

## Faculty Proficiency with Technology: Distribution among Rank and Institution

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### Abstract

In recent years there has been a rapid growth in interest to integrate technology into the engineering curriculum, both to extend the reach and effectiveness of teaching and learning, and in response to industry needs. We have conducted a survey of engineering faculty at the eight SUCCEED coalition universities to identify the training needs and present levels of experience with various technologies. The results of that survey are presented here, with an emphasis on the variations between faculty rank and the institutions' emphasis on teaching or research

The results showed that, as a coalition, there is little variation between faculty rank (Assistant, Associate, or Full Professor) with regard to either (1) faculty skill level, (2) current use of various technologies, and (3) faculty willingness to attend technology workshops. When the data was further segregated according to whether each institution's main mission is research or undergraduate teaching, the results were unchanged for faculty skill level and current use of each technology. The only observed difference between research and teaching institutions was that a higher percentage of Associate and Full Professors at teaching institutions are willing to attend technology workshops, while Assistant Professors at either institution type are equally willing.

### 1. Introduction

Information technology holds great promise for enhancing the teaching and learning processes. Correctly designed and implemented, it promotes active learning, addresses the various learning styles of students, and is more accessible to students via the Internet or on portable media, either synchronously or asynchronously [1,2,3]. While examples of successful technology-based learning environments aimed at specific courses or topics abound, a large proportion of faculty simply do not have the skills needed to undertake the development of such projects, or even to borrow and revise them for their own use.

The Southeastern University and College Coalition for Engineering Education (SUCCEED), an NSF-sponsored engineering education coalition composed of the engineering colleges of eight southeastern universities, is committed to a comprehensive revitalization of undergraduate engineering education for the 21<sup>st</sup> Century. The eight institutions comprising SUCCEED are: Clemson University, Florida A&M/Florida State University (FAMU/FSU), Georgia Institute of Technology (Ga Tech), North Carolina A&T State University (NCA&T), North Carolina State University (NCSSU), University of Florida, University of North Carolina-Charlotte (UNCC), and Virginia Polytechnic Institute and State University (Va Tech).

The coalition has identified four themes, or Focus Areas, which it will target for improving the teaching and learning enterprises. These Areas are Faculty Development, Assessment and

Evaluation, Student Transitions, and Technology-Based Curriculum Delivery. More information on these Focus Areas, as well as the coalition itself, can be found on the Web at <http://www.succeed.vt.edu/>.

The goal of the Technology-Based Curriculum Delivery (TBCD) focus team, the working committee for this Focus Area, is to support the effective use of technology in enhancing the learning and teaching environment in the coalition's colleges of engineering. In preparation for achieving this goal, the TBCD focus team plans to offer a series of workshops targeted at introducing various technologies and building skills in faculty members to facilitate technology incorporation. In order to provide the appropriate training, at the appropriate level of expertise, the team undertook an assessment to determine the needs and skill levels of the faculty in the coalition schools. This effort includes a faculty survey. The results of the survey also serves as the baseline for later assessment of the effectiveness of the TBCD efforts.

## 2. Survey Design

We have previously described the TBCD survey in detail [4]. What we focus on in this paper are the faculty's responses to questions concerning ten technologies that we believe to be important. These are:

1. Using email to communicate basic information to students;
2. Using word processing skills to prepare course material;
3. Presenting lectures or class demonstrations from a computer;
4. Creating, editing and incorporating multimedia into course materials;
5. Developing multimedia courseware or modules using commercial authoring tools;
6. Using the World Wide Web to search for and gather teacher resources;
7. Creating a Web page for a course to provide information and distribute course materials;
8. Holding electronic help-sessions or office hours using conferencing or collaboration tools;
9. Developing a course delivered entirely via the Web;
10. Developing Java applets to enhance courses.

Table 1 shows demographic information of the respondents. Note that not all 360 respondents completed all survey questions, which accounts for the Total values in Table 1 being less than 360. Generally, respondents from larger campuses (Clemson, Georgia Tech, NCSU, Florida, and Va Tech) are comprised of more Full Professors than Associate or Assistant Professors. The remaining, generally smaller, schools have a more uniform distribution between the three ranks. All schools show a low percentage of Adjunct, Instructor and Other faculty who responded. Survey distribution to these faculty groups was non-uniform across the campuses and, therefore, it is likely that they are under-surveyed.

Regarding the years of service as a faculty member, it is interesting to note that, for the coalition as a whole, faculty with more than ten years of teaching experience represent a high percentage of all faculty. In fact, with the exceptions of FAMU/FSU and NCA&T, this group of senior faculty represents the overwhelming majority. We have no current data on the length of service of faculty, either in all disciplines or in engineering, so it is not known whether this finding is particular to engineering faculty or to SUCCEED's engineering schools.

*Table 1: Demographic information of survey respondents, both as a summary of all coalition schools, and as individual campuses.*

RANK	All schools		Clemson		FAMU/FSU		Ga Tech		NCA&T		NCSU		Florida		UNCC		Va Tech	
	# <sup>a</sup>	% <sup>b</sup>	#	%	#	%	#	%	#	%	#	%	#	%	#	%	#	%
Full Professor	141	40.4	24	42.1	7	33.3	13	39.4	8	25.8	16	41.0	29	44.6	7	29.2	37	46.8
Assoc. Professor	104	29.8	17	29.8	5	23.8	11	33.3	11	35.5	12	30.8	14	21.5	11	45.8	23	29.1
Assist. Professor	77	22.1	13	22.8	8	38.1	6	18.2	7	22.6	8	20.5	17	26.2	3	12.5	15	19.0
Adjunct Professor	5	1.4	0	0.0	1	4.8	0	0.0	3	9.7	0	0.0	1	1.5	0	0.0	0	0.0
Instructor/Lecturer	6	1.7	3	5.3	0	0.0	0	0.0	0	0.0	1	2.6	1	1.5	0	0.0	1	1.3
Other	16	4.6	0	0.0	0	0.0	3	9.1	2	6.5	2	5.1	3	4.6	3	12.5	3	3.8
<b>Total</b>	<b>349</b>		<b>57</b>		<b>21</b>		<b>33</b>		<b>31</b>		<b>39</b>		<b>65</b>		<b>24</b>		<b>79</b>	

<sup>a</sup>Number of respondents

<sup>b</sup>Response as percentage of total

### 3. Results and Discussion

Of the 1622 surveys distributed at the eight campuses, 360 were returned for a response rate of 22.2%. Response rates from individual campuses ranged from a low of 9.5% to a high of 40.4%. All disciplines of engineering (including technology) were represented among the respondents, and the number of respondents in each discipline roughly reflects their predominance on campuses (e.g. electrical/computer, mechanical, civil engineering had the highest numbers, architectural, bio/biomedical, mining/minerals, nuclear engineering had the lowest).

For the coalition as whole, there is relatively little variation between faculty of different rank for three observed traits: (1) faculty skill level, as shown by the percentage of faculty who self-reportedly are either intermediate or advanced in skill level with various technologies (Fig. 1); (2) percentage of faculty already using various technologies (Fig. 2); and (3) percentage of faculty who are willing to attend workshops for various technologies (Fig. 3).

We next looked for differences between faculty at institutions with different missions; i.e. the schools' emphasis on research versus undergraduate teaching. The eight coalition schools were labeled either as a 'research' institution (Clemson, Ga Tech, NCSU, Florida, and Va Tech) or a 'teaching' institution (FAMU/FSU, NCA&T, and UNCC), and their data were pooled for comparison.

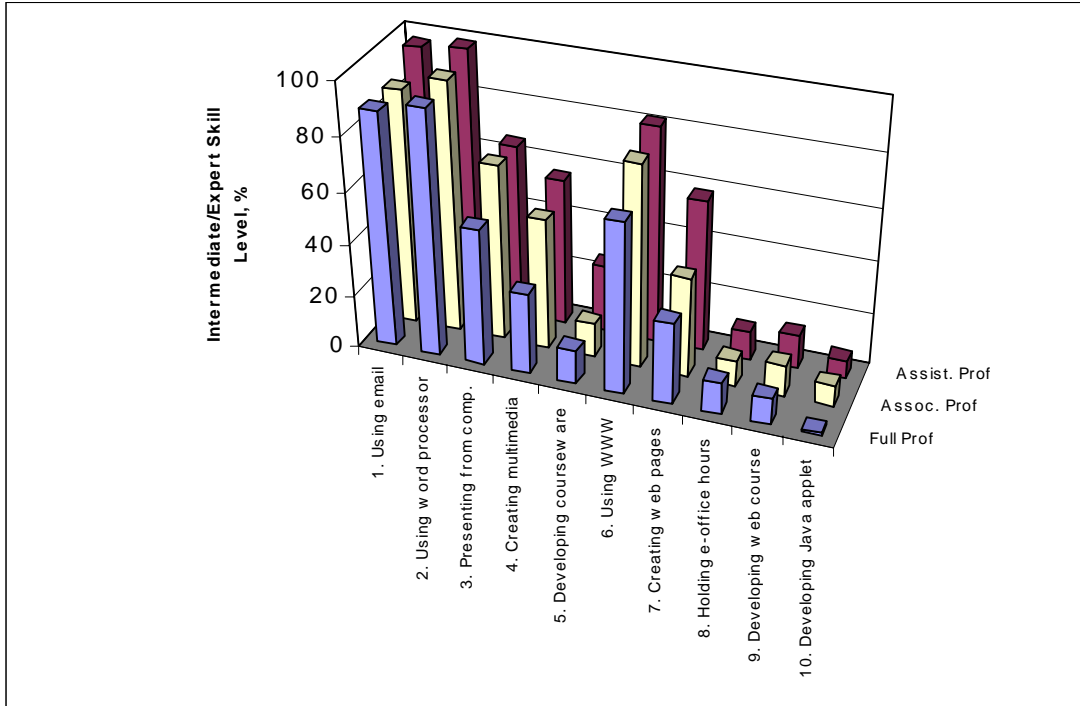


Figure 1: Percentage of faculty of SUCCEED who possess intermediate or advanced skills with various technologies.

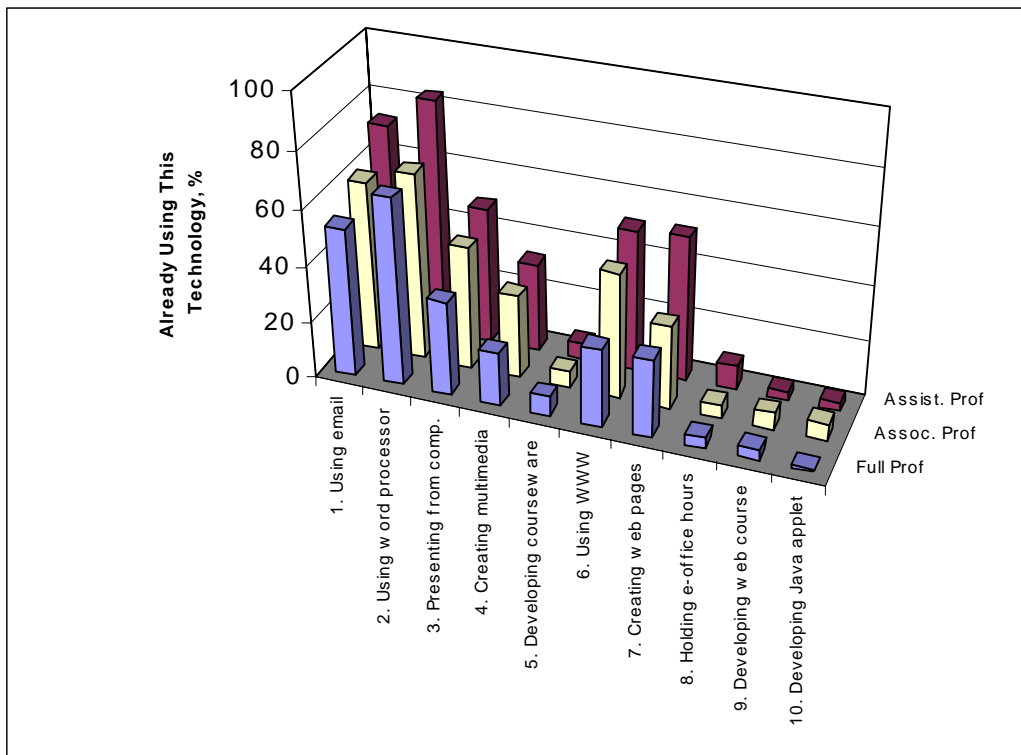


Figure 2: Percentage of SUCCEED faculty who are currently using various technologies.

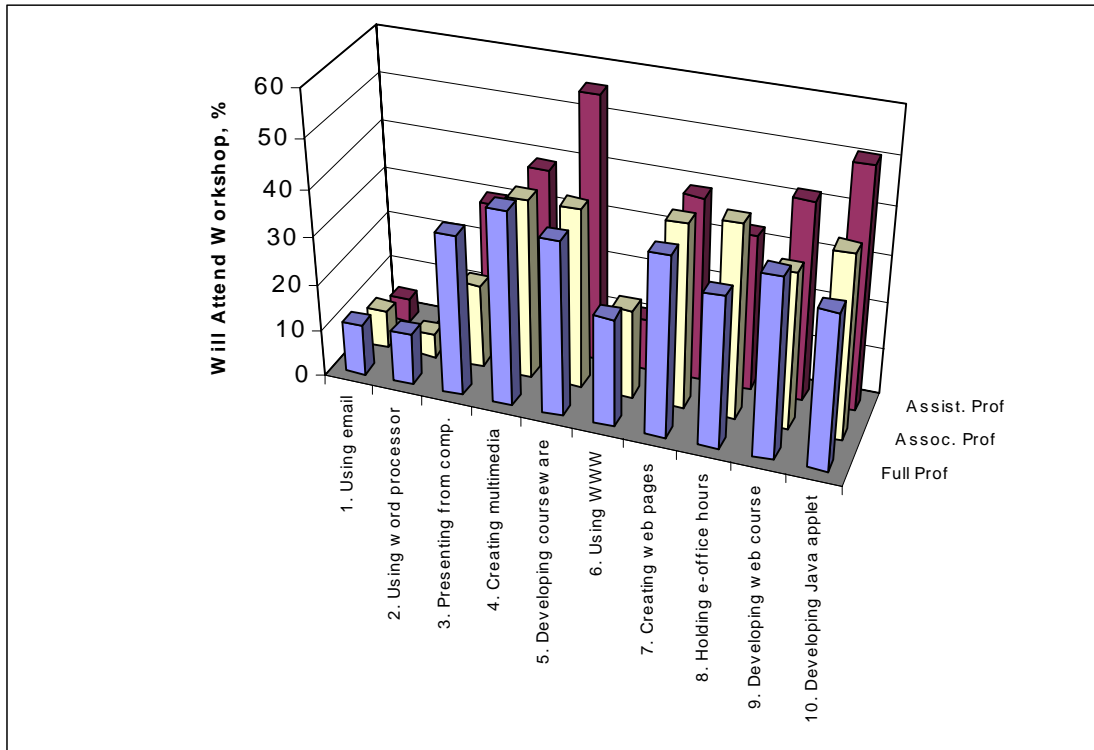


Figure 3: Percentage of SUCCEED faculty who are willing to attend workshops on various technologies.

For both institution types, there is little difference between faculty at different ranks regarding their skill level (Fig. 4), although the data may show that Assistant Professors at teaching institutions are slightly more skilled at certain technologies. Very little difference exists between institution type and faculty rank regarding the percentage of faculty who are currently using various technologies (data not shown).

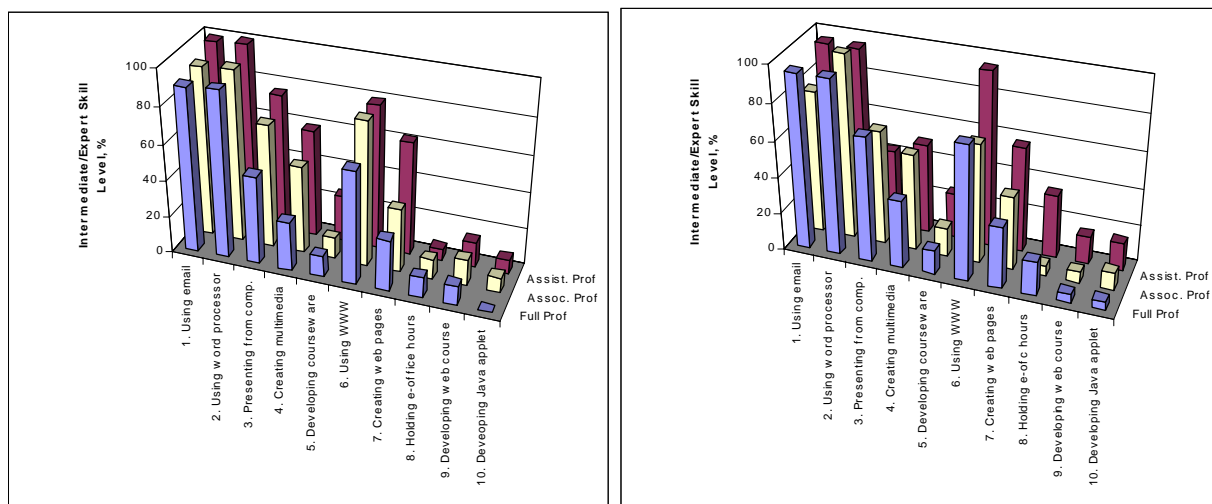


Figure 4: Comparison of percentage of faculty who self-report a high skill level between 'research' institutions (left) and 'teaching' institutions (right).

The major difference that we found between institution type is the willingness of faculty to attend workshops. Figure 5 clearly shows that on percentage, faculty at teaching institutions are more willing to attend technology workshops. Closer inspection of Fig. 5 shows that while Assistant Professors at both institution types respond similarly to this question, it is the Associate and Full Professors at the teaching institutions that are most eager for technology skills development.

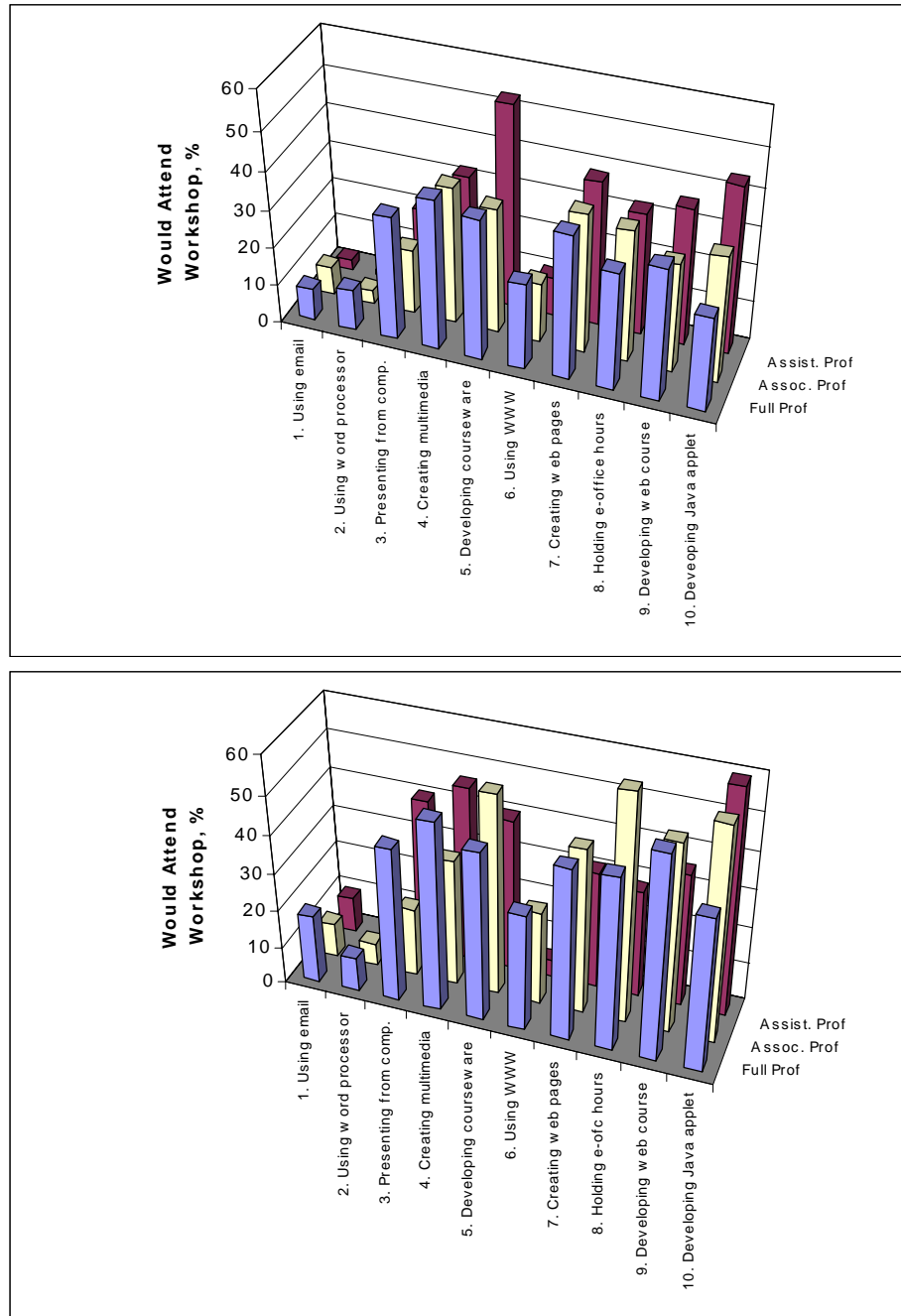


Figure 5: Comparison of faculty's willingness to attend workshops. 'Research' institutions (top) and 'teaching' institutions (bottom).

#### 4. Conclusions

A survey of engineering faculty at the eight SUCCEED engineering schools was undertaken to ascertain the faculty needs and skill levels. Ten technologies were included in the survey. The results show that, as a coalition, there is little variation between faculty rank (Assistant, Associate, or Full Professor) with regard to either (1) faculty skill level, (2) current use of each technology, and (3) faculty willingness to attend technology workshops.

When the data was further segregated according to whether each institution's main mission is research or undergraduate teaching, the results were unchanged for faculty skill level and current use of each technology. The only observed difference between research and teaching institutions was that a higher percentage of Associate and Full Professors at teaching institutions are willing to attend technology workshops, while Assistant Professors are equally as willing at either type of institution.

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