

FINAL REPORT

**Professional Engineering Licensure Statistics for Engineering and Engineering
Technology Faculty**

Submitted to the American Society for Engineering Education

Engineering Technology Division

By

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Introduction

The Engineering Technology National Forum (ETNF) has identified licensure of Engineering Technology (ET) graduates as a national issue. The National Society of Professional Engineers (NSPE) indicates that as of September 2018, only 20 states allow ET graduates to earn a Professional Engineering (PE) license in that state [1]. An additional twenty states, plus the District of Columbia, allow ET graduates to earn a PE license “after completing additional education and experience requirements and/or passing supplemental verification” that are not required of graduates with engineering degrees. According to [1], nine states do not allow ET graduates to earn a PE license under any circumstances.

As indicated in [2], ET graduates are hired by employers as engineers. In addition, a survey of employers of ET graduates, found at [3], indicates that employers of these graduates overwhelmingly supported their ability to obtain a PE license should they choose to pursue one.

Engineering Technology students are generally taught by faculty members who have either engineering or ET undergraduate degrees, and who also have relevant industrial experience. In both engineering and ET programs, a percentage of faculty will have obtained a PE license in at least one state. Such faculty members have demonstrated both technical competence and a dedication to “perform under a standard of professional behavior that requires adherence to the highest principles of ethical conduct” [4]. Their experience, technical competence and ethical behavior is invaluable for preparing future engineers to succeed in the workplace.

The purpose of this proposal was to provide a snapshot of the percentage of faculty in ABET accredited programs in both engineering and engineering technology that have obtained a PE license within the United State. This snapshot enables a comparison of the two sets of faculty, and identifies any similarities and differences within the disciplines identified in Table I.

Table I. Disciplines Evaluated for Identifying Faculty with at least one PE License.

Engineering Discipline	ET Discipline
Mechanical Engineering (ME)	Mechanical Engineering Technology (MET)
Electrical Engineering (EE)	Electrical Engineering Technology (EET)
Civil Engineering (CE)	Civil Engineering Technology (CET)

The effort only focuses on full-time faculty members. It is recognized that adjunct faculty members may play an important role in delivering a particular academic program, but since their commitment to the program can vary greatly, they are not included in the overall data mining.

Additionally, the data mining will discriminate between Research 1 universities and other university designations, to identify if necessary any skewing of data due to the large number of faculty at larger institutions that focus heavily on research, grants and scholarship.

Approach

Two graduate students were employed to create a set of spreadsheets, one focusing on engineering programs and the other focusing on engineering technology programs. Programs were targeted based on [5]. All programs listed were ABET accredited. The list of programs in each category are provided in Table II. This list shows that 26 institutions with engineering

programs and 27 institutions with engineering technology programs were contacted. Although the list of institutions was not exhaustive, especially considering the number of engineering programs in the United States, there should be enough data to make some assertions about the relative percentage of engineering versus engineering technology faculty that are licensed in at least one state.

Table II. Institutions Contacted.

Engineering Programs Contacted	Engineering Technology Programs Contacted
Auburn University	Vaughn College of Aeronautics and Technology
Boise State University	Purdue University Polytechnic Institute
California State University Northridge	Michigan Technological University
Cleveland State University	Cleveland State University
Colorado School of Mines	University of Houston-College of Technology
Iowa State University	Metropolitan State University of Denver
IUPUI	University of Arkansas at Little Rock
Johns Hopkins University	Oklahoma State University
Montana State University	University of Hartford
Ohio University	University of Toledo
Oklahoma State University	Montana State University
Oregon State University	Ferris State University
Purdue University	Alfred State SUNY College of Technology
Seattle University	Kennesaw State University
South Dakota State University	Rochester Institute of Technology
Southern Illinois University Edwardsville	Oregon Institute of Technology
Stevens Institute of Technology	Wayne State University
Stony Brook University	Penn State Behrend
University of Alabama at Birmingham	University of Maine
University of Georgia	University of Cincinnati
University of Hartford	Old Dominion University
University of Nevada, Reno	New Mexico State University
University of Notre Dame	Virginia State University
University of Virginia	Youngstown State University
University of Wyoming	University of North Texas
Utah State University	UNC Charlotte
	IUPUI

Once an institution was identified, the student went to the program website and attempted to identify which faculty members were licensed. This entailed potentially looking at the following:

- Whether the faculty member had “P.E.” after their name
- Whether the faculty member included being licensed in their educational and industry background
- Searching the internet to see if the person was licensed in the state they were employed

Even with all of these approaches, there was no certainty that a particular faculty member was licensed. So, the next step was to take the data compiled by the student for each institution and draft an email to the institution’s program or department chair, asking them to validate the data compiled by the student for that program. In fact, two emails were sent, one in the fall semester 2019 and, if necessary, a follow-up email was sent in the spring semester 2020. Example emails to a department chair are provided in Appendix A.

Responses from a program head or department chair allowed the spreadsheet data to be adjusted as necessary, and validated. This might include identifying faculty members who were licensed that the students didn’t identify, as well as adding or removing faculty members who either were no longer at the university full time, or were in a department but not in the program of interest. For example, in one department, there were faculty members in both civil engineering as well as environmental science (ENSC), and the department chair was able to extract the ENSC faculty members so only the CE members who were licensed were tallied. Interestingly, there were instances where program faculty had been licensed at one time, but did not pay the fees to renew. In this case, those faculty were not counted as being licensed since their license had expired.

Typically, no more than three changes were identified versus the student data, and in many cases there was only one change or no changes. It is important to know the accuracy of the initial estimates by the students, since a number of programs did not respond, which could skew the overall data if the students did not perform due diligence in their effort. Figure 1 shows a count of the number of times that a particular difference occurred between the initial estimate by the students and the actual number of licensed engineers provided by the program or department. A negative number indicates that the students over-estimated the number of PEs in a program. This occurred due to the retirement of faculty who had been licensed, for example.

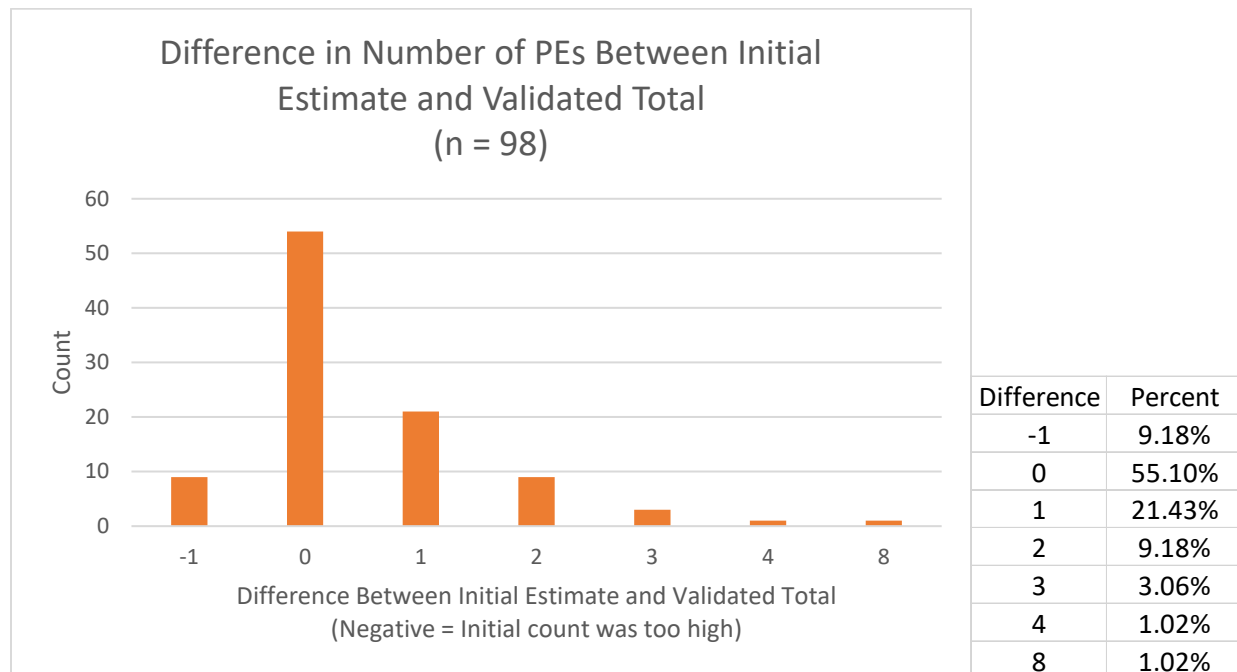


Figure 1. Count of the Difference in the Number of PEs between the Initial Estimate and the Validated Total

As seen in Figure 1, 55% of the estimates were validated with no change in numbers, and 85% of the estimates were within +/- 1 of the total provided by the program or department. Only 2% of the estimates were off by more than three, with one significant outlier (a civil engineering program). Thus, although a number of programs did not respond to a request to validate the data, the students generally did a very nice job with their estimates. Therefore, results and assessment provided here should not be much different than had all the program and departments responded.

Results

Response rates for Engineering and ET programs are provided in Table III below.

Table III. Response Data for Engineering and ET Programs

Program	Number of Programs Contacted	Number of Programs Responded	Percentage of Responses
Civil Engineering	25	16	64
Civil Engineering Technology	12	10	83
Electrical Engineering	26	21	81
Electrical Engineering Technology	24	17	71
Mechanical Engineering	26	15	58
Mechanical Engineering Technology	26	20	77

Data has been collected and condensed below into Table IV and V for engineering and ET programs, respectively. Given that the response rate from all engineering and ET program or department heads was above 60% except for ME (58%), and given that the student estimates of the number of PEs at each institution was pretty close based on Figure 1 above, it can be concluded that the data collected is reasonable.

Note that the data for all three engineering programs in Table III showed some consistency between the percent of faculty among the responded programs and the unresponsive programs. For example, there was less than 1% difference between the responded and unresponsive programs in mechanical engineering, while the largest gap occurred in civil engineering, with an approximate 11% difference between the responded and unresponsive programs. Less consistency between the percentages existed for the EET and MET programs, especially when looking at the much higher percentage of licensed MET faculty from the programs that responded to those that did not. Responsive programs had a higher percentage of PEs in general because the program or department head was able to identify faculty members who were PEs that the students were unable to identify. The converse did occur but was uncommon, namely, a program or department head identifying a faculty member who wasn't a PE that had been identified as such by the students.

The reduced number of CET programs contacted is due to the reduced number of CET programs nationally when compared with the number of EET and MET programs.

Table IV. Engineering Program Data

NAME OF INSTITUTION	CE-PE	CE-Total	EE-PE	EE-Total	ME-PE	ME-Total	Total PE	Total Faculty	Percentage PE
Auburn University	13	27	1	34	7	37	21	98	21.43
Boise State University	7	8	4	21	7	19	18	48	37.5
California State University Northridge	6	10	0	22	2	43	8	75	10.67
Cleveland State University	4	9	0	22	5	13	9	44	20.45
Colorado School of Mines	6	33	2	18	1	48	9	99	9.09
Iowa State University	16	44	1	57	6	58	23	159	14.47
IUPUI	0	0	3	18	3	27	6	45	13.33
Johns Hopkins University	3	13	0	52	0	42	3	107	2.8
Montana State University	8	26	3	15	12	37	23	78	29.49
Ohio University	9	20	2	30	2	12	13	62	20.97
Oklahoma State University	15	18	3	19	3	34	21	71	29.58
Oregon State University	16	48	0	98	6	66	22	212	10.38
Purdue University	15	58	1	108	3	95	19	261	7.28
Seattle University	8	8	1	7	3	9	12	24	50
South Dakota State University	11	12	1	6	4	16	16	34	47.06
Southern Illinois University Edwardsville	8	10	0	11	0	13	8	34	23.53
Stevens Institute of Technology	4	28	0	22	1	33	5	83	6.02
Stony Brook University	1	10	0	37	2	22	3	69	4.35
University of Alabama at Birmingham	5	11	2	12	3	13	10	36	27.78
University of Georgia	8	23	0	22	5	16	13	61	21.31
University of Hartford	4	12	1	13	2	15	7	40	17.5
University of Nevada, Reno	13	27	1	17	0	21	14	65	21.54
University of Notre Dame	7	31	0	34	1	55	8	120	6.67
University of Virginia	6	25	2	43	1	40	9	108	8.33
University of Wyoming	16	22	4	12	1	14	21	48	43.75
Utah State University	9	31	0	22	0	17	9	70	12.86
Total	218	564	32	772	80	815	330	2151	Faculty Total %: 15.34
Unresponded Total	78	236	4	259	34	333			
Responded Total	140	328	28	513	46	482			
Total %	38.65		4.15		9.82				
Unresponded Total %	33.05		1.54		10.21				
Responded Total %	42.68		5.46		9.54				
Key									
	on university name means email has been sent out to respective department chairs								
	on respective department data means data has been confirmed/feedback has been closed/ that department doesn't exist in that university-no action further needed								
	on respective department data means that have been resent to professors but still no response								

Table V. ET Program Data

NAME OF INSTITUTION	CET-PE	CET-Total	EET-PE	EET-Total	MET-PE	MET-Total	Total PE	Total Faculty	Percentage PE
Vaughn College of Aeronautics and Technology	0	0	1	4	0	10	1	14	7.1
Purdue University Polytechnic Institute	0	0	0	13	5	26	5	39	12.8
Michigan Technological University	0	0	0	3	1	7	1	10	10.0
Cleveland State University	0	0	0	3	0	3	0	6	0.0
University of Houston-College of Technology	0	0	0	5	0	20	0	25	0.0
Metropolitan State University of Denver	1	3	0	3	0	6	1	12	8.3
University of Arkansas at Little Rock	0	0	1	4	2	4	3	8	37.5
Oklahoma State University	1	5	3	4	2	6	6	15	40.0
University of Hartford	0	0	2	13	0	0	2	13	15.4
University of Toledo	2	4	2	4	2	4	6	12	50.0
Montana State University	8	24	0	0	10	40	18	64	28.1
Ferris State University	0	0	1	5	1	9	2	14	14.3
Alfred State SUNY College of Technology	1	7	1	3	1	10	3	20	15.0
Kennesaw State University	0	0	2	5	2	6	4	11	36.4
Rochester Institute of Technology	7	10	1	17	2	18	10	45	22.2
Oregon Institute of Technology	0	0	2	15	1	18	3	33	9.1
Wayne State University	0	0	0	3	0	5	0	8	0.0
Penn State Behrend	0	0	1	3	7	14	8	17	47.1
University of Maine	4	5	4	4	4	4	12	13	92.3
University of Cincinnati	0	0	2	37	0	8	2	45	4.4
Old Dominion University	4	6	1	7	3	9	8	22	36.4
New Mexico State University	2	3	0	0	0	3	2	6	33.3
Virginia State University	0	0	0	3	0	3	0	6	0.0
Youngstown State University	0	3	1	3	2	3	3	9	33.3
University of North Texas	3	4	0	0	1	8	4	12	33.3
UNC Charlotte	5	13	0	5	3	8	8	26	30.8
IUPUI	0	0	1	4	1	6	2	10	20.0
Total	38	87	26	170	50	258	114	515	22.1
Unresponded Total	6	16	4	44	6	65			
Responded Total	32	71	22	126	44	193			
Total %	43.68		15.29		19.38				
Unresponded Total %	37.50		9.09		9.23				
Responded Total %	45.07042254		17.46		22.79792746				
Key									
	on university name means email has been sent out to respective department chairs								
	on respective department data means data has been confirmed/feedback has been closed/ that department doesn't exist in that university-no action further needed								
	on respective department data means that have been resent to professors but still no response								

Table VI compares the overall percentages for the various engineering and ET programs.

Table VI. Comparison of Overall Percentages

Program	Percent of PEs Unresponded	Percent of PEs Responded	Percent of PEs Total
Civil Engineering	33.05	42.68	38.65
Civil Engineering Technology	37.50	45.07	43.68
Electrical Engineering	1.54	5.46	4.15
Electrical Engineering Technology	9.09	17.46	15.29
Mechanical Engineering	10.21	9.54	9.82
Mechanical Engineering Technology	9.23	22.80	19.38

As we compare the engineering data to the ET data from peer institutions, a pattern does seem to emerge. Clearly, the highest percentage of PEs within the engineering programs exists among civil engineering faculty members, with mechanical engineering faculty significantly less, and electrical engineering faculty even less than that. This also remained true looking at the equivalent ET programs. Noticeably, in virtually all cases in Table VI, the percentage of PEs in the ET programs was higher than in the peer engineering programs, whether looking at programs that didn't respond, programs that responded, or the total of all programs contacted. In the one outlying case, the unresponded percentage of licensed MET faculty was only slightly less than for the licensed ME faculty. Otherwise, in the case of both electrical and mechanical degree programs, the differences were significant. In all cases with the electrical programs, the percentage of faculty with a PE license in the U.S. was at least 3.5 times greater for EET faculty than for EE faculty. Percentages for faculty in mechanical degree programs were relatively similar among those programs that didn't respond, but were around two times greater for MET faculty than ME faculty for those programs that did respond, as well as for the total percentage.

An additional study looked at only the engineering programs from Research I (R1) universities [6]. This data is provided in Table VII below. Table VIII compares the data for engineering programs overall with those of only R1 universities. This data shows a reasonably close relationship between the entire pool of engineering programs and those programs in R1 institutions, especially when looking at the total percentage of PEs, covering both those institutions that responded as well as those that did not respond. There is a slight drop in the last column of Table VIII when the R1 institutions are considered, most noticeably in the civil engineering programs, but the data does not appear to have any significant impact.

Table VII. Engineering Program Data for Research I Universities

NAME OF INSTITUTION	CE-PE	CE-Total	EE-PE	EE-Total	ME-PE	ME-Total	Total PE	Total Faculty	Percentage PE
Auburn University	13	27	1	34	7	37	21	98	21.43
Iowa State University	16	44	1	57	6	58	23	159	14.47
Johns Hopkins University	3	13	0	52	0	42	3	107	2.8
Montana State University	8	26	3	15	12	37	23	78	29.49
Oklahoma State University	15	18	3	19	3	34	21	71	29.58
Oregon State University	16	48	0	98	6	66	22	212	10.38
Purdue University	15	58	1	108	3	95	19	261	7.28
Stony Brook University	1	10	0	37	2	22	3	69	4.35
University of Alabama at Birmingham	5	11	2	12	3	13	10	36	27.78
University of Georgia	8	23	0	22	5	16	13	61	21.31
University of Notre Dame	7	31	0	34	1	55	8	120	6.67
University of Virginia	6	25	2	43	1	40	9	108	8.33
Total	113	334	13	531	49	515	175	1380	Faculty Total %: 15.34
Unresponded Total	45	129	1	206	27	235			
Responded Total	68	205	12	325	22	280			
Total %	33.83		2.45		9.51				
Unresponded Total %	34.88		0.49		11.49				
Responded Total %	33.17		3.69		7.86				
Key									
	on university name means email has been sent out to respective department chairs								
	on respective department data means data has been confirmed/feedback has been closed/ that department doesn't exist in that university-no action further needed								
	on respective department data means that have been resent to professors but still no response								

Table VIII. Comparison of Percentages of Engineering Programs Overall with those of only R1 Institutions

Program	Percent of PEs Nonresponded	Percent of PEs Responded	Percent of PEs Total
Civil Engineering	33.05	42.68	38.65
Civil Engineering - R1	34.88	33.17	33.83
Electrical Engineering	1.54	5.46	4.15
Electrical Engineering – R1	0.49	3.69	2.45
Mechanical Engineering	10.21	9.54	9.82
Mechanical Engineering - R1	11.49	7.86	9.51

Conclusion

Although only a subset of all engineering and ET programs were contacted during this study, a number of conclusions can be drawn. First, the data shows, at a minimum, that ET programs employ faculty with a PE license in percentages that are comparable to, if not exceeding, those in engineering programs. Civil engineering and CET programs are certainly comparable in terms of percentage of faculty with a PE license. But the data seems to indicate more emphasis in ET programs on hiring faculty with a PE license in EET and MET programs as compared to EE and ME programs. One reason could be that EE and ME programs typically only hire faculty who have a PhD and who are focused on research productivity, including writing papers and

submitting grant proposals. In the civil engineering field, however, research could be funded through departments of transportation, including federal and state agencies, who may be more interested in knowing that investigators they are funding are licensed. Additionally, in engineering technology programs historically, tenure-line faculty candidates have more flexibly been hired who have either a PhD, or a Master's degree with a minimum number of years of industry experience along with a PE license.

Second, the percentage of faculty who are licensed is especially low in both the electrical and mechanical programs. From the data provided, no set of faculty exceeded 20% who were licensed. If learning from a licensed engineer is important, then those numbers will need to rise.

Third, one element of the data that was not explored concerned the number of faculty holding both a doctoral degree as well as a PE license. A question might be raised as to whether institutions are able to recruit and hire new faculty with both sets of credentials. This leads to a larger issue of the importance of licensure in areas such as EE and ME. Faculty members who are focused on research may see no benefit in becoming licensed if licensure doesn't help secure grants. It may seem draconian, but suppose grant agencies required researchers to be licensed to secure grant funding. One might see a much larger percentage of faculty applying to become licensed. However, if the grant agencies consider this to be an artificial barrier for faculty, then this change will never happen.

Overall, it seems clear that NSPE should be aware that students are equally likely, if not more likely, to learn from a licensed engineer if they are enrolled in an engineering technology program versus an engineering program as an undergraduate.

Acknowledgement

The author of this report would like to acknowledge the work of Mr. Souparna Satpati and Mr. Nicholas Kieser, students in the School of Engineering & Technology at IUPUI, for their support in creating, populating and maintaining the spreadsheets for each institution identified in this report.

References:

- [1] NSPE Report, "Can Engineering Technology Graduates Earn a PE License?," found at <https://www.nspe.org/sites/default/files/resources/pdfs/admin/publications/NSPE-Eng-Tech-Grad-PE-License.pdf>
- [2] Land, R. E., "Engineering Technologists are Engineers," *Journal of Engineering Technology*, pp. 32-39, Spring 2012.
- [3] Engineering Technology website: www.engtech.org
- [4] NSPE website: www.nspe.org
- [5] *Profiles of Engineering and Engineering Technology*, ASEE, 2018
- [6] Carnegie Classification of Institutions of Higher Education, website: https://carnegieclassifications.iu.edu/lookup/srp.php?clq=%7B%22basic2005_ids%22%3A%2215%22%7D&start_page=standard.php&backurl=standard.php&limit=0,50

Note: Copies of spreadsheets for individual institutions are available from the author.

Appendix A

Sample First and Second Emails to Program/Department Heads

First Email

From: Weissbach, Robert Stephen

Sent: Saturday, October 19, 2019 1:15 PM

To: King, Brian

Subject: Fw: [External] Licensed Engineers Teaching within Academia- IUPUI EE

Dear Professor King,

I am working on a funded project through the American Society for Engineering Education to determine the influence of licensed professional engineers (PEs) on engineering education. As part of this project, I am trying to determine the number of full-time (tenure line or non-tenure line) faculty members in your department that are registered PEs in at least one state within the United States. I am hopeful that you can take a few minutes to review the list and indicate what if any adjustments to the provided list are necessary.

I thank you in advance for taking the time to look at this list and ensure its accuracy.

Sincerely,

Rob Weissbach

Dr. Robert Weissbach

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Brian King	0
Zina Ben Miled	0
Stanley Yung-Ping Chien	0
Lauren Christopher	0
Euzeli Cipriano Dos Santos	0
Mohamed El-Sharkawy	0
Dongsoo Stephen Kim	0
Sarah Koskie	0
John Lee	0
Lingxi Li	0
Maher Rizkalla	0
Steven Rovnyak	0

David Russomanno 0
Paul Salama 0
Peter Schubert 0
Jeffrey Sears 0
Seemein Shayesteh 0
Jane Simpson 0
Qingxue Zhang 0
Total PE in EE 0

Second Email

From: Weissbach, Robert Stephen <rweissba@iupui.edu>
Sent: Thursday, February 27, 2020 4:50 PM
To: King, Brian <briking@iupui.edu>
Subject: Licensed Engineers Teaching within Academia- IUPUI EE

Hi Brian,

Some time ago I reached out to you to identify which of the full-time faculty in your department were licensed as a professional engineer in at least one state in the country. Based on my records, it appears that I never received a response from you. I believe that having accurate data can be valuable in showing the relative importance universities place on professional registration of their faculty members with engineering backgrounds.

I have pasted the original email below. I'm hopeful you'll take a few minutes to review the list and ensure its accuracy, and to let me know what if any changes are necessary.

Thank you in advance Brian for your support of this effort.

Sincerely,

Rob Weissbach

(note: The more personal approach in this second email is due to the author personally knowing the department head at this institution. More typically, the recipient is addressed as "Professor <last name>".)