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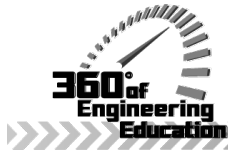


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Increasing Retention in Engineering and Computer Science with a Focus on Academically At-Risk First Year and Sophomore Students

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1. Introduction

The program described in this paper seeks to increase retention rates for engineering and computer science students and to evaluate the effectiveness of best practices for retention of academically at-risk students. The main hypothesis is that students who fall behind their cohort early in their college career are less likely to be retained in engineering and computer science. As such, we focus this project on the academically “at-risk” student group defined as first-year college students who are not calculus ready and sophomores who are missing up to two courses necessary to be classified as part of their class-level cohort.

This NSF-funded STEP grant project started in the 2013 – 2014 academic year at the University of Portland, a private, Catholic comprehensive university serving approximately 3500 undergraduate students; of those, approximately 650 are in the School of Engineering. The Shiley School of Engineering is undergraduate-focused and student-centered; as such, the faculty’s primary responsibility is to teach, advise, and mentor undergraduates. Several student life offices and tutoring centers support student engagement and development at the university. The 10-year (2001 – 2011) retention rate from 1st semester to 3rd semester for engineering and computer science students is 77%, but most stay at the university with a different major.

In Fall 2013 55 academically “at-risk” students were encouraged to participate in a voluntary, ongoing retention program directed by the STEP retention counselor. Of the 55, 33 participated in the retention program through regular meetings with the STEP retention counselor and through attendance at academic workshops, such as time management and test-taking strategies. Other components of the retention program include networking dinners with alumni, meeting with the staff at the learning resource center, attending professional society meetings, meeting with staff at Career Services, and one-on-one advising sessions with the STEP retention counselor.

2. Engineering Retention Program

More specifically, the retention program consists of weekly individual or group meetings with the STEP retention counselor and attendance at academic and career workshops. In Table 1, topics for meetings with the counselor are shown for each month.

Table 1: Meetings with STEP Retention Counselor

Counselor Meetings	Topic 1	Topic 2	Topic 3
September	Program Introductions	Academic Updates	Survey of Interests
October	Mid-term grades	Learning Styles	Study skills
November	Professor Office Hours	Tutoring	Finals schedule
December	Resume critique	Externship application	Winter Break Plans

In Table 2, topics and the number of students in attendance at each of the workshops are shown for each month.

Table 2: Engineering Academic and Professional Workshops

Workshops	Topic 1	Topic 2	Number of Attendees
September	Time Management		10
October	Test Taking Strategies	Tutoring Coordination	10, 5
November	Alumni Mixer	Writing	12, 5

3. Formative Assessment: Data gathered from the End of Semester Survey

In December 2013, data was gathered from an end of semester survey given to the 55 academically at-risk first-year and second-year engineering students. Table 3 describes the survey responders and Table 4 summarizes how they responded. Recall that 33 of the 55 students voluntarily participated in the retention counseling sessions and the professional workshops. These 33 belong to the “Participant” categories shown in Table 3. The other 22 comprise the “Non-participant” categories. Furthermore, first-year students who did not place into calculus started behind in the curriculum and are in the category “Start Behind”. Second-year students who are behind their cohort by up to two courses are in the “Fall Behind” category.

The survey was a formative assessment tool to evaluate the first semester of implementation of the STEP Retention Program. The survey questions are based on Tinto’s Model of Retention^[4,6,9,14]. They support the attributes of Academic and Social Integration to the University, which in turn will assess the student’s success.

Table 3: Survey Participants

Student group	Year	Fall 2013 Math Course	Number of Resp.
Start Behind Non-participant (SBN)	First-year	Pre-Calculus 2	2 responses
Start Behind Participant (SBP)	First-year	Pre-Calculus 2	13 responses
Fall Behind Non-participant (FBN)	Second-year	Calculus 1 or 2	0 responses
Fall Behind Participant (FBP)	Second-year	Calculus 1 or 2	7 responses

Table 4: Survey responses based on Tinto's Model of Retention

<p>A. Questions supporting Academic Integration focusing on prior qualifications and attributes</p> <p>SBN: High school course confidence was low Academic skills were average</p> <p>SBP: High school course confidence was spread out, but mostly good or high Academic skills high</p> <p>FBN: No responses</p> <p>FBP: High school course confidence was spread out, but mostly good Academic skills were mostly high</p>
<p>B. Questions supporting Social Integration focusing on teaching, learning, support, facilities, and sense of belongingness</p> <p>SBN: Sense of belonging was high</p> <p>SBP: Sense of belonging was mostly high, with a couple low</p> <p>FBN: No responses</p> <p>FBP: Sense of belonging was mostly high</p>
<p>C. Questions supporting Social and Academic Integration, meetings with STEP Counselor and Academic Workshops</p> <p>SBN: Did not attend, therefore questions were not asked</p> <p>SBP: Overall, students felt counselor meetings and workshops were beneficial, learned something new, and would recommend to others</p> <p>FBN: No responses</p> <p>FBP: Overall, students felt counselor meeting and workshops were beneficial, learned something new, and would recommend to others</p>
<p>D. Open ended questions supporting both Academic and Social Integration</p> <p>SBN: Did not find the need to attend workshops or meetings with counselor, felt supported enough already at University of Portland. Would have liked to attend a workshop in math or physics</p> <p>SBP: Appreciated help and advice provided by the STEP retention counselor, felt comfortable talking with retention counselor, meetings were individual and personal, very informative</p> <p>FBN: No responses</p> <p>FBP: STEP retention counselor was positive and offered lots of suggestions, talked about issues in personal life, was able to talk openly about progress and steps to take, interested in workshops on how to study smarter and get schoolwork done faster, more class specific help available, more workshops on where an engineering degree can take them</p>

Overall, the responses from the survey show that the students who attended the retention counselor meetings and the academic and professional workshops found the experiences to be positive and beneficial. From the meetings with the retention counselor, students are quoted as saying:

- “She knew my situation and loved to listen and offer advice.”
- “The most helpful aspect would be the advice that I took from Zuly about how to graduate in 4 years, despite being behind. The option of summer classes and just having options in general was truly comforting.”
- “Being able to openly talk about my progress and get advice on what steps I should take or direction I should go.”

Students who attended the academic workshops were quoted as saying:

- “The writing workshop gave me what I believe will be valuable information for when I do take a writing course here at UP”.
- The people who represent the workshops are knowledgeable in their respective areas.”

4. Engineering Summer Bridge Program

Currently under development, a summer bridge program will offer pre-calculus 2 and Introduction to Theology for ~14 incoming first-year students who do not test into calculus. During late-June to early-August, these students will live on campus, attend both classes, attend workshops and tutoring sessions, meet engineers, and visit engineering sites and companies.

5. Conclusion

Both programs will be assessed using institutional research data: tracking the retention of “at risk” students who participate in the programs, “at-risk” students who do not participate in the programs, and the “not at-risk” students. In addition to the quantitative metrics, data gathered from focus groups and surveys will be used to identify best practices and areas for improvement for these programs. Based on quantitative and qualitative data, the goal of this project is to use, improve, and disseminate best practices for retaining first- and second-year engineering and computer science students.

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