Education

While a third of the faculty (*n* = 8) said they were very involved in the pre-service education of future teachers in the current (2004-2005) academic year, most (58.3%, *n*= 14) were either not involved or barely involved. Of those who said they were very involved, 62.5% (*n* = 5) of them were untenured participants. The majority of the participants (70.8%, *n* = 17) had only become involved in pre-service teacher education within the past 24 months. Few participants actually taught pre-service teacher education courses. The average for the 25 participants was only one (*SD* = 1.23 course) course during the current (2004-2005) academic year. The average number of hours per month participants reported in pre-service education activities was 21.35 hours (*SD* = 30.49 hours). As for advising students, the average time participants spent was 2.65 hours (*SD* = 4.02 hours).

Most participants were either not involved (45.8%, *n* = 11), barely involved (12.5%, *n* = 3), or occasionally involved (25%, *n* = 6) in aligning the science and math curricula with either the college of education, individual education faculty members, or with members of the "Collaborate." Despite their low level of involvement in aligning the curricula, most participants said it was either very important (64%, *n* = 16) or somewhat important (12%, *n* = 3) to align the math and science curricula with the college of education, individual education faculty members, and the Collaborate. Likewise, most participants said it was either very important (60%, *n* = 15), or somewhat important (36%, *n* = 9) for science and math faculty to engage in the preparation of pre-service teachers. In fact, 42.9% (*n* = 9) of the participants said that their involvement in pre-service teacher education positively changed their attitude about engaging in pre-service activities. However, another 42.9% (*n* = 9) said their attitude had not changed.

Engagement in Graduate Teacher Education

Over half (56.5%, *n* = 13) reported they had only been involved in graduate teacher education during the past 24 months. Most participants said they were not involved (56.5%, *n* = 13) in teaching graduate teacher education courses in the current (2004-2005) academic year. In fact, when asked how many graduate teacher education courses they had taught in the current (2004-2005) academic year, participants, on average, taught .48 courses (*SD* = .79). Participants spent an average of 10.95 hours per month (*SD* = 17.00 hours) involved in graduate teacher education and an average of 3.51 hours (*SD* = 6.70 hours) advising graduate students who were teachers.

When asked about their involvement in mentoring graduate students in education, 56.5% (*n* = 13) were not involved and another 4.3% (*n* = 1) was barely involved in mentoring. Conversely, only 17.4% (*n* = 4) said they were very involved in mentoring graduate students. Similarly, very few participants were involved with faculty members or administrators from the college of education or the Collaborative in the planning and preparation of current teachers who were studying at the graduate level. For example, 62.5% (*n* = 15) were not involved at all and only 12.5% (*n* = 3) were barely involved. Only 2 of the 25 participants (8.3%) said they were very involved.

Notwithstanding their low involvement, 79.2% said it was either very important (41.7%, *n* = 10) or somewhat important (37.5%, *n* = 9) to collaborate with the college of education, college of education faculty members, or the Collaborative to align the graduate math and science curricula for teachers. Likewise, 44% (*n* = 11) said it was very important and another 44% (*n* = 11) said it was somewhat important for science and math faculty members to engage in the graduate education of current teachers. In fact, one participant penciled the following statement in the margin adjacent to his or her answer regarding this issue: "I see this as a conflict since math and science faculty are expected to teach and publish and bring in large grants—when are they to have time to work with education of teachers?" Almost one-third of the participants indicated their attitude about participating in the graduate education of current teachers was positively changed (30.4%, *n* = 7) due to their involvement in teaching graduate courses to current teachers.

Work in K-12 Schools

About half of the participants were either not involved (39.1%, *n* = 9) or barely involved (8.7%, *n* = 2) in working with K-12 schools during the current (2004-2005) academic year. However, the average number of times participants visited a K-12 school for teaching, presentations, advising, research, or other activities was 7.68 visits per current (2004-2005) academic year (*SD* = 21.64 visits per current academic year). Nearly three quarters (70.8%, *n* = 17) of the participants said they were not involved in the professional development of teachers at K-12 school sites. Only one participant (4.2%) said he or she was very involved. Additionally, 65.2% (*n* = 15) said they were not involved in mentoring or advising K-12 students about math and science content or about specific research projects at K-12 schools during the current (2004-2005) academic year.

Nearly three-quarters (73.9%, *n* = 17) of the participants were not familiar with the RPLs. Not surprisingly, 75% (*n* = 18) of the participants said they had not been involved in the Research Pedagogical Laboratories (RPLs).

In spite of their unfamiliarity with STEM faculty activities in the school or their lack of personal involvement in the schools, a majority said that it was somewhat important (26.1%, *n* = 6) or very important (39.1%, *n* = 9) for science and math faculty to engage in K-12 school activities. More than one-third of the participants said it was either somewhat important (17.4%, *n* = 4) or very important (21.7%, *n* = 5) for science and math faculty to conduct research at school sites.

K-20 Curricula Alignment

Most participants were not involved in efforts to align either the K-16 or the K-20 curricula in science and math; not quite half (47.8%, *n* = 11) of the participants said they were not involved and another 13.0% (*n* = 3) said they were barely involved in these efforts. However, despite their low involvement, 21.7% (*n* = 5) said it was somewhat important and 52.2% (*n* = 12) said it was very important to align curricula.

The last question on the survey asked the participants if they thought faculty members should be rewarded for their involvement in K-12 school. One hundred percent of the participants said they should be rewarded. Participants were asked to add their comments about faculty reward for K-12 participation. Ten participants wrote the following responses:

- “If through their work in K-12 schools, faculty produce scholarly work that also benefits the teachers and students in the schools, then there should definitely be strong recognition. Additional recognition should come from outreach activities, such as presentations and recruiting, but this recognition should fall in the service category.”

- “Faculty members are employed to increase and disseminate knowledge. Involvement in K-12 schools fits these criteria. More importantly, involvement should make the university-level education more efficient.”
- “I was hired as a mathematics education faculty member. My whole focus is teacher preparation and working with K-12 schools. I should get tenure credit for doing what I was hired to do.”
- “If a person is to be involved it needs to be valued equally with other research efforts with regard to tenure and promotion.”
- “Any professional activity to better teachers and improve student preparation should be recognized.”
- “As a state funded institution, we owe this involvement to the community, and recognition encourages this participation. Because involvement in K-12 schools often has a big impact on preparation of students enrolled at [our university], a sacrifice is made of time that could have been spent on research. [Our university] rewards publications, grants, and the push have gotten even stronger for faculty to spend more time on research and proposal writing. So, if [our university] wants faculty members involved, then they need to recognize this work.”
- “It is a vitally important service and done well, it takes precious time.”
- “All workers should be recognized for everything they do as part of their jobs.”
- “Faculty should not be placed under constraints to do and perform some tasks repeatedly, then find out that what they are being asked to do has nothing to do with the university’s reward system! Please remember confidentiality.”

- “I view math/science education as a continuum between K and post-graduate studies. Whatever we can do to enhance K-12 helps everyone and benefits our programs at the university level. I also believe in recognition for education outside of the K-12/university setting. A better educated general public in science/math makes better informed decisions.”

Discussion

The results of this pilot study demonstrate that most STEM faculty, while clearly inexperienced in helping to academically prepare future and current K-12 teachers, aligning the curricula, and working with colleges of education faculty and others, nevertheless are eager to engage in this kind of activities. Granted, the NSP MSP grant in relatively new. However, the activities of this particular university to improve not only the math and science but also the general curricula of the community’s mostly Hispanic K-12 students have been ongoing for more than a decade. Many of the participants stated that these activities were vital to both the university and the K-12 community. In the words of one participant, “As a state funded institution, we owe this involvement to the community.”

However, the barriers to active participation in MSP activities by STEM faculty appear to be significant. The faculty participants of this study (both the untenured and tenured faculty members) were deeply concerned their participation would be adversely judged in accordance with the university’s faculty reward system. This is reflected in the findings regarding how faculty actually allocate their time as opposed to how they prefer to send their time. How faculty actually spend their time is very different from how faculty think their superiors want the faculty to spend their time.

In this study, faculty preferred to spend more time on researching and publishing than on teaching. They important question to ask is, why? One plausible explanation, of course, is that faculty realize the important role publications and grant writing have in the scheme of the faculty reward system. As is true in most research universities, conducting research, writing publications, and receiving grants monies are often tantamount to successful faculty review-little else really matters. Why should faculty spend time on activities they believe they will not be rewarded? This study demonstrated that faculty perceive the focus of the institution--be it at the department, college or university level—to be primarily focused on research and publishing, not on teaching and service activities. These results are consistent with the findings of Boice (1991), Li-Ping and Chamberlain, (2001), and O'Meara, (2002).

Limitations of the Study

The scope of the study was limited in a number of ways. This was a pilot study of 24 STEM faculty at one Hispanic-serving research university in the southwest. Only faculty members from the disciplines of biology, chemistry, geology, and mathematics were included in this study. As part of the NSF grant evaluation process, the faculty survey will be administered in Spring 2006 and Spring 2007. Over the next several years, faculty members from this university's technology and engineering disciplines are expected to begin participating in pre-service teacher education and the professional development of current teachers.

Clearly, efforts need to be made to increase faculty response rates. Having less than one-quarter of the STEM faculty population at this institution respond is challenging and leads one to question the findings. For example, due to the low sample size, conducting many statistical analyses (i.e., inter-item reliability, Chi-square) is problematic at best.

Recommendations

The National Science Foundation's Math-Science Partnership Programs are intended to fundamentally change the preparedness of K-12 teachers. In turn, it is hoped, these well-prepared teachers will substantially improve math and science education. The end goal is in sight; namely, to create the kind of fundamental change in education that lasting improvement that better prepares America's youth for postsecondary experiences, careers, and contributions to society.

The work of improving P-12 mathematics and science education "cannot succeed without the participation of leaders from its institutions of higher education (Business-Higher Education Forum, 2005, p. 29). Possibly, it is time to revisit faculty reward systems in order to more positively affect these very important partnerships between university STEM faculty and K-12 institutions. Failing to change the faculty reward systems may mean that, while faculty are likely to remain interested and committed to these partnerships, they will nonetheless be hobbled by the realities of the faculty reward systems currently prevalent across research universities. To fail to address these issues will only hold America's minority youth even further from the starting gates of educational achievement and success as working, contributing members of society.

In 1990, Boyer wrote, "It's time to ask how priorities of the professoriate relate to the faculty reward system" (p. 2). Many since Boyer (e.g., Checkoway, 2001; Glasser, Huber, & Maeroff, 1996; Kuh & Hu, 2001; Ward, 2005) have written convincingly about the need to reexamine and restructure university faculty reward systems in the context of the many missions of postsecondary institutions in general and research universities in particular. Ward, for instance, said "institutions need faculty reward structures that value the complexity of faculty work, including the important and unique contributions of teaching, research, and service that focus on the public good" (2005, p. 229). It is time, once again, to revisit the nature of faculty work and reward.

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