

First year student persistence at the Brunswick Engineering Program

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ABSTRACT

The University of Maine's Brunswick Engineering Program (BEP) was started in 2012 to implement modern engineering pedagogy in an off-campus startup setting. The program delivers the first two years of the Mechanical, Electrical, Computer and Civil Engineering Bachelor Degree programs using an integrated curriculum, that teaches the mathematical and science content within an engineering context, with a strong emphasis on project and problem based learning, experiential learning with significant hands-on components, flipped classrooms, and overall a highly student centered education. The objectives of the program are to provide an additional entry point into Engineering Education at the regional area of interest, while at the same time increasing student persistence through the application of the student centered pedagogy. Initial persistence results however have not confirmed this hypothesis; first year drop out rates of the first student cohort have been very high (only 3 out of 11 students returned after semester 2). Subsequent root cause analysis indicates that the high dropout rate can be attributed to late student recruiting, insufficient student preparation (both academic and behavioral), and the peculiarities of a new startup environment. Appropriate measures were developed (timely recruiting,

1. INTRODUCTION

Retention of students in the STEM fields has received much attention over the past decade. The growing need of STEM professionals in the workplace, combined with the low growth rates in these careers traditionally perceived as difficult, has triggered strong interest in increasing student persistence (Moller-Wong

& Eide, 1997; Takahira, Goodings, & Byrnes, 1998; Veenstra, Dey, & Herrin, 2009). The salient conclusions drawn from these studies is that the application of a student centric instructional approach, combining an environment supportive of student needs and close faculty student interaction, with an interdisciplinary topic presentation, and with an instruction style that engages students in their own learning, is conducive to increasing persistence (Knight, Carlson, & Sullivan, 2007). The implementation of these measures takes on various forms, however the introduction of integrated curricula, with the corresponding pedagogic strategies (such as Problem and Project based learning, conceptual learning, flipped classroom (Mazur & Watkins, n.d.)) has provided a validated pathway to generate such a student centered learning environment (Corleto, Kimball, Tipton, & MacLauchlan, 1996; Froyd & Ohland, 2005).

The BEP was initiated as a model program to implement an integrated curriculum (Friess, 2013) in a student centered learning environment, thereby creating an additional entry point into Engineering Education at the regional area of interest, while at the same time increasing student persistence through the application of the student centered pedagogy

2. DISCUSSION

One of the primary objectives of the BEP is to increase student retention in engineering. The initial hypothesis was that such a small program with student centered pedagogy would result in increased retention over the already good numbers from the main campus (first year retention within College of Engineering is 76%); however these expectations were not met during the first year of operation. From an initial cohort of 11 students, after semester one only eight students remained (seven in the program), and after semester two only four students

were retained, of which three remained in-program. While surveys indicate strong student satisfaction, the overwhelming drop-out reason was poor academic performance; only two of the students who left the program did so because of a change of mind as to their career goals, the remaining five being suspended or withdrawing before being suspended due to poor grades and insufficient academic effort, even in light of unlimited faculty access and available help. These unexpected developments lead to a thorough analysis of all program aspects, including:

- The recruiting and admissions process (and timing of the recruiting process),
- Student behavioral college readiness
- Student mathematic readiness and assessment thereof,
- The student-faculty interaction and academic support mechanisms,
- The academic rigor and workload,
- The mechanisms for the initiation of typically student-lead activities such as study groups, clubs, and other mechanisms that enhance the sense of belonging and improve academic performance.

The insights gained from this analysis were implemented with the second cohort. A critical measure included extending the recruitment timing to the normal year-long cycle, whereas, and due to delays in program development, it had been significantly shorter for the first cohort. In addition, mathematics placement exams and the ACT ENGAGE college readiness inventory were administered to better understand the academic and behavioral characteristics and needs of the incoming cohort. Strong emphasis was placed on motivating and guiding the students to develop their peer-based academic support structures. Specific seminars and activities that target college readiness skills that were identified as weak during the pre-testing were created and delivered in dedicated timeslots, and introduced more formally in curriculum and class project components (with the associated learning outcomes).

2.1 CONCLUSION

The startup year of the BEP has resulted in an unexpectedly poor retention of the first cohort of students. This can be attributed to insufficient

academic preparation, however also to a lack of behavioral college readiness skills. It is difficult to find metrics for the latter, but the very late recruiting of the first cohort may have had an impact on attracting primarily students who were undecided as to their future career, and thus – it is hypothesized – display a lower level of motivation and a higher dropout likelihood (this link will be explored in future work). The lessons learned have been implemented with the second cohort. This cohort was recruited in a normal year-long cycle, and is showing very positive results: academic performance may be termed normal, and student satisfaction continues to be very high. Year two dropout number after one semester is 1 student (10 remain from an initial class of 11).

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