passed the Engineer-in-Training exam. Clearly the BSCE is the easier path to Federal employment, as professional registration alone would require several years of experience. Likewise, qualifications for higher grades are often easily satisfied through the completion of the requisite number of advanced years of education leading to advanced degrees.

A civil engineer hired straight out of a four-year BSCE program will generally be placed at the GS-5 grade. If that student demonstrates superior academic achievement at the baccalaureate level, however, he/she can qualify for GS-7 positions and earn almost $7,000 more a year. Graduates of five-year programs with at least 160 credit hours also qualify for GS-7 positions. If a master's degree or equivalent experience is required for a position, that position starts at the GS-7 or GS-9 grade, with salaries $6,700 to $14,700 higher than GS-5 positions (OPM 2001C). Simply put, educational achievement means higher salaries for civil engineers in Federal employment.

Civil Engineering Compared to Other Professions

Based on Federal government statistics, increased educational requirements in a profession generally correspond to higher starting grades of employment, higher average grades, and higher average salaries. Table 3 presents the required education, starting and average GS grades, and the average salaries of several leading professions. The average grade for the GS is a weighted average obtained by dividing the total number of employees in the GS and equivalent-to-GS pay systems (OPM 1979). The professions are ranked from the highest to the lowest average yearly salary. The average salary was obtained from the appropriate salary rate table (OPM 2001a; OPM 2001b; OPM 2001c).

Note that civil engineers begin at grade GS-5—the lowest starting level for a white-collar, professional occupation. Civil engineers start at the lowest level, and progress to an average GS grade below that of doctors, dentists, lawyers, optometrists, architects, and even the average of all white-collar occupations. Accordingly, civil engineers are compensated significantly less than those leading professions by up to tens of thousands of dollars per year (Table 3, Column 5).

While the income disparity with architects and accountants may be insignificant, civil engineers earn slightly more than pharmacists and occupational therapists in the Federal sector. Nevertheless, the divide between the professions graded lower than civil engineering is decreasing, while the divide between the professions graded higher is increasing. Figure 1 presents the 1967 and 1997 median grades of the same professions listed in Table 3. Notice that every profession has witnessed an increase in its median grade over the 30-year period, except three—architecture, civil engineering, and medicine. At grade GS-15, medicine cannot rise beyond what is the highest level. Figure 2 helps explain this stasis by illustrating the historic rise in required education to at least 5 years for all the major professions, save one: civil engineering. While required years of education for professional practice is not the only factor for the static position of civil engineering grading, and thus compensation, it is nonetheless significant, especially considering that accountancy, occupational therapy, and pharmacy have each recently increased their educational requirements.

Table 3. Education, Starting and Average Grades, and Average Salaries of Select Federal Professionals
(Source: OPM 1997; OPM 2001a; OPM 2001b; OPM 2001c)

Name of Professional (1)	Required Education (Years) (2)	Starting GS Grade (3)	Average GS Grade (4)	Average Salary ($) (5)
Doctor	8	11	14.80	99,391
Dentist	8	11	14.61	79,060
Lawyer	7	9	13.85	72,641
Optometrist	8	9	13.63	66,906
Accountant	5*	5	11.91	50,964
All Professional Series	--	--	12.22	50,000
Civil Engineer	**4**	**5**	**12.13**	**49,839**
Architect	5	5	12.19	49,830
Pharmacist	5/6**	7	11.51	45,600
Occupational Therapist	5	6	11.20	41,577

*Accountancy requires a total of 150 credit hours of college education, with at least 24 at the graduate level
**Pharmacy is currently a 5-year degree, but by 2007 will be a 6-year degree

Numbers Don't Lie

Since pharmacy is a profession that currently requires a five-year degree for practice, it would appear that pharmacy disproves the suggestion that more education requirements correspond to higher salaries. For this reason, our analysis encompasses more than just Federal government statistics. First of all, the Federal government is not a significant employer of pharmacists, with less than 5,000 of the 185,000 licensed pharmacists working for the government (BOL 2001; OPM 1997). Secondly, in the private sector, pharmacists earn median salaries greater than civil engineers' median salaries (BOL 1999). Most importantly, pharmacists have dramatically outpaced civil engineers in first-year earnings, as shown in Table 4. Table 4 also reveals that while accountants continue to make salaries comparable to those of civil engineers in both the public and private sectors, starting occupational therapists are offered salaries higher than starting civil engineers. In 1990, first-year civil engineers made approximately $2,500 more than first-year occupational therapists, but $8,000 less than pharmacists. In 2000, however, first-year occupational therapists earned on average $3,500 more than civil engineers, while first-year pharmacists made almost $30,000 more. These increases can be attributed to enhanced educational standards.

Table 4. Average Yearly Salary Offered to Bachelor Degree Candidates (Men and Women) (Source: NACE 1990 and 2000)

Curriculum (1)	1990 ($) (2)	2000 ($) (3)	Change $ (4)	Change % Increase (5)
Civil Engineering	28,136	37,932	**9,796**	**35**
Accounting	26,391	36,710	**10,319**	**39**
Occupational Therapy	25,644	43,500	**17,856**	**70**
Pharmacy*	36,728	64,717	**27,989**	**76**

* Pharmacy is a five-year degree program

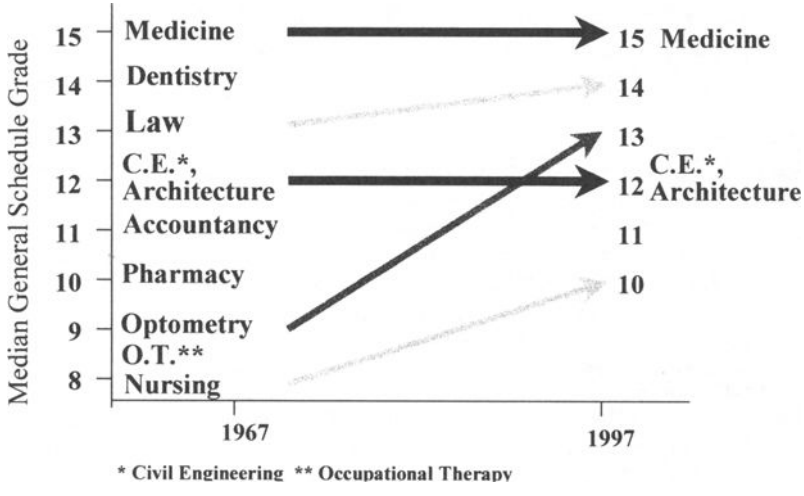

Figure 1. Median General Schedule

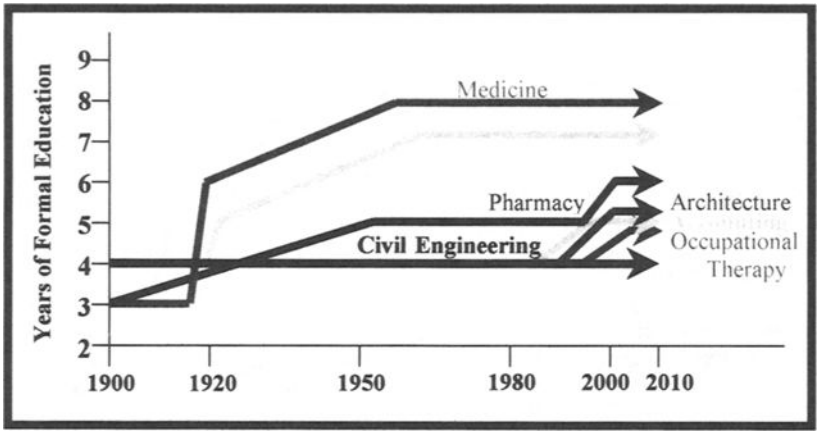

Figure 2. A Leader No Longer

Accountancy. As the authors have previously noted, accountancy is in the process of adopting a 150-hour educational requirement for accreditation as a public accountant (Russell et al., 2000). The previous standard had been the bachelor's degree. While first-year accounting salaries have so far remained equivalent to those of civil engineering, salaries have been shown to increase in states that have adopted new educational requirements. In Florida, for instance, a state that implemented the requirement starting in 1983, first-year salaries of graduates with 150-hour degrees have outranked the salaries of graduates from traditional four-year programs by an average of 8%-16% (Cumming and Rankin 1999).

Occupational Therapy. The occupational therapy (OT) profession recently made the master's degree the first degree for professional practice. In 1999, the American Occupational Therapy Association (AOTA) passed a resolution calling for the installation of a post-baccalaureate entry-level requirement for professional OT practice. The previous standard had been the bachelor's degree. Proponents of the new standards cite the perception that occupational therapists have been subordinated with respect to other professionals such as doctors, physical therapists, and social workers, and are thus penalized financially (Steib 1999). They also frequently mention an increasing emphasis on the need for professionalism, professional standards, and advanced training to cope with the increased knowledge about the body introduced by advances in biological and medical science (St. Ambrose 2001).

In a timeline established by the Accreditation Council for Occupational Therapy Education, programs have until January 1, 2007 to implement post-baccalaureate degree programs of at least five years, most culminating in the Master's of Occupational Therapy (AOTA 1999). The time lag from acceptance to full-compliance allows programs several years to meet the new requirements or phase out their existing programs. Since the master's will become an eligibility requirement to

sit for national certification, occupational therapy has effectively factored the new educational requirements into the licensing model of the profession (NBCOT 2001).

Pharmacy. Like accounting, civil engineering, and occupational therapy, pharmacy was once a four-year undergraduate program. Following a national study on pharmacy education, the American Association of Colleges of Pharmacy (AACP) promulgated in 1954 a five-year bachelor's degree consisting of two pre-professional and three professional years of education (Buckner et al., 1997). As demands on the profession increased, pharmacy again called for increased education. In 1992, the AACP endorsed the Doctor of Pharmacy (Pharm.D.) as the first professional degree for practice (Hitchens 1997).

The acceptance of the Pharm.D. as the first professional degree for pharmacy practice necessitated new accreditation standards. The American Council on Pharmaceutical Education adopted the new standards in June of 1997. The standards called for the discontinuation of the B.S. degree after June 30, 2000, with the last class of graduates leaving their programs in 2004 (Hitchens 1997). As with occupational therapy, the national accreditation body played a major role in enforcing the new standards, this time by discontinuing the accreditation of previous five-year programs. To date, the resolution "has not negatively impacted the number of students applying for admission into pharmacy professional degree programs" (Hitchens 1997).

Lessons Learned

Clearly civil engineers are not alone in their belief that increased education for professionals is necessary in the 21st century. Recognizing this, accountancy, occupational therapy, and pharmacy have each moved forward with implementing augmented educational standards. Accordingly, all three professions have witnessed increases in starting salaries; in the case of the latter two, the results have been dramatic (Table 4).

The examples of occupational therapy and pharmacy also suggest the need for enforceable change, meaning there must be buy-in from accreditation and licensing organizations. With their new accreditation standards, the Accreditation Board for Engineering and Technology (ABET) appears receptive and able to support civil engineering in defining the master's as the FPD (Russell et al. 2000). Encouragingly, the National Society of Professional Engineers (NSPE) has recently revised its model law for licensing by outlining two paths to achieve the requirements: (1) with a BSCE and (2) with a MS or Ph.D. ("NSPE Proposes" 2000). These proposed changes to the model law suggest receptivity for the master's as a requirement for civil engineering. Furthermore, by providing a pathway for civil engineers to pursue licensing alongside other branches of engineering with four-year education requirements, the proposed changes should help avoid any problems of compatibility.

While ABET and NSPE appear receptive to supporting the FPD, the stance of the National Council of Examiners for Engineering and Surveying (NCEES) remains unclear. NCEES is in contact with state licensing boards and could help facilitate the transition to the new educational requirements. Nonetheless, it remains to be seen how NCEES will encourage the master's degree for civil engineering. As ASCE

develops its implementation plan, key representatives from NCEES, ABET, and NSPE should be consulted.

Table 5. Salary Comparison of Civil Engineering Bachelor's and Graduate Degrees (Sources: NACE 2000; BOL 1999; NSF 1997)

Salary (1)	Bachelor's Degree ($) (2)	Master's Degree ($) (3)	Doctorate ($) (4)
Average Starting	36,100	42,300	58,600
Median	51,000	60,000	68,000

Outcomes

Adopting increased education requirements for civil engineering will not guarantee that all Federal civil engineering positions will instantly be reclassified at a higher level, nor will it guarantee that private industry will increase civil engineering salaries. Yet both the government and private industry pay for increased education, as illustrated in Table 5. It is our contention that as the educational credentials of the profession are enhanced, so will the responsibilities of Federal jobs. Moreover, it is conceivable that the entire Federal Civil Engineering Series could be restructured to begin at the GS-7 level. This would be consistent with other professions that require education beyond the bachelor's degree for professional practice, as Column 3 in Table 3 makes clear.

Overall, the numbers support the master's for civil engineering. With increased value-adding knowledge and skills, young civil engineers will stand a better chance for advancement in public or private practice. In this way, more education will help civil engineers take control of their future.

References

American Occupational Therapy Association (1999). "ACOTE sets timeline for postbaccalaureate degree programs." OT Week, 13(33).

American Society of Civil Engineers (2001). "Draft Report of the Task Committee on the First Professional Degree," <http://www.asce.org/firstprofdegree/report050701.cfm >.

Buckner, C., Connors, K.A., Parascandola, J., Sonnedecker, G., and Zografi, G. (1997). *Its first century*, Madison, WI.

Bureau of Labor (1999). "1999 National Occupational Employment and Wage Estimates," < http://stats.bls.gov/oes/1999/oes170000.htm >.

Bureau of Labor (2001). "Occupational Outlook Handbook 2000-2001 Edition," <http:// stats.bls.gov/ocohome.htm >.

Cumming, J., and Rankin, L.J. (1999). "150 hours: A look back." *Journal of Accountancy*, 187 (4), 53-66.

Giggs, N. S. (2000). "Demographics and Industry Employment of Civil Engineering Workforce." *Journal of Professional Issues in Engineering Education and Practice*, July 2000, pp. 116-124.

Hitchens, K. (1997). "Pharmacy schools support ACPE degree standards." *Drug Topics*, 141(15), 16.
National Association of Colleges and Employers (1990). *Salary Survey Fall 1990*, Bethlehem, PA.
National Association of Colleges and Employers (2000). *Salary Survey Fall 2000*, Bethlehem, PA.
National Board for Certification in Occupational Therapy (2001). "Eligibility requirements for US graduates taking the COTA or OTR examination," < http://www.nbcot.org/webpage_exameligibility.htm >.
National Science Foundation (1997). "Table G-1 Median annual salaries of U.S. scientists and engineers, by occupation and highest degree attained," < http://srsstats.sbe.nsf.gov/preformatted-tables/1997/tables/tbG01.pdf >.
National Society of Professional Engineer (2000). *Income and Salary Survey 2000.*
"NSPE Proposes Changes to Model Law for Licensing of Engineers" (2000). *Engineering Times*, 22(10), 1, 12.
Office of Personal Management (1997). *Federal Civilian Work Force Statistics: Occupations of Federal White-Collar Workers,* OMSOE-OWI-56-25.
Office of Personal Management (1999). *Introduction to the Position Classification Standards*, HRCD-7.
Office of Personal Management (2001a). "2001 General Schedule Pay Table," < http://www2.opm.gov/oca/01tables/Gsannual/html/2001gs.htm >.
Office of Personal Management (2001b). "Special Salary Rate Table Number 0290 for Medical Officers (Clinical) Worldwide," < http://www2.opm.gov/oca/01tables/SSR/html/0290.htm >.
Office of Personal Management (2001c). "Selected Salary Rate Table Number 0414 for Selected Engineers Worldwide," < http://www2.opm.gov/oca/01tables/SSR/html/0414.html >.
Russell, J.S., Stouffer B., Walesh S.G. (2000). "The First Professional Degree: A Historic Opportunity," *Journal of Professional Issues in Engineering Education and Practice*, 126(2), 54-63.
St. Ambrose University (2001). "Occupational Therapy: Graduate Program," < http://www.sau.edu/ot/program.html >.
Steib, P.A. (1999). "1999 RA makes history: resolution j adopted." *OT Week*, 13(16).

The Wheel Model for Faculty Assessment: A Choice Between Inertia and Change

Amir W. Al-Khafaji[1]

ABSTRACT

The fundamental objective of any assessment program should be the creation of an environment in which faculty are inspired to produce their very best. The major issues faced when assessing faculty work includes work relevancy to departmental and institutional mission, availability of resources, institution size and type, accreditation criteria, emerging technologies, collective bargaining, work quality and realistic vision and objectives. An absolute definition of faculty work in higher education is unrealistic and would not achieve desired results because of varied institutional and departmental missions. In 1998 an ASCE Task Force proposed a "wheel" model that provides desirable flexibilities in the assessment of faculty work. The proposed model links scholarship, teaching and service through interfaces with the equally important values of excellence, integrity, leadership and ethics. This paper summarizes how the ASCE Model is being implemented at Master's level institution and the associated difficulties encountered and rewards realized.

BACKGROUND

The past few decades witnessed the emergence of new technologies and innovations at a scale unmatched in human history. The successes achieved thus far would not have been possible without the solid educational foundations provided by universities across the US. To maintain preeminence and vitality of our academic institutions, a national debate is underway to reconsider conventional definitions of scholarship and advocate new standards for assessing faculty work.

The celebrated Carnegie Foundation book produced by Ernest Boyer in 1990 began the call for a redefinition of scholarship throughout the academic world. Boyer maintained that it was time to move beyond the tired old teaching versus research

[1] Member, ASCE; Professor and Chairman of Civil Engineering and Construction, Bradley University, 130 Jobst Hall, Peoria, IL 61625; phone (309) 677-2942; amir@bradley.edu

debate and ask, *What does it mean to be a scholar*. In response to that question he proposed a new model of scholarship, with four interconnected parts as follows:

a. the scholarship of *discovery*, as in research,
b. the scholarship of *integrating* knowledge, to avoid pedantry,
c. the scholarship of *applying* knowledge to avoid irrelevance, and
d. the scholarship of *transmitting* knowledge, to avoid discontinuity.

Boyer stated that such a representation broadens the work of the professoriate and recognizes the breadth of the campus mission and the breadth of talent within the academy today.

Early in 1989, Syracuse University initiated a project to enhance the meaning and eminence of teaching in higher education (National Science Foundation, 1992). The project's main focus was academic deans and department chairs because of their pivotal role in shaping the assessment and rewards system (Diamond, et al., 1993). The project provided support to associations to establish task forces that would develop and disseminate definitions of scholarship for their respective disciplines.

Phase II of the project extended this initiative to the American Society of Civil Engineers and other associations. The ASCE Task Force on scholarship was formed in response to the Syracuse invitation (Diamond, et al., 2000). The final recommendations of the ASCE Task Force were published in a report titled "The Scholarship Landscape in Civil Engineering: A Bridge Between Rhetoric and Reality," (Al-Khafaji, et. al., 1998).

FACULTY WORK ASSESSMENT

Consideration of current practices of civil engineering programs reveals a state of uncertainty over the appropriate definition of faculty work and especially scholarship. Furthermore, many departments are confounded by the many sets of mixed signals and conflicting recommendations being advanced by well-intentioned organizations and groups. These groups include but not limited to administrators, alumni, professional organizations, accrediting agencies and legislators.

Unquestionably, the policies and procedures used in assessing civil engineering faculty work vary greatly depending on their mission, goals, and makeup of the faculty. However, in all cases, tenure and promotion considerations involve committees of senior faculty. These faculty members are normally responsible for the development of the specific list of activities considered relevant in annual assessment, promotion and tenure.

Promotion and/or tenure is normally earned by a positive demonstration of effective performance in the traditional areas of Teaching, Research, and Service (Hall, W., et. al.,1988). In some civil engineering departments, mentoring and scholarship are

listed as separate categories. Certain departments, with justification, considered and valued activities that don't fit into the traditional areas of teaching, scholarship, or service. This is because such activities were deemed appropriate to the particular mission and goals of the department and university.

> *While policies vary significantly from teaching institutions to research institutions, the main factors in granting tenure appear to be based upon past performance, temperament, and long-term potential for success (National Science Foundation, 1992). Promotion, on the other hand, tends to be based solely upon past performance.*

There appears to be a consensus that the principal duties of civil engineering faculty are the creation of new knowledge, transmission of knowledge, and service to the university, profession, and community. However, the relative weighting of these activities in determining promotion or tenure vary widely.

THE ASCE WHEEL MODEL

The policies and procedures used in the assessment of faculty work and performance at several institutions were examined by an ASCE Task Force. These policies and procedures revealed a wide range of activities with different weights applied to teaching, research, and service. A summary of the lists of relevant activities and categories are given in Table 1.

Table 1. List of activities defining faculty work in Engineering (Al-Khafaji, et al., 2000).

Teaching	Scholarship	Service
Activities: Undergraduate Course Credit hours Graduate Course Credit hours Undergrad. Laboratory Credit hours Graduate Laboratory Credit hours Number of Students impacted Independent Study Courses New Course Development Laboratory revision Teaching proposals funded Teaching proposals submitted *Evaluation:* Future plan Student evaluation Peer evaluation Alumni evaluation *Honors& Awards:* University awards Student awards Invited lectures Attitude	*Research:* Active grants Proposals funded Proposals submitted Interdisciplinary activities Academic year salary support *Publications:* Technical reports Abstracts Research publications Refereed journal papers Other journal papers Magazine publications Books & textbooks Book chapters Edited books *Conferences:* Refereed conference paper Other conference proceedings Chairing sessions at conferences	*Committees:* *Students* *Department* *College* *University* *Profession* *Community and Alumni* *Consulting* Professional Expert witness National and international media Other universities Short courses *Leadership* Professional organizations Student organization Strategic planning New journals & editorship Recruiting students to major Helping junior faculty