

Assessment Tools for Measuring Productivity of Engineering Faculty

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Synopsis

This paper presents tools used to assess faculty productivity in the civil engineering departments at New Mexico State University (NMSU) and the University of Hawaii at Manoa (UHM). These assessment tools illustrate substantially different methods of quantifying faculty productivity. The NMSU method awards points for activities that faculty are expected to perform, while the UHM method estimates the number of hours required to complete specific tasks. The UHM system also incorporates some adjustments to recognize that some activities are more prestigious than others. Other differences between the tools include the quantification of teaching load. In the NMSU model, two classes per semester is considered a standard teaching load. However, the UHM model incorporates additional data related to the number of lecture hours associated with each class, whether or not there were laboratory sections associated with a class, and the number of teaching assistants available to assist the faculty member. The authors have found successfully implementing an assessment tool depends almost entirely on how well the tool addresses the needs of the faculty within the department.

Introduction

Descriptions of the responsibilities of a university professor are many and varied. The diversity of responsibilities arises from the multitude of activities that a faculty member may choose from when deciding how to invest their professional time. However, most civil engineering departments at research universities use a general description stating that faculty members are responsible for teaching undergraduate and graduate classes, conducting externally funded research, advising undergraduate and graduate students, and perform service to the department, college, university and profession.

This vague description is necessary to accommodate the variety of activities in which university professors engage. However, it is difficult to assess the productivity of faculty members on a comparative basis. Such comparisons are often desired by administrators charged with granting raises on the basis of merit or reviewing applications for promotion and tenure.

In hopes of providing the profession with a new perspective on this issue, the authors present workload guidelines used in two civil engineering departments, NMSU and UHM. Both of these tools attempt to evaluate both the quantity and the quality of work performed by civil engineering faculty, since meritorious work could conceivably fall into two categories: meritorious quality of work and meritorious amounts of acceptable work (Kasten 1984).

Case 1: Evaluation Metrics at UHM

The assessment tool used in the Civil and Environmental Engineering department at the University of Hawaii at Manoa was adopted in 1999, and is used to evaluate faculty for merit raises. An image of the spreadsheet used for calculating the workload of a faculty member is presented in Figure 1. The spreadsheet is subdivided into the broad categories of teaching, research and service that are used to evaluate faculty at most universities (Katz 1973). Additionally, there are categories to address faculty time that is contractually obligated to projects or organizations, administrative duties, and other scholarly activities such as consulting work. Values are averaged over a four semester period. The input values are generally integer values describing the number of amount of the line item. The factor in the right column is multiplied by the input to compute an equivalent workload in terms of credit hours. At the end of the spreadsheet the workload is computed as a percentage of a 12 credit hour workload, which is the definition of full-time according to the faculty contract at UHM.

The teaching load at UHM is quantified using the number of lectures associated with the courses taught, whether or not a class had a laboratory component, the number of teaching assistants associated with a class, and whether or not a course was writing intensive (WI). Students at UHM are required to take five WI courses instead of a technical writing course. WI status requires that students write, receive feedback on, and re-write at least 16 pages during the semester. The most basic case would reflect a faculty member who teaches two three-credit courses without labs for four semesters. Since six credit hours is one-half of the 12 credit hour workload, teaching would constitute 50% of the faculty member's workload.

The reasoning behind the factors applied to the line items in the teaching category are that four credit courses require more work from the instructor than three credit courses, laboratory courses (where experiments are conducted in the lab) also require more work, and that teaching assistants reduce the workload of the faculty. It should be noted that the UHM model makes no attempt to quantify the quality of teaching activities.

Research productivity in the UHM model is measured by counting publications, graduate student committees, and proposals aimed at obtaining extramural funding. Although many departments include research funding in such an evaluation (Roesset and Yao 2002), it is prohibited by the faculty contract at UHM. The factors applied to the line items in the research category reflect both the time estimated for the task and the prestige of the task. For example, advising an average of one master's student per semester constitutes 1 credit hour (8.3% of workload) of work while advising on Ph.D. student constitutes 1.5 credit hours of work (12.5% of workload). The difference in these factors reflects the fact that Ph.D. students may require more time for advising and bring more prestige to the department. Similar reasoning has been used for the factors applied to publications. Although it may take approximately the same amount of time to prepare a refereed conference paper and a refereed journal paper for publication, the journal paper is weighted to receive more than twice as much credit (factors of 1.2 for the journal paper and 0.5 for the conference paper) because the journal paper is more prestigious.

Line items in the service category include committee positions, other service positions, and miscellaneous activities. No distinction is made between service to the department, college, university or profession. However, service positions are broken into two subdivisions: major and minor. Major service positions would include activities such as serving as the editor for a journal or serving as the faculty advisor for some student organizations. Specifically, a service position requiring more than three hours of service per week would be considered a major service position. All faculty are granted one credit hour of miscellaneous service for academic advising of undergraduate students.

Faculty Time Assessment Worksheet			
Contractual Obligations (Any)		Input	
Total % of time obligated		0	
Administrative Obligations		Input	
Total % of time obligated		0	
Instructional (except time covered by contractual obligation, average per semester over 2 years)			
		Input	Factor
Lecture hours (50 min.)		6	1
Lab sections (total enrol. for a 2nd section must exceed 20)		0	1.5
Writing intensive courses			
10-19 students		0	0.5
20 or more students		0	1
Number of TA's		0	-0.5
Number of graders (for classes with less than 20 students)		0	-0.5
699 unrelated to thesis research (sum students*credits)		0	0.1
499 (sum students*credits)		0	0.1
Instructional workload	100%*total/12	50	
Research (except activities covered by contractual obligation, average per semester over 2 years)			
		Input	Factor
Graduate Student - Major Advisor			
M.S. Plan A (limit 4 semesters/student)		0	1
M.S. Plan B (limit 4 semesters/student)		0	0.3
Ph.D. (limit 8 semesters/student)		0	1.5
Graduate Student (Graduated) - Committee Member (not chair)			
M.S. Plan A		0	0.2
M.S. Plan B		0	0.1
Ph.D.		0	0.3
Refereed Journal Publications (first 2 Ph.D.'s on auth. list only)		0	1.2
Refereed Conference Publications (first 2 Ph.D.'s on auth. list only)		0	0.5
Other Papers		0	0.3
Discussions, articles in newsletters, nontechnical magazines, etc		0	0.05
Books (includes chapters in books)			
First Edition (total pages/100)		0	2.4
Subsequent Editions (total pages/100)		0	1.2
Edited		0	1.2
PI-Proposals (Exceeding \$15,000, Approved by ORS or RCUH)		0 (limit 1.5)	0.4
CoPI-Proposals (Exceeding \$15,000, Approved by ORS or RCUH)		0 (limit 1)	0.3
Co-Invest. Proposals (Exceed. \$15,000, Approved by ORS or RCUH)		0 (limit 1)	0.1
Funded undergrad. research asst. (10 hrs/wk, 9 mo.)		0	0.5
Research Workload	100%*total/12	0	
Service (except time covered by contractual obligation, average per semester over 2 years)			
		Input	Factor
Committee Chair (Dept., College, Univ., or professional)		0	0.5
Committee Co-Chair (Dept., College, Univ., or professional)		0	0.4
Committee Member - non-chair (Dept., College, Univ., or professional)		0	0.3
Major Academic/Professional Service Positions (more than 3 hrs/wk)		0	1
Minor Academic/Professional Service Positions		0	0.3
Misc. Service (1 for all faculty)		1	1
Hours of Other Service Activities (at discretion of Dept. Chair)		0	0.01 per hour (max 40 hours)
Service Workload	100%*total/12	8.333 (limit 35%)	
		8.333	
Other Scholarly Activities			
Up to 10% of time (at discretion of Dept. Chair)		0	
Total Workload (%)		58.33	

Figure 1. Assessment tool used in the Civil and Environmental Engineering department at UHM.

Case 2: Evaluation Metrics at NMSU

The assessment tool for the CAGE department at NMSU was developed to quantify faculty productivity for the ABET evaluation in 1998. An image of the spreadsheet used for evaluating faculty productivity at NMSU is presented in Figure 2. As with the UHM model, the major categories are teaching, research and service. An additional section is provided for consulting work. Credit for accomplishments in each area is given on a point system, where the points for each line item are based on similar systems at peer institutions.

In the category of teaching, the NMSU model does not distinguish between classes with laboratories or teaching assistants. However, additional line items are provided for funded teaching activities, distance education, and teaching evaluations and awards. These line items reflect the emphasis on teaching excellence and the broader teaching activities of the faculty at NMSU.

In research, the NMSU tool incorporates research funding into the evaluation, which UHM is not allowed to do. The NMSU form also contains line items similar to the UHM line items. However, the differences between points awarded for various activities are sometimes not as great as the differences between factors in the UHM model. The NMSU model has separate line items for research awards, which is similar to the prestige factors used the UHM model. NMSU also uses the total number of journal papers in a career. This line item would be expected to be substantially greater for senior faculty than for junior faculty, and can be used to measure a faculty member's growth over time.

The UHM and NMSU assessment tools both reflect the activities of the faculty in their respective departments. The UHM assessment tool incorporates administrative and contractual obligations because a disproportionate number of the faculty have dedicated their time to activities that don't result in the normal products of research, namely publications and graduate degrees. Alternatively, the NMSU evaluation form addresses a much wider range of teaching activities because teaching is a greater focus of the university and the department.

Summary

Tools for assessing faculty workload and productivity at UHM and NMSU were presented. These tools have several components in common, but vary at the line item level to reflect the activities of the faculty in their respective departments. The tools presented in this paper have been used to assess faculty productivity for merit raises and to quantify individual and departmental effort in teaching, research, and service. These types of tools can be extremely useful for administrators trying to compare productivity across the faculty or for external reviews, such as ABET accreditation reviews.

It is essential that an assessment tool reflect the activities of the faculty in the department to ensure equity in the evaluation process. In developing tools like the ones presented here, the authors suggest that feedback be gathered from the faculty to ensure that their activities are assessed fairly and credited appropriately. The weighting factors for individual line items should be agreed upon by the faculty in a democratic manner. This encourages the faculty to study the system that will be used to assess them, tailor it to fit their activities, and allows the system to be adopted with the wholehearted support of the faculty.

References

- Katz, D. A., (1973). "Faculty Salaries, Promotions, and Productivity at a Large University," *The American Economic Review*, Vol. 63, No. 3, p. 469.
- Kasten, K. L., (1984). "Tenure and Merit Pay as Rewards for Research, Teaching, and Service at a Research University," *Journal of Higher Education*, Vol. 55, No. 4, p. 500.
- Roesset, J. M., and Yao, J. T. P., (2002). "Engineering Faculty Reward Systems," *ASCE Journal of Professional Issues in Engineering Education and Practice*, Vol. 128, No. 3, p. 95.

Name of Faculty: Rank: Prof. Assoc. Prof. Assist. Prof.
Last name, Initial Adjunct faculty

PE Registration: Highest degree:
 Yes State(s): Degree year:
 No Expecting Institution:

Years of experience
 Govt. Ind. ? Teaching At NMSU

For Instructions, please point the mouse at the red triangles

Teaching Awards and Related Activities [during last 5 years]:											
	N° Pts ?				N° Pts ?			Comments			
Teaching awards from NMSU	5	0	0	Educ. grants/funds as PI	6	0	0				
Teaching awards from outside	6	0	0	Educ. grants/funds as Co-PI	4	0	0				
Jour. papers on teaching	4	0	0	Sh'tcourses, w'kshops taught	4	0	0				
Teaching present., Int/National	4	0	0	Distance ed. courses taught	5	0	0				
Teaching present., Reg/Loc.	3	0	0	PhD/MS Exam com. member	2	0	0				
New courses developed	5	0	0	NMSU/COE/CAGE activities	3	0	0				
Textbooks written	10	0	0	Student's teaching evaluation	8	0	0				
Sub-total				Sub-total				0	??	0	

Professional Service Activities in Committees/Panels/Boards [during last 5 years]												
	Chair			Office bearer			Member			Total		Comments
	N°	Pts	?	N°	Pts	?	N°	Pts	?	N°	??	
International	6	0	0	5	0	0	0	0	0	0	0	
National	5	0	0	4	0	0	3	0	0	0	0	
State/Regional	4	0	0	3	0	0	2	0	0	0	0	
Local	3	0	0	2	0	0	1	0	0	0	0	
University level, regular	4	0	0	3	0	0	2	0	0	0	0	
College level, regular	3	0	0	2	0	0	2	0	0	0	0	
Dept. level, regular	1	0	0	1	0	0	1	0	0	0	0	
Conf. Seminar/Meeting	3	0	0	1	0	0	1	0	0	0	0	
NMSU/COE/CAGE ad hoc	2	0	0	1	0	0	1	0	0	0	0	
Total												

Consulting/Sabbatical/Summer Industry Activities [during last 5 years]												
	More than 10			6 to 10			1 to 5			Total		Comments
	N°	Pts	?	N°	Pts	?	N°	Pts	?	N°	??	
International	6	0	0	5	0	0	4	0	0	0	0	
National	5	0	0	4	0	0	3	0	0	0	0	
State/Regional	4	0	0	3	0	0	2	0	0	0	0	
Local	3	0	0	2	0	0	1	0	0	0	0	
Total												

Name of Faculty:

Research Grants, Publications, and Related Activities [during last 5 years]											
	N° Pts ?				N° Pts ?						
If PI in > 3 projects...?	6	0	0	Ref'd jour. papers in last 5 yrs	6	0	0				
PI in > 2 projects...?	5	0	0	Ref'd jour. papers in career							
PI in 1+Co-PI in > 4 projects?	4	0	0	N° of SCI citations of papers	4	0	0				
Co-PI in >5 parallel projects?	3	0	0	Conf. proceedings, printed	2	0	0				
Co-PI in <3 parallel projects?	2	0	0	Research present., I/National	3	0	0				
Well defined research areas	4	0	0	Research present., Reg/Loc.	2	0	0				
N° of proposals pending as PI	2	0	0	Journal papers submitted	3	0	0				
N° of proposals pending as Co-PI	1	0	0	N° of res. proposals reviewed	3	0	0				
PhD Dissertations done	6	0	0	N° of jour. papers reviewed	2	0	0				
MS Thesis done	3	0	0	Research awards, Int./National	6	0	0				
Undergrad. Hon Thesis done	2	0	0	Research awards, Regional	3	0	0				
Total grad. students current	3	0	0	Research awards, University	4	0	0				
? research \$\$ as PI > 400K	4	0	0	Research awards, College	4	0	0				
? research \$\$ as PI > 200K	2	0	0	Invited seminars, Int./National	4	0	0				
? research \$\$ as PI > 100K	1	0	0	Invited seminars, Reg./Local	2	0	0				
Sub-total				Sub-total							

Comments (Use Column/Row notation for reference):

Figure 2. Assessment tool used in the CAGE department at NMSU.