Data and Perspectives on Retention

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Abstract:

The results of a study and perspectives on retention in an EET program are discussed. Data used in the study includes graduation data for the entire history (over 30 years) of the program as well as more detailed data from the past 14 years. Factors considered include graduation rate for day vs. evening courses, instructor ability, class size, and the time it takes students to achieve a degree. The study is based on data and the perspective of the author, who is a faculty member, and currently department chair. Results indicate: that faculty considered as "non-motivating" teachers should not teach first semester courses and that emphasis should be placed on encouraging students to declare their major early and on providing interesting first semester courses.

I. Introduction

Indiana University Purdue University Fort Wayne (IPFW) is a state-supported commuter campus with about 11,000 students (about 5500 FTE). The Electrical and Computer Engineering Technology Department (ECET) provides instruction for accredited[1] A.S. and B.S. programs in Electrical Engineering Technology (EET). There are currently about 220 students majoring in EET, over 1000 students have received Purdue EET degrees during the past 30 years from this department, and the average age of students is about 28.

Many studies of retention have been presented in the ASEE Prism and other publications. This study of retention in a small department was motivated by the desire to see how applicable common ideas concerning retention are to this program and to develop methods to increase retention. Data used were from alumni records and from the registrar. Factors considered include instructor ability, day vs. evening classes, full-time vs. part-time instructors, and class size. The study is based on the data and the perspective of the author, a faculty member for fourteen years and currently department chair.

Printed grade rosters for each course were available from the registrar's office with computer files available since Fall 95. Graduation data are from alumni rosters for the department, provided by Purdue University. Personal observations are based on knowledge of students and instructors during the period studied.

II. Degree and Time to Graduation

[1] Technology Accreditation Commission of the Accreditation Board for Engineering and Technology

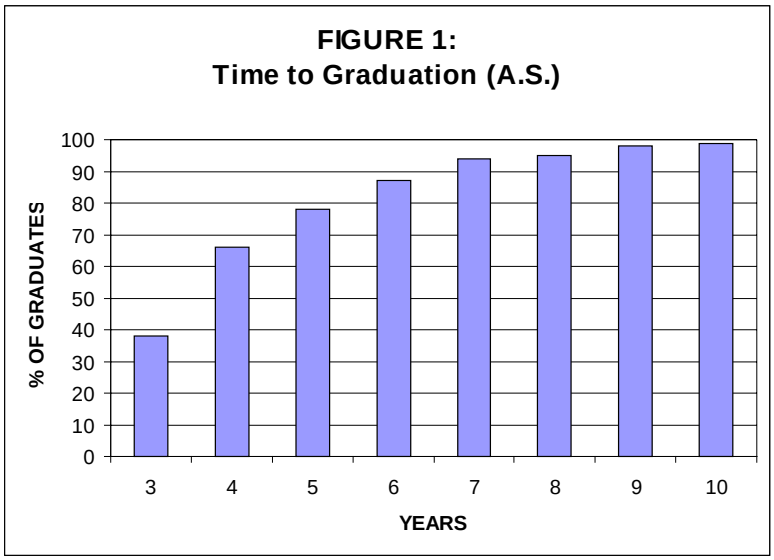
A.S. Degree vs. B.S. Degree: Comparison of the number of A.S. graduates with the number who go on for a B.S. degree provided information on more recent graduates. Data were gathered on all graduates (30+ years) and the results compared with data for students who took a required, first semester, circuit analysis course during the past 14 years. This course was chosen because students take a College Algebra course concurrently, which means students who drop out due to insufficient remedial mathematics skills do not appear in the data. This course may not be the first EET course taken by new students, but it is the first course requiring College Algebra and appears to be a pivotal course when students make a decision to remain in the program.

1. The total number of graduates (A.S. and B.S.) in EET since the inception of the program in the mid-1960's is 1013. Of these, 362 (35.7%) stopped at the A.S. and 651 (64.3%) continued for the B.S. Additionally, 72 of the 362 A.S. graduates continued for a B.S. from Purdue in other majors with the most popular B.S. degrees being: Industrial Technology (39), Mechanical Engineering Technology (9), and Supervision (8).
2. From Fall 85 through Spring 90 186 of the students enrolled in the required, first semester, circuit analysis course received degrees. 118 (63.4%) of these students stopped at the A.S. (Table 1) while the other 68 (36.6%) went on for the B.S. (Table 2). This data appears reliable because a minimum of 9 years were available for these students to complete a B.S. degree and 95% of students who receive a B.S. complete it within 9 years (Table 2).
3. From Fall 90 through Spring 93, 86 of the students enrolled in the required, first semester, circuit analysis course received degrees. 53 (61.6%) stopped at the A.S. and the other 33 (38.4%) continued for their B.S. This provides 6 years for the Spring 93 semester students to complete their B.S.

This data shows a trend during the past 14 years for students to stop at the A.S. degree rather than complete the B.S. Over the 30+ years of EET graduates, 64.3% of graduates went on for a B.S., however, only 36.6% of the students graduating from 1985 through

Years	# of A.S. Grads
3	65
4	48
5	21
6	14
7	12
8	3
9	6
10	1
11	1

Table 1:
# of A.S. Graduates within __ Years



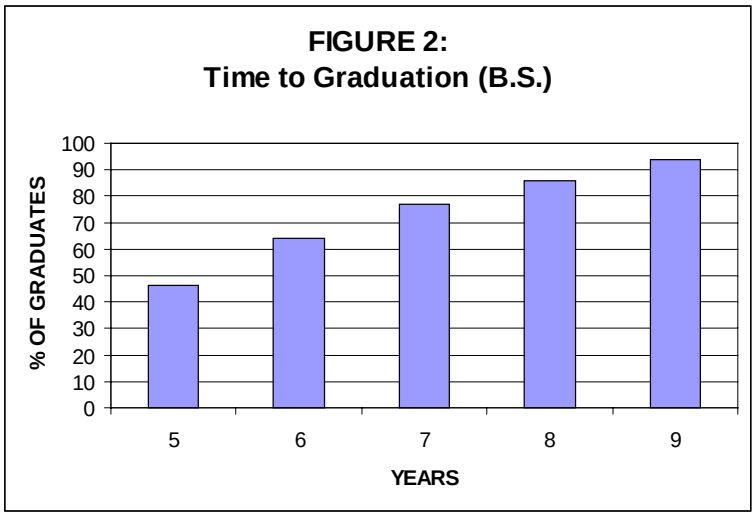
1990 continued for a B.S.

Time to Graduation: Data were gathered on the length of time it takes graduates to achieve their A.S. and B.S. Degrees considering students enrolled in the same required, first semester, circuit analysis course.

1. A.S. Degrees (Fall 85 through Fall 95): Table 1 contains the data gathered and Figure 1 summarizes the results. The majority (113 of 171 or 66%) of the A.S. graduates completed the degree within 4 years. The remainder of those who graduated followed an exponential curve with a time constant of 4 years.
2. B.S. Degrees (Fall 85 through Fall 93): Table 2 contains the data gathered and Figure 2 summarizes the results. The majority (65 of 101 or 64%) of B.S. graduates completed their degree within 6 years of taking the course. This graduation rate graph is almost linear.

Years	# of B.S. Grads
5	46
6	19
7	13
8	8
9	9
13	6

Table 2:
# of B.S. Graduates within __ Years



III. Retention Factors

A definition of retention is the number of students who graduate from each class analyzed. Data were based on the graduation rate of students entering selected, required courses for each semester of the first two years of the program. Sufficient time was allowed for graduation with an A.S. degree when determining the final date each course was considered. Numerical results are shown in Table 3, and a discussion of the results is provided after Table 3. Some information on each course:

First semester course This course was "Circuit Analysis I" and there were 32 sections from Fall 85 through Spring 95, taught by 12 faculty, with 667 students enrolled.

Second semester course This course was "Electronics I" and there were 25 sections from Fall 85 through Fall 95, taught by 12 faculty, with 465 students enrolled.

Third semester course This course was "Introduction to Microprocessors" and there were 30 sections from Fall 85 through Fall 96, taught by 8 faculty, with 501 students enrolled.

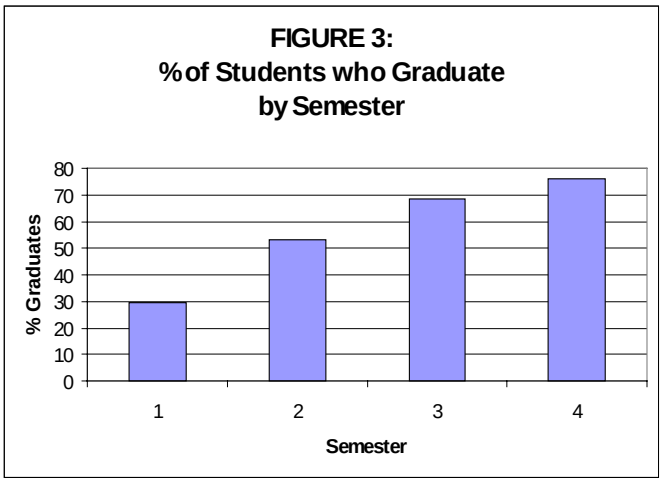
Fourth semester course This course was "Motors and Generators" and there were 25 sections from Fall 85 through Spring 98, taught by 11 faculty, with 368 students enrolled.

Semester	%Grads Mean	% Grads Std Dev	Class Size (Range)	% Day grads/ % Night grads	% grads Mot. Faculty/ % grads Nonmot. Fac.
1	30	14	10-40	32/25	30/26
2	53	15	4-29	58/41	58/45
3	68	12	4-27	71/63	Equal
4	76	15	6-26	86/67	Equal

Table 3: Retention

Discussion of the Data in Table 3:

1. The % of students who graduate increased substantially the longer the student remained in the program. This is shown graphically in Figure 3.
2. The graduation rate for day sections is higher than for evening sections. Most younger students (new high school graduates) attend during the day. This data indicates that these students are more likely to graduate than the evening students, more of whom have jobs, families, house payments, and other responsibilities.



3. "Motivating" and "Non-motivating" faculty were designated based on 14 years experience with the faculty involved. The designations were made prior to obtaining the data so a fair basis for comparison could be made. The data on % of graduates for " motivating" vs. " non-motivating" teachers shows evidence that "better" teachers effect retention for freshmen (30% vs 26% grads for first semester courses and 58% vs 45% grads for second semester students. There was little difference in sophomore level courses. Students are generally more committed to obtaining a degree by their sophomore year. It was also noted that more students tended to withdraw from sections taught by "non-motivating" teachers'.
4. Data were obtained concerning the effect of part-time faculty vs. full-time faculty on retention. However, there is too much overlap with the day/evening data, and the significant statistic is considered to be the day vs. evening rather than the quality of teaching by part-time faculty.

The general conclusion from this data is that individual motivation and outside influences have the greatest effect on graduation rate.

Non-Degree Retention: Another retention statistic is the number of first semester EET majors who continue into second semester courses and those who continue into the second year of the program. Data on students who were listed as EET majors were only available since Fall 95. Five semesters of data (Fall 95 through Fall 97) were used:

1. First semester EET majors in a required, first semester, circuit analysis course who continued into a required second semester course.
    a. 37 of the 70 students (52.5%) continued into the second semester course the following semester.
    b. 12 more of the 70 students continued into the second semester course during the next several years. Adding these, 49 of the 70 EET majors (70%) remained in the program for at least one academic year.
2. First semester EET majors in a required, first semester, circuit analysis course who continued into a required third semester course.
    a. Of the 70 students in the first semester course who where EET majors, 49 continued into the required third semester course.
    b. This indicates that EET majors who continued into the second semester of the curriculum also continued into the third semester.

In general, students make their decision to stay in the program based on first semester courses. When the 70% retention from the first to the third semester is compared with the graduation rates in Figure 3, it is apparent that students who have decided on their major are much more likely to continue in the program, and therefore, are more likely to graduate.

IV. Conclusions

1. Interesting, informative, first semester courses taught by "motivating instructors" may be the best method of increasing retention.
2. Faculty considered (by students and department chairs) as “non-motivating” teachers should not teach first or second semester courses.
3. Daytime students during the first semester are more likely to graduate than evening students so additional emphasis should be placed on advising evening students.
4. Most students who declare a major during the first semester continue into the second and third semester courses in their major, so emphasis should be placed on encouraging students to choose their major as early as possible.
5. 2/3 of students receiving a degree complete their A.S. within 4 years and complete their B.S. within 6 years of taking the required, first semester, circuit analysis course. Therefore, students taking relatively heavy (at least 2 courses per semester) loads should receive continued encouragement.
6. More recent students (1985 to 1993) were more likely to end their formal education after receiving an A.S. degree than earlier students (1968 to 1984).

HAL BROBERG
Hal taught Electrical Engineering for 3 years at the U.S. Naval Academy and after retirement from the Marine Corps as a Lieutenant Colonel, chose to continue teaching. He received his PE license in Indiana in 1988 and his PhD in Engineering (EE) in 1993. His research area is servo systems and he has consulted and worked for ITT (Aerospace-Communications) on weather satellite servos for the past 7 years. He is currently Associate Professor and Department Chair of Electrical and Computer Engineering Technology at Indiana-Purdue University in Fort Wayne, IN. He is a senior member of IEEE and has been on nine TAC/ABET accreditation visits for IEEE.