SOUTHEASTERN UNIVERSITY AND COLLEGE COALITION FOR ENGINEERING EDUCATION

1999-2000 SUCCEED Faculty Survey of Teaching Practices and Perceptions of Institutional Attitudes Toward Teaching[a]

Executive Summary

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1999–2000 SUCCEED COALITION FACULTY SURVEY OF TEACHING PRACTICES AND PERCEPTIONS OF INSTITUTIONAL ATTITUDES TOWARD TEACHING

Abstract

SUCCEED (Southeastern University and College Coalition for Engineering Education) is an eight-campus coalition of engineering schools formed in 1992 under the sponsorship of the National Science Foundation. In 1997, members of SUCCEED's faculty development and program assessment teams designed a faculty survey of instructional practices and attitudes regarding the climate for teaching on the Coalition campuses. The respondents were asked about the frequency with which they used various teaching techniques (including active learning, team homework, and technology-assisted instruction), their involvement in faculty development programs, and the effects of those programs on their teaching. They were also asked to rate the importance of teaching quality to themselves, their colleagues, and their department, college, and university administrators and in the faculty reward system on their campus. The survey was first administered late in 1997 and a modified version was administered late in 1999. (A third administration will take place in the spring of 2002.)

The 1999 survey was sent by e-mail to 1621 faculty e-mail addresses, and a follow-up survey was sent a month later to non-respondents. After blank surveys and duplicates were eliminated from the returns, 586 valid and usable surveys remained, a return rate of 36%. Of those, 75 were excluded from most analyses (except for demographic summaries) because the respondent had not taught undergraduates in the prior three years. The demographic profile of the respondents closely matched that of the full faculty with respect to sex, rank, position, engineering discipline, and participation in SUCCEED-sponsored activities.

This report summarizes results from the 1999 administration of the survey and itemizes significant differences among groups (sex, rank, position, years of service, SUCCEED involvement, prior attendance at teaching seminars, and Carnegie classification). When possible, the data are compared with the data from the 1997 survey administration to examine changes in faculty teaching practices and attitudes in the intervening two years.

Electronic versions of the complete report and the executive summary may be viewed at

<http://www.succeednow.org/products/99faculty_survey.pdf>
<http://www.succeednow.org/products/99faculty_survey_execsum.pdf>

Executive Summary

SUCCEED (Southeastern University and College Coalition for Engineering Education) is an eight-campus coalition of engineering schools formed in 1992 under the sponsorship of the National Science Foundation. In 1997, members of SUCCEED's faculty development and program assessment teams designed a faculty survey of instructional practices and attitudes regarding the climate for teaching on the Coalition campuses. The respondents were asked about the frequency with which they used various teaching techniques (including active learning, team homework, and technology-assisted instruction), their involvement in faculty development programs, and the effects of those programs on their teaching. They were also asked to rate the importance of teaching quality to themselves, their colleagues, and their department, college, and university administrators and in the faculty reward system on their campus. The survey was first administered late in 1997 and a modified version was administered late in 1999. (A third administration will take place in the spring of 2002.)

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We initially speculated that faculty inclined to participate in faculty development activities and to use non-traditional instructional methods like active and cooperative learning would be over-represented among respondents to a survey of teaching practices. This fear proved to be unfounded. When the survey asked about participation in SUCCEED-sponsored activities (workshops, seminars, etc.), 42% of 509 respondents reported having participated. An independent database of tenured and tenure-track engineering faculty participants in SUCCEED-sponsored activities (workshops, seminars, etc.) shows that near the end of 1999, 42% of 1563 faculty members had participated. We conclude that the 1999 survey respondents constitute a fair sample of the entire SUCCEED engineering faculty population in every important respect.

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Active learning

The instructional method emphasized most heavily in SUCCEED-sponsored teaching workshops is active learning—getting students to do anything in class other than watch and listen to the instructor and take notes. In 1999 many of the survey respondents were using active learning to some extent. Sixty percent reported assigning small group

exercises for brief intervals in their classes, with 22% doing so once a week or more, and 37% reported using active learning for most of a class period, with 8% doing so once a week or more. All of these percentages represent slight but not statistically significant increases from the 1997 values. (We believe that they represent sizeable increases from the values when SUCCEED began in 1992 but we have no data to confirm this belief.) The percentages on individual campuses using active learning varied from 48% to 95%.

Women were much more likely than men to use active learning, associate and assistant professors more likely than full professors to use it, and faculty members at masters institutions more likely than faculty members at research institutions to use it. Participation in teaching seminars was associated with an increased use of active learning and a decrease in the frequency of lecturing for most of every class session.

Team assignments

In the 1999 survey, 73% of the respondents reported giving assignments on which students had the option of working in teams, with 35% doing so weekly or more often; 54% of the respondents reported giving assignments on which teams were required, with 16% doing so weekly or more often; and 82% reported assigning a major team project in some or all of the courses they taught. The percentages of respondents using optional or mandatory team assignments and the percentages doing so weekly or more often each rose by about 7% from 1997 to 1999. The percentages giving optional team assignments on individual campuses varied from 64% to 88%, and the percentages giving mandatory team assignments varied from 49% to 80%.

Those who were actively involved in SUCCEED were more likely to require teams for assignments (71%) than those who had only heard of the coalition (48%). All other subpopulations studied were equally likely to use team assignments. The incidence of team assignments increased from 1997 to 1999 for all of the subpopulations examined.

Technology-based instruction

The most common category of technology applications reported in the 1999 survey was communication between instructors and students: 96% of the respondents reported using e-mail to respond to questions from their students, 75% sent information to the whole class, and 24% posted on-line responses to frequently asked questions. The next highest category involved posting course materials: 66% reported posting syllabi, 60% assignments, 48% problem solutions, 44% lecture notes, 44% links to other web sites, and 38% old tests. Smaller percentages set up on-line communications among the students—32% with class listservs and 11% with chat rooms—and used technology for actual course delivery other than posting lecture notes—16% used on-line tutorials, 7% on-line tests, 5% on-line video, and 4% on-line audio. Similar questions were not asked in 1997, so there is no way to determine the extent to which technology use changed between survey administrations.

The campus-to-campus variations in use of some of the technology applications were greater than the variations seen for any other measured variable. The percentages of the

respondents who posted syllabi on the Web varied from 35% to 84%, the percentages posting old tests varied from 5% to 59%, and the percentages setting up class listservs varied from 10% to 75%. These pronounced variations undoubtedly reflect the fact that some SUCCEED campuses have a fully networked computing environment and make extensive use of instructional delivery tools such as Web-CT and Blackboard, while at other schools with fewer resources and/or more traditional and technology-resistant faculties, most professors have not progressed much beyond e-mail, programming, and word-processing in their computer usage.

Writing assignments

A movement to increase writing content in engineering courses has followed the adoption of EC 2000 as the accreditation standard. The percentage of the survey respondents who reported ever giving writing assignments increased from 84% in 1997 to 88% in 1999, and the percentage doing so weekly or more often increased from 8% to 21%. Men and women were almost equally likely to give writing assignments, and there were also no significant differences across academic ranks or types of institution.

Preparation for classes and contact with students

Faculty members in all categories other than administrators reported spending between 8 and 11 hours a week on preparation for a single course. On average assistant professors spent about two hours more than full professors did. Associate professors reported spending an amount of time roughly midway between the times spent by assistant and full professors, but only the difference between the assistant and full professors was statistically significant.

Faculty members also reported spending an average of 3.9 hours per week outside of office hours with undergraduate students. The greatest amount of time was spent by teaching faculty (5.6 hours), followed by department chairs (4.8 hours), research faculty (3.8 hours), teaching/research faculty (3.5 hours), and administrators other than department heads (3.4 hours), although only the difference between teaching and teaching/research faculty was statistically significant. Faculty at masters institutions spent more time with undergraduates (5.0 hours) than did faculty at research institutions (3.7 hours). Seventy-eight percent of the respondents indicated that they solicited feedback regarding their teaching at times other than at the end of the semester, with 88% of the assistant professors, 81% of the associate professors, and 71% of the full professors doing so.

Instructional objectives and study guides

Writing instructional objectives (or in ABET terminology, course learning objectives) is another instructional method strongly encouraged by both SUCCEED teaching workshops and Engineering Criteria 2000, and the workshops encourage participants to give their objectives to their students in the form of study guides for examinations. The number of respondents who reported usually or always writing instructional objectives

was 65% in 1999, a 5% increase from 1997. Assistant professors were much more likely to write them at all and to write them frequently than were associate and full professors. Similar results were obtained regarding the provision of study guides for tests. In 1999, 80% reported doing so with 60% usually or always doing so, percentages not much different from the 1997 values. Nearly three-quarters of the women (73%) compared with only 59% of the men reported that they always or usually give study guides before tests. Attending teaching seminars was positively associated with writing instructional objectives.

Faculty development

Eighty-two percent of the respondents reported having attending one or more teaching workshops on their campuses, 64% attended a meeting or brown-bag lunch dealing with teaching, 62% consulted books, 59% consulted a newsletter or a web site, 40% observed a videotape, 35% participated in a mentoring program, and 13% worked with a teaching consultant. Assistant professors (87%) and associate professors (86%) were more likely than full professors (77%) to attend teaching workshops, and women (27%) were much more likely than men (11%) to work with a teaching consultant. Large campus-to-campus variations were observed, reflecting the different availabilities of faculty development resources and programs on the different campuses.

As previously noted, the use of active learning, team assignments, and other nontraditional instructional methods were positively associated with attendance at teaching seminars. This result by itself does not show that the seminars induced participants to adopt the nontraditional methods: one might expect that professors who choose to attend teaching seminars would be more inclined to use nontraditional methods than would their colleagues who choose not to attend. To determine whether the association was causal rather than merely correlational, the 1999 survey asked the respondents which of several listed instructional methods they had adopted as a consequence of attending teaching workshops, seminars, or conferences. Of roughly 500 respondents, 59% reported that they either began or increased their use of active learning, 43% wrote instructional objectives, 43% used cooperative learning, 28% provided study guides before tests, and 18% participated in a mentoring program. When asked how the changes they made affected their students' learning, 69% of the respondents reported improvements, 6% said that they could see no improvement, and 25% indicated that they had not made any changes.

Women (95%) were more likely than men (72%) to try new methods, assistant professors (82%) more likely than associate professors (72%) or full professors (70%) (only the difference between the assistant and full professors was statistically significant), and faculty at masters institutions (90%) more likely than faculty at research institutions (71%). Willingness to try new approaches generally correlated positively with the number of teaching seminars attended.

Rated importance of teaching quality and innovation

From the point of view of the survey respondents, the climate for teaching on their campuses was not particularly good in 1997 and worse in 1999. Most respondents expressed a belief that teaching quality was very important to them, with an average rating of 6.5 on a scale from 1 (not at all important) to 7 (extremely important). They regarded teaching quality as decreasingly important to their department head (5.6), faculty colleagues (5.2), dean (5.1), and top university administrator (5.1). Most believed that teaching quality and teaching innovation (testing new instructional methods, writing textbooks or instructional software) were not particularly important in the faculty incentive and reward system, with average ratings of 3.7 and 3.5 respectively. All significant changes from 1997 to 1999 were in the negative direction.

Women generally gave lower ratings of the importance of teaching to colleagues and administrators and in the reward system than did men, and assistant professors gave lower ratings than associate professors, who in turn gave lower ratings than full professors (again only the difference between assistant and full professors was statistically significant). Administrators consistently rated the importance of teaching to themselves and their colleagues and in the reward system higher than the rest of the faculty did. Predictably, ratings of the importance of teaching quality in the reward system were higher at masters institutions (4.0) than at research institutions (3.7), but both ratings were relatively low.

Conclusions

- *Use of nontraditional instructional methods.* Extensive evidence from cognitive science and empirical classroom research supports the effectiveness of active learning, team-based learning, writing formal instructional objectives, and assigning writing exercises at promoting acquisition of knowledge and skills. While we have no data on the frequency of use of these methods in 1992 when SUCCEED began, we feel confident in saying that they were known to relatively few engineering faculty members and practiced by even fewer. Their use in 1999 by over half of the faculty and in some cases considerably more than half, and the relatively high percentages using them on all of the SUCCEED campuses, suggest that the combined effects of faculty development programs, education-related articles in professional journals, EC 2000, word-of-mouth from colleagues, and pressure from students have had significant effects on faculty teaching practices. We anticipate that the observed trend toward adoption of the new methods will continue as faculty members who have used the traditional ones for decades retire, and their replacements are given training and mentoring in more effective methods starting as soon as they arrive on campus.

- *Technology-assisted instruction.* Engineering education is in a transitional state regarding the use of instructional technology, and the variations observed on the SUCCEED campuses undoubtedly reflect the situation throughout the country. Some of the SUCCEED campuses have a fully networked computing environment, make

extensive use of instructional delivery tools such as Web-CT and Blackboard, and require all engineering students to purchase laptops. These are the schools that make the greatest use of technology for communication and instruction—where over 80% of the instructors post their syllabi on the Web, for example, and over 70% set up listservs for their classes. At other schools with fewer resources and/or more traditional and technology-resistant faculties, most professors have not progressed much beyond e-mail, programming, and word-processing in their computer usage. The full use of instructional technology for course delivery with such tools as on-line test administration and multimedia courseware is still in its early stages on all of the campuses. We anticipate dramatic changes in this situation in the coming years.

- *Participation in and effectiveness of faculty development.* In 1999, 82% of the survey respondents reported having attended one or more teaching workshops on their campuses, with smaller but still substantial percentages participating in other types of faculty development programs. Large percentages of the respondents attributed their adoption or increased use of nontraditional instructional methods to their participation and expressed beliefs that the changes led to improvements in their teaching.

  Our conclusion is that while faculty development cannot claim exclusive credit for the increased use of the instructional methods it has sought to promote in recent years, it has clearly made a major contribution to the increase. Considering the historic reluctance of engineering faculty to participate in campus-wide faculty development programs, engineering schools would do well to strengthen their internal faculty development efforts rather than relying primarily or entirely on campus-wide teaching centers for guidance in improving teaching. Guidelines for the design and implementation of engineering faculty development programs formulated by the SUCCEED Coalition[1] might prove useful in this regard.

- *Rated importance of teaching quality and innovation.* In both 1997 and 1999, most respondents expressed a belief that teaching quality was more important to them than to their colleagues and administrators, and there was general agreement that teaching quality and teaching innovation (testing new instructional methods, writing textbooks or instructional software) were not important in the faculty incentive and reward system. All significant changes from 1997 to 1999 were in the negative direction.

  We infer from these findings that most professors who spend time and energy participating in faculty development programs and learning and implementing new methods do so despite their belief that their efforts will neither be appreciated by their colleagues nor rewarded by their administrators. (There is some comfort in the fact that respondents gave department chairs the second-highest rating after themselves, indicating a belief that those who rise to that level feel that teaching is more important than it is to rank-and-file faculty.) Nevertheless, the study also shows that many of

[1] R. Brent, R. Felder, T. Regan, A. Walser, C. Carlson-Dakes, D. Evans, C. Malave, K. Sanders, J. McGourty, "Engineering Faculty Development: A Multicoalition Perspective," *Proceedings, 2000 Annual Meeting of the American Society for Engineering Education*, ASEE, June 2000.

them choose to make the effort anyway, which we regard as a tribute to their dedication. The dramatic advances in the quality of American engineering education that might result from putting teaching and research on a more equal footing in the faculty reward system can only be imagined.