



Barriers to Completion of Two-Year Engineering Technology Programs: A Survey

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Financial Barriers to Completion of Two-Year Engineering Technology Programs: A Survey

Low student enrollments coupled high global demand for qualified graduates has become a serious concern in engineering education. As the demand for professionals with engineering degrees increases, colleges and universities are trying to use many programs and activities during high school and college to attract more students to engineering, especially woman and minority students. Unfortunately, forty to fifty percent of engineering students drop out or switch to other majors. This indicates that keeping students in engineering is as important as having more students enroll in engineering degrees. In support of that, cost analysis shows that recruiting new students is more expensive than retaining students already enrolled.

In an effort to understand students better, accurately determine the reasons behind low retention and high dropout, and provide services students truly need, a survey was administered at Bridgemont Community and Technical College (BCTC). A total of 139 students from seven different engineering technology programs were surveyed. From those surveyed, 40.75% were 22 years or older, 48.12% were first-generation college students, and 93.53% were full-time students. Besides basic demographics, respondents provided information on how many hours per week they worked, if a lack of funding delayed or slowed their progress to matriculation, if they felt that employment prevented them from studying and completing their assignments, their reasons for being employed while attending college, and how concerned they were about having available funds to finance their college education.

In this paper, the data is analyzed to provide valuable information for a National Science Foundation (NSF) scholarship in science, engineering, technology, and mathematics (S-STEM) grant application. The results are further analyzed to give direction for more effective retention efforts, including advisement about courses and workloads.

Introduction

Community and technical colleges are a major component of the American higher education system. The proliferation of community and technical colleges over the last century significantly increased participation in higher education, predominantly among people with limited opportunities for education beyond high school due to academic difficulties, financial constraints, and other factors³. Unfortunately, the number of student graduates from community and technical colleges with a certificate or a degree does not match the substantial growth in the number of community and technical colleges, or the students attending those colleges. A study by Calcagno, Bailey, Jenkins, Kienzl, and Leinbach (2006)¹ shows that within six years of transitioning to college, only slightly more than 30% of entrants received any kind of a certificate or degree.

Moreover, even though community colleges embrace an open-door policy with the intention of democratizing opportunities, the completion of a certificate or a degree remains correlated with the level of socioeconomic advantage⁵. In fact, students with a middle-class socioeconomic status benefit more from community colleges³. Even though a large amount of government investment has been made into community colleges, distributed as financial aid, students have a

hard time accessing such aid due to rules and guidelines governing its distribution. For instance, while many community and technical college students enroll part time, in many cases, this indicates that students need to earn income to afford college, as being a part-time student reduces aid eligibility. Students enrolled less than half-time are ineligible for any form of aid, and earnings from work are absorbed quickly (especially for independent students) under the Federal formula^{3,4}.

Objective

Bridgemont Community and Technical College in Montgomery, West Virginia, was awarded a NSF S-STEM grant of \$600,000 (over five-year period) to establish the BCTC STEM Scholars program, which seeks to increase the following:

- the annual, full-time enrollment of engineering technology and applied technology majors;
- the retention of and degree completion rates of participating STEM majors; and
- the number of graduated BCTC STEM Scholars who become employed in their field or continue their education.

This paper shares the insights gained about retention and enrollment in engineering technology programs via a survey conducted to learn about the impact of financial and academic barriers on student enrollment and retention during the grant-writing process.

Research Methodology

During the spring semester of 2013, a total of 139 students from all technology programs offered at BCTC were surveyed. Table 1 shows the technology majors offered at ----- BCTC and the total number of students in each program. The total number of students enrolled in technology programs is 212.

Table 1

Department Enrollment by Major

Major	Enrollment
Civil Eng. Tech.	29
Elect. Eng. Tech.	55
Mech. Eng. Tech.	18
Comp/Info. Tech.	31
Comp. Draft/Design Tech.	9
Diesel Tech.	45
Electromech Instr.	4
Blasting Tech.	12
Welding Tech.	9

A survey questionnaire was prepared by a group of faculty, including the NSF grant principal investigator (PI) and co-PI. The aforementioned data shows that 65.6% of students from technology programs took the survey. Even though demographics and baseline data left no doubt that the communities served are disadvantaged, come from low-income families in West Virginia, and require financial assistance, more insight is needed to determine a proposed, well-rounded plan to increase retention using the prospective grant.

Data Collection

To obtain objective information for the grant-writing process, fifteen survey questions were created. All survey questions were closed-ended, and were either multiple-choice or scaled. Students were surveyed during the same week by the instructors of pre-selected courses in order to avoid multiple surveys from student respondents.

Results

All the questions asked in the survey and responses gathered are summarized in Tables 2 through 12, below.

Table 2

Survey Questions #1-5

Number/percent of students in targeted departments who are employed during the school year.		%
Total Responses		139
1. Employed during the school year.	87	62.59
2. Full time employed student.	29	20.86
3. Part time employed student.	58	41.73
4. How many hours per week employed? (Part-time students)	20.5 hours	
5. How many hours per week employed? (All students)	27 hours	

Table 3

Survey Question #6

6. Are you a full-time or part-time student?		%
Part time	9	6.47
Full time	130	93.53

Table 4

Survey Question #7

7. Are you employed during the summer? If so, is it full-time or part-time employment? (137 responses)		%
Employed during summer.	118	
Part-time employed during summer.	23	19.49
Full-time employed during summer.	95	80.51

Table 5

Survey Question #8

8. What is your age? (134 responses)		%
18-21 years old	66	49.25
22-25 years old	26	19.40
26-30 years old	11	8.21
30 or more years old	31	23.13

Table 6

Survey Question #9

9. Are you a first generation college student (the first person in your family to go to college)? (133 responses)		%
Yes	64	48.12
No	69	51.88

Table 7

Survey Question #10

10. Do you have some form of financial aid to help you pay for college? * (134 responses)		%
Yes	113	84.33
No	21	15.67

Table 8

Survey Question #11

11. How many hours per week do you spend studying for your classes on average? * (124 responses)		
Majors	Average Studying Per Week	# of Student Responses
Overall	9.66	124
EET	9.4	45
MET	10.2	14
CIT	7.23	21
CIET	14.2	23
Welding	9.5	8
Blasting	4.8	7
CADD	6.6	3

Table 9

Survey Question #12

12. How concerned are you about having the funds available to finance your college education? (133 responses)		%
Yes, definitely.		
1	52	39.10
2	32	24.06
3	32	24.06
4	9	6.77
5	8	6.02
Not concerned.		

Table 10

Survey Question #13

13. Has a lack of funding delayed or slowed down your progress in getting a college education? (130 responses)		%
Yes, definitely.		
1	20	15.38
2	21	16.15
3	31	23.85
4	21	16.15
5	37	28.46
No, not at all.		

Table 11
Survey Question #14

14. Do you feel employment prevents you from studying and completing assignments? Using the scale, rate how employment affects your studies. (126 responses)		%
Yes, very much so.		
1	27	21.43
2	27	21.43
3	35	27.78
4	20	15.87
5	17	13.49
No, not at all.		

Table 12
Survey Question #15

15. Based on the scale, rate your reason for being employed while attending college. (121 responses)		%
A must: Wages earned to pay for school.		
1	41	33.88
2	27	22.31
3	29	23.97
4	10	8.26
5	14	11.57
A choice: Experience wanted only; funding isn't an issue.		

Discussion

According to Table 2, two-thirds of students (62.59%) work either part time or full time during the school year. The average weekly work hours for part-time and full-time employed students is 20.5 hours and 27 hours, respectively.

As Table 3 indicates, students are overwhelmingly full-time students (93.53%), which means that more than half of the students study full time and work more than 20.5 hour per week or more.

Based from this data, an important question to ask is, why do more than a half of the students choose to work and study? Tables 6 through 9 and 12 provide valuable insight about this. Half of the students surveyed are first-generation students, which means that they are mostly coming from low-income families, and half are non-traditional students (22 years or older), which means that a significant number of the students surveyed do not receive support from their families.

This is especially true for BCTC, because most of the students are from rural areas, and West Virginia is second-to-last in U.S. terms of median household income⁶.

Furthermore, Table 7 and Table 8 show that even though 84.33% of the students surveyed have some form of financial aid to help them pay for college, 93.98% of those students are concerned about having the funds available to finance his or her college education at various levels.

Finally, Table 12 shows that 33.88% of students stated that they must work to pay for school, and 11.37% of students stated that funding is not an issue. The remaining students are somewhere between these percentages.

This survey also aimed to gather valuable insight on the effects of financial issues on student success and retention. Table 8 shows that students spend 9.66 hours per week studying for their classes on average, varying between 14.2 hours per week and 6.6 hours per week, depending on the student's major. Table 10 shows that a lack of funding delayed or slowed down 88.43% of the students' progress in getting a college education, at varying levels. Also, Table 11 shows that 86.51% of students surveyed feel that employment prevents them from studying and completing course assignments.

Conclusion

The results of the survey show that financial barriers cause two main problems: First, most of the students surveyed indicate that they cannot afford to pay for the college. Even though a majority of the students receive some kind of financial aid, they must still work to pay for college. Second, the survey results show that students do not spend enough time studying for their classes due to working part-time or full-time and having other family responsibilities as a result of being non-traditional students. For example, most of the students do not have available time to spend in the lab performing hands-on learning, or in the library performing more in-depth study. They have difficulty finding time in their schedule to come together as a group and work on group projects. Basically, the students surveyed indicated that they do not take advantage of facilities and resources BCTC provides them. As a result, some students fail to pass their classes. Those who do pass do not do learn as much as they could because of limited and inefficient time spent with course material. Thus, financial barriers decrease retention and lower the quality of education a student receives.

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