

AC 2009-366: PROFESSIONAL ENGINEERING LICENSURE AND PROFESSIONAL EXPERIENCE AMONG CIVIL ENGINEERING FACULTY: A MULTI-INSTITUTIONAL COMPARISON

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Professional Engineering Licensure and Professional Experience among Civil Engineering Faculty: A Multi-Institutional Comparison

Abstract

Civil engineering faculty members endeavor to prepare their students for a variety of career paths within the engineering industry. Several of those paths require or are bolstered when students decide to pursue licensure to practice as professional engineers. As students, individuals learn about the merits of professional licensure from a variety of sources. Not to be overlooked is the influence that professors, licensed as professional engineers, have on their students and the opportunity to act as a role model to those students considering a career path that includes professional licensure.

The research question explored during this study was; “Among currently licensed civil engineering faculty members, what are the perceived values of professional experience and of licensure as a professional engineer?” A reality testing, qualitative-based framework was utilized to design and execute a study in response to the research question. Within this study, the authors evaluated the existing literature, both internal and external to civil engineering, relative to prior studies of experience and professional licensure among engineering faculty. Further, the authors conducted a series of interviews with licensed faculty members at three disparate universities, using a semi-structured interview protocol. As the authors represent three distinctly unique academic institutions, the collected interview data were evaluated for commonality, as well as differentiation among the academic institutions. The interview process probed at issues including the perceived value of licensure among faculty members, the relationship between licensure and promotion/tenure, and the licensed faculty member as a role model for colleagues and future engineers.

This paper details the research design, implementation of the study, and the resulting findings. The findings and conclusions of this study will be of interest to a variety of academic and licensure stake-holders, including: civil engineering faculty members (both licensed and unlicensed), academic administrators, and licensing organizations such as the National Council of Examiners for Engineering and Surveying (NCEES).

A Review of the Literature

In the realm of academics, what is the value of experience as a practicing engineer and the value of licensure as a professional engineer? Does the perception of experience and licensure vary among the licensed faculty of universities with different academic missions? Those were the questions that formed the inquiry behind this study and prompted a review of the existing literature.

A reasonable amount of literature discussing professional licensure of engineering faculty, both within and external to the discipline of civil engineering was found to exist. However, the amount of rigorous research in this area can best be described as limited. A fairly exhaustive review of that literature identified very few thorough studies on the

subject. This section summarizes those relatively few identified studies reported with a minimum acceptable level of rigor.

Malasri, Madhavan, and Ventura¹ in the late 1990s presented the preliminary results of a licensure in academics study at the 2000 Mid-South Annual Engineering and Science Conference and subsequently in a 2003 forum within the American Society of Civil Engineer's (ASCE) *Journal of Professional Issues in Engineering Education and Practice*. No follow-on or final publication related to this study was identified. Malasri, Madhavan, and Ventura sent a written survey to 180 deans of engineering and 95 responses were obtained. The responses came from institutions that varied in terms of highest degree offered, funding sources—both private and public—and geographical regions. The results of the survey indicate that 60% of the responding deans were registered professional engineers, while only 47% of the department chairs and 31% of full-time engineering faculty members were reportedly registered.²

Harichandran³ conducted a survey of the faculty hiring practices at 14 small- to medium-sized research-oriented departments of civil engineering. One of the findings of this study was that none of the participating departments require their faculty to obtain licensure as a professional engineer. Harichandran states that “research funding, scholarship, and guidance of PhD students are the primary expectations for promotion to associate professor with tenure...” at the universities that participated in the study. Thus, based on this study it would appear that professional licensure is not valued during the hiring process within the participating research-oriented departments.

The lack of connection to professional practice appears to continue after the hiring process, as well. Nixon⁴ conducted a survey of faculty development activities in civil engineering. He issued written surveys to 200 departments of civil engineering and obtained 46 responses. The respondents represented a diverse set of institution types. Nixon noted that only 60% of the responding departments provided some form of assistance to faculty to obtain professional licensure or other specialty certification. As Nixon suggests, degree programs run the risk of becoming too “divorced” from the practice of civil engineering by not supporting on going professional development activities. While professional licensure is not the only mechanism for maintaining a connection to practice, it does represent a common credential available to academics and practicing engineers, alike.

Wherein the Harichandran study and the Nixon study illustrate a lack of connection between professional licensure and the processes of academic hiring and development, a study conducted by Dettman⁵ indicates that students strongly support the idea of being taught by professors with professional experience. Dettman surveyed students enrolled in two courses at a single university (n = 84). The survey asked students to comment on the “importance or value of having professors who actively engage in professional practice in addition to their teaching duties.” Dettman’s study provided evidence that the majority of students feel that professional practice by faculty members adds significantly to the student’s educational experience.

Students are not the only educational stake holders that have voiced an opinion on the subject of licensure and professional experience among engineering faculty. ABET (formerly known as the Accreditation Board for Engineering and Technology) is the organization responsible for defining the criteria for faculty members of accredited programs. The 2008-2009 ABET Criteria for Accrediting Engineering Programs states:

The overall competence of the faculty may be judged by such factors as education, diversity of backgrounds, engineering experience, teaching effectiveness and experience, ability to communicate, enthusiasm for developing more effective programs, level of scholarship, participation in professional societies, and licensure as Professional Engineers (pg. 3).⁶

Further, the program criteria for civil and similarly named engineering programs states:

The program must demonstrate that faculty teaching courses that are primarily design in content are qualified to teach the subject matter by virtue of professional licensure, or by education and design experience. The program must demonstrate that it is not critically dependent on one individual (pg. 9).⁶

Thus, through implementation and enforcement of their accreditation criteria, ABET has placed significant value on professional licensure and/or education coupled with design experience among a portion of the civil engineering faculty.

Now in its second edition, ASCE's Body of Knowledge (BOK2) describes the knowledge, skills, and attitudes necessary for entry into professional practice.⁷

Recognizing that faculty members are a critical link in the process of implementing the educational change called for by ASCE, the BOK2 offers some guidance relative to the role of faculty. The BOK2 states:

Regardless of personal desires or choice, every civil engineer who is in contact with students serves as a role model for the profession. You should be aware that students are viewing you in that light. The ideal civil engineering faculty members should present a positive role model for the profession. Students should be able to both relate to and follow these role models and be put on a path toward becoming successful engineers in their own right (pg. 40).⁷

Clearly, ASCE recognizes that prior to engaging in professional practice, the students' primary interaction with civil engineers is with civil engineering faculty. Accordingly, faculty members are being encouraged to recognize their position as role models for the profession. The BOK2 then states that "furthermore, when appropriate, civil engineering faculty should obtain professional licensure" (pg. 45).⁷ Thus, it is suggested that professional licensure of civil engineering faculty is one way of acting as a role model for students that aspire to professional-track careers. The BOK2 also indicates that civil engineering faculty members can be role models through effective instruction and high-quality mentoring. The BOK2 further states that design experience is necessary and professional licensure holds particular relevance for those that teach civil engineering design courses.

The National Academy of Engineering (NAE) appears to support the idea of amending the hiring and promotion practices of engineering programs to place greater value on experience as a practicing engineer. In their report *Educating the Engineering of 2020*, the NAE states:

Colleges and universities should develop new standards for faculty qualifications, appointments, and expectations, for example, to require experience as a practicing engineer, and should create or adapt development programs to support the professional growth of engineering faculty (pg. 54).⁸

A recent article in *PE Magazine*, a publication of the National Society of Professional Engineers (NSPE), noted that “many people in academia see the PE license like the parsley sprig...in a practical sense, it’s not really necessary.”⁹ The reviewed literature illustrates that there are general perceptions related to licensure and experience within the community of licensed faculty members; while at the same time, the literature lacks a formal confirmation of those perceptions. The study presented in this paper attempted to probe the perceptions of professional licensure and practical experience held by licensed civil engineering faculty members at three universities. Is the perception that licensure and experience is “not really necessary” unique to a particular type of academic institution or is it a commonly held opinion? If this perception is found to be reality among some faculty members, what is it about the nature of academic practice that has led to such a position?

A Research Framework

The qualitative framework for this study is based on the principles of applied reality testing. This framework is commonly employed in the process of evaluation-based research,¹⁰ such as the study presented within this document. Research questions associated with reality testing typically attempt to determine what the reality of a particular situation is. For the purposes of this study, the “reality” that is being investigated is to determine what the perceived value of professional licensure and experience is among licensed civil engineering faculty. To address the issues identified in reviewing the literature and in accordance with the reality testing approach, the following primary research question was generated: “Among currently licensed civil engineering faculty members, what is the perceived value of professional experience and licensure as a professional engineer?” Further, the authors were interested in determining if variations in the perceived value of licensure and professional experience, among currently licensed faculty members, existed among academic institutions with disparate classifications. Notably, the research was limited to only capture the perceptions held by licensed members of the faculty.

No testable theories related to licensure of engineering faculty are known to presently exist. Thus, this research was conducted in an emergent manner that allows for the possible development of such theory as a result of the study. Consequently, the intent has been to produce a study whose quality is judged by “...its intended purposes, available resources, procedures followed, and results obtained...(pg. 71).”¹⁰ The research questions, identified previously, have been addressed in accordance with the pragmatically designed procedures detailed herein.

Methods of Investigation

Qualitative techniques of educational research were utilized to address the research question. This included the development and implementation of a semi-structured interview protocol to explore issues related to the perceived value of licensure among licensed faculty members, the relationship between licensure and promotion/tenure, and the licensed faculty member as a role model for colleagues and future engineers. The process was designed to facilitate in-person interviews, as opposed to phone interviews or web-based surveys. The initial protocol was beta tested by one of the co-investigators using an actively licensed, but retired member of the engineering faculty at Purdue University as a mock participant. Results from the beta test were largely positive and were used to refine the protocol. Additional beta testing of the protocol was not considered necessary in light of the proposed interview format. The semi-structured nature of the interview protocol is an indication that the investigators were expected to utilize the interview script as a guide for discussion, but were not expected to strictly adhere to a particular format or order. Such an approach to qualitative investigation encourages a greater depth of dialogue.¹¹ To encourage open and honest responses by the participants, they were each notified at the start of the interview process that while notes would be taken, identifying information, such as their name, would not be reported in the associated dissemination of findings.

The final protocol was reviewed and discussed by each co-investigator prior to implementation. The majority of the 22 question script is presented in an open-ended manner that prompts the respondent to provide detailed responses. A copy of the questions used during the semi-structured interview is included in Appendix A of this paper.

It should be noted that the three co-authors were the sole members of the research team. Accordingly, the terms “author,” “investigator,” and “researcher” are appropriately used interchangeably within this paper. An enhanced level of validity is generated in the reported findings when there is consistency among the individuals who execute a study and the individuals who report on the findings.¹¹

Among all disciplines of engineering, civil engineering has the highest representation of individuals who obtain licensure to practice as a professional engineering. A study performed in 1996 determined that 44% of civil engineers obtain licensure, followed by mechanical engineers at 23%, electrical engineers at 9%, and chemical engineers at 8%.¹² Given that civil engineering has the highest representation of licensed engineers, the investigators made a conscious decision to limit this study’s participants to civil engineering faculty members. Further, the interviewed population was limited to only include those members of the civil engineering faculty who were licensed as professional engineers at the time of the interviews. Individuals with expired or inactive licensure were not included as part of the study. Given that the focus of the study was on the perceptions held by licensed civil engineering faculty members, the location of professional licensure was not a limiting factor. Therefore, faculty members holding international licensure as professional engineers were included in the study.

The co-authors recognize that valuable insight might have been identified if all members of the civil engineering faculty, regardless of licensure status, were queried as part of this study. While this may appear to be a significant limitation of the study, it is in keeping with the defined research question. More specifically, the study’s research question relates only to the perceptions held by licensed members of the civil engineering faculty, rather than all members of the faculty.

The civil engineering unit affiliated with the co-authors’ academic institutions, Oregon Institute of Technology (OIT), Purdue University (Purdue), and Rowan University (Rowan), participated in this study. OIT is located in Klamath Falls, Oregon and serves an undergraduate population of 3,305.¹³ Purdue is located in West Lafayette, Indiana and has an undergraduate enrollment of 31,186, as well as a graduate enrollment of 6,994.¹³ Rowan, located in Glassboro, New Jersey, has an undergraduate enrollment of 8,430, and a graduate enrollment of 1,148.¹³ The number of active civil engineering faculty members associated with each of these academic institutions is indicated in Table 1.

Table 1

Academic Institution	Total Number of Full-Time Faculty	Number of Licensed Professional Engineers	Number of Interviews Performed*
Oregon Institute of Technology (Department of Civil Engineering)	6	4	3
Purdue University (School of Civil Engineering)	52	20	15
Rowan University (Department of Civil Engineering)	8	5	4

*Does not include the co-authors

Several systems have been developed to classify, rank, and/or group academic institutions. The most widely used system is the *Carnegie Classification of Institutions of Higher Education* (Carnegie Classification). The Carnegie Foundation for the Advancement of Teaching initially developed their classification system in 1970 as a means of supporting its program of research and policy analysis.¹⁴ The Carnegie Classification has seen multiple updates during the past three decades. Perhaps the mostly widely used and recognized version of the Carnegie Classification is the 2000 update. That particular update groups academic institutions based predominately on their research mission. Utilizing the 2000 Carnegie Classification system, OIT is classified as an Engr (School of Engineering and Technology), Purdue is a Res I (Research University I), and Rowan is classified as a MA I (Master’s Colleges and Universities I).

Based on the brief descriptions and Carnegie Classifications provided for each of the participating institutions, it should be evident that this study included three unique academic environments. This intentional assembly of universities accommodated the desire to determine if the perceptions of professional licensure among civil engineering faculty members differed among academic institutions serving different missions.

The method of identifying licensed members of the civil engineering faculty for potential recruitment as participants in the study varied by university. Within the comparatively small Departments of Civil Engineering at OIT and Rowan, the co-authors were knowledgeable of who was licensed as a professional engineer and, recruiting for purposes of the study was conducted via brief conversations with likely participants. Conversely, the size of the School of Civil Engineering at Purdue necessitated alternative methods. Specifically, the School's most recent ABET Self-Study document was consulted to generate an initial list of licensed faculty. Each member of the list was then sent an email asking to confirm their status as a licensed engineer. After a confirmed list was generated, each member was again sent an email explaining the nature of the study and asking them to voluntarily participate. To reduce the potential introduction of bias to the study the co-authors did not perform self interviews. This process minimized the direct influence of the co-author's opinions and beliefs in the study's findings.

To promote a consistent approach to collection of data, the co-authors discussed the questions and procedures in advance of performing interviews. All interviews were conducted between 11 December 2008 and 27 January 2009. Due to monetary and time limitations, the interviews were not recorded and transcribed. Rather, each of the co-authors collected notes during the interview process. Those notes were then assimilated and shared among each member of the research team.

A system of open coding and selective coding was used to extract theme-based evidence from the notes generated during the interview. An iterative process of comparison of findings was used to evaluate the collected data. The three co-authors performed coding of their own interviews initially and then provided a complete set of emergent themes and interview notes for the research team to consider. Common themes and noted differences between the academic institutions were then discussed by the full research team and are addressed individual in the subsequent section of this document.

Generated Findings & Resulting Discussion

A portion of the civil engineering faculty at each of the three participating academic institutions was licensed as a professional engineer. Table 1 identifies the total number of faculty, as well as the number of licensed faculty members.

Among the three participating engineering programs, there was a population of 29 faculty members licensed as professional engineers, including two of the co-authors. (Note: All three co-authors are licensed, but one is not a faculty member.) Interviews were conducted with a total of 21 individuals, for an overall interview response rate for this study of 81%. Ary, Jacobs, Razavieh, and Sorensen¹¹ note that response rates for questionnaires administered in the manner utilized in this study are typically high. Thus, the general response rate for this study was consistent with similar studies.

Collectively, 44% of the civil engineering faculty among the three participating institutions were actively licensed as professional engineers. That percentage appears to

be relatively consistent with the findings presented in the study by Malasri, Madhavan, and Ventura.¹ Interestingly, the percent of licensed faculty identified in the current study also maps very well to the statistics reported by Lawson¹² that show that 44% of all graduates from civil engineering programs ultimately obtain licensure. Therefore, relative to the percent of licensed individuals, the population utilized in the current study appears to be reflective of the reported licensure among engineering academics, as well as the civil engineering community as a whole.

Within the interviewed population the number of reported years as a licensed professional engineer ranged from 12 to 39. Likewise, the length of time in academia ranged from 4 months to 36 years. Further, the individuals that participated in this study held professional licensure in 12 different states and 3 foreign countries. Regardless of the type of institution that they were associated with, the vast majority of the participants were aware of existing or pending legislation for continuing education requirements in the states, U.S. territories, and/or foreign countries in which they were licensed.

At OIT, all of the faculty that participated in the study had obtained licensure and had accumulated multiple years of non-academic experience prior to joining the department. At OIT professional licensure is listed as a highly desired credential at the time of hire and is expected of all eligible civil engineering faculty within a reasonable amount of time after joining the department. At Rowan, 3 of the 4 licensed faculty members interviewed were licensed at the time of hire and the fourth obtained licensure subsequent to the start of academic employment. Professional licensure is not a required credential for employment in the civil engineering department at Rowan, but eligible faculty members are strongly encouraged to pursue it. At Purdue, possession of a professional license is considered during the hiring process, but it is not listed as an expected credential. In fact, the majority of the licensed civil engineering faculty members at Purdue had obtained licensure during a professional practice phase of their career, prior to starting their academic position.

At all three academic institutions, state law or university policy prohibited direct reimbursement for professional licensure fees. Thus, direct financial support for obtaining or maintaining licensure was not reported. However, each university did provide some level of support, either direct or indirect, for attendance at conferences or workshops, which, if approved, could be used to satisfy continuing education requirements for licensure renewal.

At OIT, professional licensure is viewed as part of the culture within the Department of Civil Engineering. The reasons for pursuing licensure and the required process for obtaining licensure are discussed in multiple classes throughout the curriculum. In fact the department has adopted a series of assessments administered at various points in the curriculum that are modeled after the Fundamentals of Engineering (FE) Examination (the first examination in the licensure process). Thus, OIT civil engineering faculty members engage in discussion of professional licensure with their students and colleagues on a routine basis. At Rowan, professional licensure is not as extensively covered as it is at OIT, but it is still a regular part of classroom discussions. The

interviewed faculty members at Rowan reported that discussions of professional licensure are a part of specific design courses. Civil engineering students at Rowan are strongly encouraged to take the FE examination. However, among the faculty at Rowan, there appears to be less discussion of licensure when compared to OIT. Finally, at Purdue there was a wide variation in the reported amount of discussions that faculty members have with their students regarding professional licensure. Among those interviewed at Purdue, there were a few individuals that could be classified as “champions” of professional licensure; those individuals that on a regular basis speak with students inside and outside of class about becoming a professional engineer. A handful of additional faculty members reported speaking with their students (undergraduate and graduate level) about professional licensure when there was an appropriate connection in the classroom. At Purdue, professional licensure is a scheduled topic of discussion during the senior design course. During that course, students learn about and are encouraged to take the FE examination. Notably, very few of the licensed members of the civil engineering faculty at Purdue reported licensure-based discussions with their colleagues and predominately, when those discussions occurred, they were centered on continuing education issues.

At both OIT and Rowan, the participants reported that they list the “P.E.” designation after their name on such documents as course syllabi, automated email signatures, curriculum vitae, and business cards. However, as is common in many states, individuals residing in the State of Oregon are prohibited from including the “P.E.” designation on official documents carrying an Oregon address unless they are licensed in Oregon. At Purdue, the vast majority of the participants indicated that the “P.E.” designation is listed on official documents when they list the “Ph.D.” designation. Rarely was an instance identified when one designation was listed without the other. Interestingly, very few of the participating faculty members at Purdue list any designation on their course syllabi. Thus, while use of the “P.E.” designation might have been an indication of the perceived value among licensed faculty members, it appears that designations of this type are only sporadically utilized.

The majority of the interviewees, at all three institutions, reported that they have in the past or are currently performing consulting engineering services in addition to their academic responsibilities. In general, the amount of active consulting that was reported was relatively small in relation to their academic responsibilities. Among those that were actively performing consulting services, all reported that they are asked to join the projects because of expertise they could provide to the project team. Furthermore, most reported that as a means of continuous professional growth they were only willing to accept challenging consulting projects. Several individuals discussed professional practice as a means for them to maintain connection with industry practices and a way to bring examples of actual projects into the classroom. The value of classroom discussions related to actual projects that the faculty member had worked on was a repeated theme identified in the interviews. While student perceptions were not captured as part of this study, the perceptions offered by the licensed faculty members that participated in this study appear to support Dettman’s⁵ findings that students strongly support the idea of being taught by professors with professional experience.

When the participants were asked if they believed that the promotion and tenure system at their respective institutions values professional licensure, distinct responses were reported. Beginning with OIT, all of the participants agreed that achieving and maintain professional licensure indicates a level of practice, experience, and continued progression that the institute values in its faculty. At Rowan, however, the responses were split, with half of the participants believing that the system values licensure and the other half believing that it does not. Reported personal familiarity with tenure review at Rowan also indicated a mix of experiences relative to professional licensure. At the other end of the spectrum from OIT, the overwhelming response from Purdue participants is that their system does not value professional licensure. All of the Purdue faculty members who were licensed at the time of tenure review listed their licensure credentials on their tenure documents, but reported that it was never discussed as part of the review process. Other participants who previously or currently held positions on tenure review committees supported the fact that licensure is not considered. Rather, the primary focus appeared to be consistent with factors associated with Purdue's mission as a research university.

While there was a clear recognition among the licensed civil engineering faculty members at Purdue that the promotion and tenure process does not value experience and professional licensure, several of the faculty members there noted that to be elected to the grade of "Fellow" within ASCE requires professional licensure. Thus, if not for personal satisfaction of accomplishment, personal gain and growth through consulting, or for the sake of acting as a role model for future engineers, another reason for obtaining and maintaining professional licensure is the potential honor of election as an ASCE Fellow. Such an honor appears to be well respected both within and external to academia.

The following quote from ASCE's BOK2 was read to the participants, and they were asked to respond:

Regardless of personal desires or choice, every civil engineer who is in contact with students serves as a role model for the profession. You should be aware that students are viewing you in that light. The ideal civil engineering faculty members should present a positive role model for the profession. Students should be able to both relate to and follow these role models and be put on a path toward becoming successful engineers in their own right (pg. 40).⁷

All participants agreed with the statement and the majority elaborated on their own efforts to act as a positive role model for their students. However, when the quote was then extended to include: "Furthermore, when appropriate, civil engineering faculty should obtain professional licensure," the responses varied by academic institution. At OIT, the department's mission statement is to "prepare students for professional practice." Thus, not surprisingly, the OIT respondents stated that as role models, they themselves felt it was important, though not necessary, that the faculty be licensed engineers. At Rowan, all respondents agreed with the statement, but one individual noted that the "when appropriate" clause is critical. Further, that individual stated that the primary purpose of professional licensure is protection of public safety and not all faculty members are engaged in consulting practices with potential impact on safety, health, and welfare of the public. Finally, at Purdue, nearly all of the respondents emphasized the "when appropriate" clause. Most appear to align with ABET's statement that those with

instructional responsibilities in design courses should be licensed and/or have sufficient professional practice experience. In addition, it was also noted that a number of civil engineering faculty at Purdue contribute significantly to the research mission, but lack the required background to pursue licensure. For example, individuals with a chemistry (not chemical engineering) background working in the area of water and wastewater treatment. It is also noteworthy that a percentage of participants at each of the universities expressed strong beliefs that licensure is not the only path toward professional development. For instance, service to professional and technical organizations was cited as a path of continuous development that benefits the individual and the engineering community.

Finally, the participants were asked to comment on the statement made by NAE in *Educating the Engineer of 2020*:

Colleges and universities should develop new standards for faculty qualifications, appointments, and expectations, for example, to require experience as a practicing engineer, and should create or adapt development programs to support the professional growth of engineering faculty (pg. 54).⁸

To the extent that this quote appears to suggest greater support for licensure and professional practice at the time of hiring and throughout an academic career, all of the respondents, at all three locations, supported the statement. However, many participants at Rowan and Purdue noted this would require a restructuring of the hiring and tenure process. Discouragingly, several individuals expressed views that those processes are too engrained in tradition and doubted that they could be revised. A few noted that under the current system it is not unusual to hire faculty members straight from Ph.D programs with no practical experience and then those individuals are given responsibilities to teach and perform research. This places them in the position of teaching about civil engineering issues that they themselves have no direct experience with. A favorable view was offered by a member of the National Academy of Engineering and the faculty at Purdue. This individual felt strongly that NAE's vision could be achieved without making sweeping changes to the hiring and tenure process. Specifically, this individual encouraged faculty to perform consulting that was important to society, challenging enough to generate professional growth, and sufficiently scholarly to result in publication.

Conclusions Drawn

Is the perception that licensure and experience is “not really necessary” unique to licensed faculty members at a particular type of academic institution? The response to that questions is “yes,” but must be elaborated on. It would be appropriate to conclude that the perception of licensure and experience as “not really necessary” is progressively more pervasive moving from the Engr to the MA I and finally the Res I academic institutions that participated in this study. Those changes in perception appear to be the result of academic mission-based activities and responsibilities. Whereas only anecdotal evidence existed previously on the perceptions of licensure and professional practice at various types of academic institutions, this study has used educational research methods to make definitive correlations.

In performance of this study, it was determined that the licensed faculty at an Engr-classified academic institution, with a strong emphasis on professional practice, view licensure and experience as critical to their performance as role models for future civil engineers. In addition, it was noted that their hiring, promotion, and tenure processes emphasize licensure and experience. At the MA I-classified university, licensure and experience are encouraged, but the promotion and tenure processes do not directly reward individuals who have achieved them. At the Res I-classified university, the majority of licensed faculty initially obtained that status during earlier stages of their professional career, prior to arrival at Purdue and continue to maintain their license to allow them flexibility in conducting occasional consulting projects.

All academic institutions have a unique mission. All types of academic institutions, including the Engr, MA I, and Res I institutions that participated in this study, serve an important role in society and in the education of future engineers. Faculty members employed by those universities must strike an appropriate balance between teaching responsibility, service to the academic community, disciplinary research, and professional development that best serves their institution's mission. Recognizing that this balance may preclude performance of active consulting and/or obtaining and maintaining professional licensure, the co-authors wish to make it clear that this study was not conducted to highlight the practices of any of the participating institutions as either exemplary or lacking in any manner.

Limitations of the Study

This study was conducted utilizing three academic institutions, each with unique Carnegie Classifications. Other Carnegie-classified academic institutions exist and were not represented as part of this study. Furthermore, the three participating universities were located in specific geographical regions. This study was also intentionally limited to include only civil engineering faculty members. Thus, the sensitivity of these findings to institution, geographical region, and discipline is unclear.

In addition, the results of this study are limited to the perceptions of currently licensed faculty members. This study does not include the perspective of non-licensed faculty members nor the perspective of students enrolled in engineering programs. Such perspectives may be sought as part of follow-on research activities.

Accordingly, there are recognized limitations on the extent to which the findings of this study can be generalized. The co-authors can make definitive statements regarding the perception of professional licensure and professional experience among the faculty interviewed as part of this study. The strength of those findings and the related discussion is diminished as they are transferred away from the original population of the study. However, much can be learned if the reader considers these findings and discussion in relation to their own programs of engineering.

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¹² Lawson, W.D., *Reliability and validity of FE exam scores for assessment of individual competence, program accreditation, and college performance*. *Journal of Professional Issues in Engineering Education and Practice*, 2007. **133**(4): p. 320-326.

¹³ American Society for Engineering Education., *Profiles of engineering & engineering technology colleges*. 2007, American Society for Engineering Education: Washington, DC. p. v.

¹⁴The Carnegie Foundation for the Advancement of Teaching. *The Carnegie classification of institutions of higher education*. 2007 [cited 2007 December 3].

APPENDIX A – Interview Protocol

Professional Registration Interviews

Statement:

The topic of this study is professional registration among civil engineering faculty. We are asking for your volunteer participation in a brief interview. You are entitled to decline to respond to individual questions or to stop the interview at anytime. The entire interview is anticipated to last less than 15-minutes. The information gathered during this interview will be used to inform the study, but your name will not be revealed as part of any publication or presentation. The results will be incorporated in a paper/presentation to the American Society for Engineering Education annual conference.

Academic institution:

Name of interviewee:

Title:

Length of time at academic institution:

Prior titles within the department (such as chair/head):

In what states are you licensed as a professional engineer?

In the state(s) that you are currently licensed in, are you aware of either existing or pending legislation related to continuing education requirements?

In what year did you obtain your license(s)?

Were you licensed when you were hired at [academic institution] or did you obtain that afterwards?

Have you been provided any incentive to obtain or maintain your license? What level did that incentive or encouragement come from (department chair/dean/other)?

Do you believe that the promotion or tenure system value professional licensure? Please describe.

Do your students know that you are licensed? Do you speak with your students about professional licensure? Please describe.

Do your colleagues know that you are licensed? Do you speak with your colleagues about professional licensure? Please describe.

When you add your name/signature to official university documents does it carry your PE designation? For example your automated email signature, course syllabus, or reports.

Are you provided support (time or financial) to maintain your license(s) (this may include continuing education requirements, depending on state)? Please describe.

Have you in the past or do you currently perform consulting work in addition to your academic requirements? What value do you perceive in conducting consulting work as an active faculty member? Please describe.

Do you believe that other civil engineering faculty members should be licensed professional engineers? Please describe.

The American Society of Civil Engineers, *Body of Knowledge 2* makes the following statement:

“Regardless of personal desires or choice, every civil engineer who is in contact with students serves as a role model for the profession. You should be aware that students are viewing you in that light. The ideal civil engineering faculty members should present a positive role model for the profession. Students should be able to both relate to and follow these role models and be put on a path toward becoming successful engineers in their own right.”

What do you think of that statement? Do you agree with this statement? Explain

The *Body of Knowledge 2* also states:

“Furthermore, when appropriate, civil engineering faculty should obtain professional licensure.”

What do you think of that statement? Do you agree with this statement? Explain

The National Academy of Engineering made the following statement in the report *Educating the Engineering of 2020*:

“Colleges and universities should develop new standards for faculty qualifications, appointments, and expectations, for example, to require experience as a practicing engineer, and should create or adapt development programs to support the professional growth of engineering faculty.”

What do you think of that statement? Do you agree with this statement? Explain

Do you have other thoughts you would like to share related to professional licensure of civil engineering faculty?

Thank you for your time.