Extended Abstract - Achieving Higher Retention Rates through an Engineering Learning Community at a Traditional Liberal Arts University

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Abstract - Two years ago, a learning community was developed in the Physics and Engineering Department at Muskingum University, a traditional liberal arts institution. The goal was to build a sense of community and belonging among freshmen engineering students, provide appropriate advising to enhance the likelihood of student academic success in the field, and improve the retention rate of the program. The learning community is comprised of the freshman design course and the First Year Seminar course. First Year Seminar provides students with a common academic experience during their first semester at the University. The course was modified for the engineering learning community to focus on learning skills and problem solving skills necessary for science and engineering students. Students in this learning community have a faculty advisor from the Physics and Engineering Department. Amongst other things, the faculty advisor helps students selecting courses, making academic decisions, and locating and utilizing campus resources. This paper outlines the implementation of the learning community, the role of the faculty advisor, and a comparison of the retention rates in the last 4 years. Preliminary results show that retention rates improved during the years in which students participated in the learning community.

Index Terms – first year seminar, learning community, liberal arts, retention.

INTRODUCTION

In 2007, Muskingum University started offering a bachelor degree in Engineering Sciences. The program is housed in the Physics and Engineering Department, part of the institution's Science Division. Being a liberal arts institution, besides the required science and engineering topics courses, students in the program are required to take approximately 40 credit-hours in liberal arts essentials. In their freshmen year, students are assigned to a faculty advisor that will help them in course selection until they have a declared major. This faculty advisor is the professor of their First year Seminar course. Once the student declares a major, they are assigned to a faculty advisor in their desired department.

During the first 3 years of the Engineering Sciences program, we notice that retention rates were very low after the first semester. After asking students about why they decided to leave the program, the two principal reasons were:

- 1. Engineering was not what I expected Students lack the problem solving or mathematical skills necessary for engineering.
- 2. I didn't know the specific requirements for the program and now I'm off track – Students didn't take the necessary courses in the time needed to finish the degree in four years.

Based on these responses, our questions were:

What can we do as a Department to better advise freshmen students about the requirements of the program? How can we motivate and keep the students that really have the potential to stay in the program?

This extended abstract presents the efforts made in the Physics and Engineering Department to improve retention rates through a learning community. Learning communities are ubiquitous in higher education with more than five hundred colleges offering them [1]. Literature indicates that students who enroll in learning communities show better grades and retention rates than their peers [2]. A longitudinal study conducted by Olds and Miller [3] confirms that this is also true for engineering students.

DESCRIPTION OF THE LEARNING COMMUNITY

The Engineering learning community at Muskingum University is a curricular-based community that follows the basic definition described by Tinto [4]; a group of students registered and scheduled to take two linked courses: Introduction to Physics and Engineering and First Year Seminar.

I. Learning Community Goals

The mission of Muskingum University is to offer quality academic programs in the liberal arts and sciences in the setting of a residential, coeducational, church-related college and in the context of a caring community where individual fulfillment is encouraged and human dignity is respected [5]. Its primary purpose is to develop intellectually, spiritually, socially and physically - whole persons, by fostering critical thinking, positive action, ethical sensitivity and spiritual growth, so that they may lead vocationally productive, personally satisfying and

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socially responsible lives. Based on this mission statement, learning communities at the university similarly seek to make a more meaningful whole of students' academic experience [6]. The goal of the learning communities is to assist students in making the transition to academic life and responsibilities, and in developing strong academic, social and support networks. At the same time, the communities promote: the acquisition of increasingly-advanced academic skills; the integration of knowledge across a breadth of areas needed for success beyond college; further develop a capacity for team-work, critical thinking and life-long learning, and; the creation of a genuine community of scholars dedicated to success and achievement.

In addition to the general goals, the engineering learning community is focused in building a sense of community among all Physics and Engineering (PHEN) students. The idea is to allow them appreciate each other's unique strengths, experiences, and interests. Due to our small size class, this community spirit is important when students work together on design projects or in teams to solve problems that reach across the broad areas of engineering and science. Also, the learning community provides appropriate advising to enhance the likelihood of student academic success in the field. A faculty advisor from the PHEN department is assigned to each student in their first semester that serves as a valuable source of information and advice during their first year on campus, helping them in course selection, making academic decisions, and locating and utilizing campus resources.

II. Courses

- IDIS 100 First Year Seminar. This is a one credit course required for all freshmen at Muskingum University. It provides students with a common academic experience during their first semester. The course offers an extended orientation to the academic environment within a context of common readings, assignments, and activities. The course also introduces students to academic resources on campus.
- PHEN 110 Introduction to Physics and Engineering. This is a two credits course required for Engineering Science, Physics, and Physics Education majors. It is an introduction to the physics and engineering professions, engineering design, problem solving, ethics, and experimentation.

III. Learning Community Implementation

Since 2010, all the students that express an interest in Physics and/or Engineering Sciences are automatically enrolled in both courses in their first semester at Muskingum University. The course PHEN 110 is team-taught by two professors: one from engineering and one from physics. The First Year Seminar (IDIS 100) is taught by another engineering professor. The professor teaching IDIS 100 automatically becomes the faculty advisor for the learning community students.

Course learning objectives for PHEN 110 satisfy student outcomes (a), (c) to (k) listed in Criterion 3 of the 2012-2013 ABET "Criteria for Accrediting Engineering Programs" [7]. In this course, students are introduced to programming using Matlab and Lego Mindstorms, ethical issues through the analysis of engineering study cases, problem solving, teamwork and design process in a series of small design projects, and presentations skills amongst other topics.

Topics for IDIS 100 have been modified to accommodate the necessities of the engineering students. Problem solving techniques and study skills are emphasized. Students develop a four-year plan with the required engineering and liberal arts courses they need. They need to build the plan considering the availability of courses each semester and their preferences. The faculty advisor meets individually with each student to discuss the plan and for course selection for the following semester. Since the faculty advisor is now from the department, we are sure that the student stays on track.

PRELIMINARY RESULTS

Table I presents the number of students enrolled in PHEN 110 as freshmen and the number of students that stayed in the engineering program during the years 2008 to 2011.

TABLE I			
FIRST AND SECOND YEAR COMPARATIVE TABLE			
Year	1 st year	2 nd year	Retention Rate
2008	16	3	18.75%
2009	15	7	46.67%
2010*	13	10	76.92%
2011*	11	7	63.64%

* Learning community

The learning community was first implemented in 2010. It was well received by the students and the University's administration. That year the retention rate increased significantly. After two years, retention rates are higher than in the first two years of the program. Our experience is that the students that stayed in the engineering program for the second year already finished or are finishing the degree.

CONCLUSIONS AND FUTURE WORK

Preliminary results after two years with the Engineering Learning Community indicate that the learning community helps in improving retention rates in our program. The learning community provided a setting for students to learn through experience how to design a part, participate in design teams, communication skills, and develop a sense of community. Also, the learning community provided appropriate academic advising to help students with their academic success.

A survey is been prepared to evaluate the success of the learning community. The survey will provide quantitative data about the reasons for staying or leaving the engineering program. Areas that will be included in the survey are appropriateness of the learning community, academic advising, learning skills, motivation, and sense of community.

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