AC 2009-248: THE FIRST-YEAR EXPERIENCE

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Islands, Bridges, or Both?
First-Year Experience Courses for Engineering and Technology Students

Abstract

A student's ability to succeed in college depends on many variables. In recent years, considerable attention has been given to providing the appropriate introduction to college life through the use of first-year experience courses. The goal of such approaches is to equip students with the knowledge, skills, and perspectives at a foundation-level in order to prepare them for success in their subsequent college courses. First-year experience courses, therefore, serve as a powerful tool in aiding student retention, engagement, satisfaction, and, ultimately, success in higher education. This paper identifies the need for such courses; explains the development and pedagogic practices involved in first-year courses; outlines the similarities and differences in both engineering- and technology-oriented courses; and discusses lessons-to-date and next steps in refining first-year experience courses for students.

Introduction

As educators, we want our students to integrate concepts and information across courses and disciplines, applying knowledge learned in one course to material in other courses, and applying academic learning to situations outside the formal classroom. Many of the new pedagogies that have gained attention in recent decades aim to foster students' abilities to perform these higher-order intellectual tasks. But too often, we expect students to carry out these tasks with little support. The result is that many students experience college education as a fragmented series of courses and requirements that fail to add up to any coherent body of knowledge. This fragmentation is exacerbated when students attend college part-time or attend several institutions over their college careers, patterns that are increasingly common[1].

At the same time, society's need for "integrative thinkers who can see connections in seemingly disparate information and draw on a wide range of knowledge to make decisions" has never been greater[2]. AAC&U's Greater Expectations report argues that universities have a responsibility to help students become integrative thinkers who can "adapt the skills learned in one situation to problems encountered in another"[2]. Another recent study of mathematical and verbal literacy found that levels of these were significantly higher among students who said that their coursework emphasized applying theories or concepts to practical problems[3].

Learning Communities in Engineering and Technology

Engineering and technology students, in many instances, lack the fundamentals necessary to succeed in upper-division courses. Thus, for the past several years, faculty at Indiana University-Purdue University Indianapolis (IUPUI) have studied and developed approaches to teaching and learning using theories of intellectual development in college like Bloom's Taxonomy[4]. The group has conceived of these skills as developing over time and with practice, and has identified a set of rubrics that define proficiency in them. It has also created sample assignments and activities that allow students to practice and faculty to assess these abilities,

with a primary emphasis on learning communities and their role in the foundation of a successful engineering and technology education.

The fundamental goal of learning communities is to assist students in making the transition from high school to college. Students coming to college today often have unrealistic expectations about what they need to do to be successful. Much research has been done in discovering what promotes retention and, conversely, what leads to student failure and departure. This research includes the work of Vincent Tinto who in 1987 suggested four areas that are associated with student departure. These include: adjustment problems, academic difficulty, incongruence or lack of "fit" within the institution, and isolation[5]. Efforts to address some of these areas drive the pedagogic content of learning community courses.

Background

IUPUI is a campus known for its pioneering efforts in learning community development. Learning communities were first implemented here in the mid-1990s. The initial learning communities were generic and did not include any major-specific content. They were taken by students admitted through IUPUI's undergraduate education center. The undergraduate education center admits exploratory students or students who lack the prerequisites to get in the school of their choice.

There were several prompting factors that drove the creation of learning communities at IUPUI. Chief among them is that IUPUI is mainly an urban, commuter campus resulting in much less in student life and interaction compared to that found on the traditional residential campus. In other words, many of our students could be described as "isolated" both from one another and from the life of the campus community. This is one of Tinto's causes of student departure[5]. Learning communities aim to strengthen the connection between student and campus.

Over time, school specific learning communities were developed. In 1999, learning communities designed specifically for engineering students were offered and a few years later were made a required part of the engineering curriculum. IUPUI combines both engineering and technology majors under one administrative umbrella. The various different technology programs began offering individual, major-specific learning communities and finally began to offer a general course taken by all technology majors. Since the engineering course was developed first, it provided the model for the technology learning community. However the courses needed to diverge in specific areas. This paper discusses the areas of convergence as well as the difference between the two courses.

One of the most important areas of attention given in learning communities is student success. According to Raymond Landis says, "A great deal of the well-publicized first-year attrition…undoubtedly stems from the assumption that freshmen should be capable of functioning as seniors from the word go"[6]. How to turn new freshman into functioning and successful learners is the crucial question. Students who don't submit in homework, miss classes and fall behind generally have a sense that something is wrong and know that what they are doing isn't working. Patterns of behavior that may have been sufficient for success in high school no longer work. Learning communities are designed to intervene before the problems become serious.

Academic difficulty is a challenge frequently reported by new students. Often this stems from unrealistic expectations about the college experience. Learning communities are also intentionally structured to coach students in the various strategies needed to be successful college students. Leading topics include time management and study skills. Anecdotal evidence and pre-semester surveys uniformly indicate that study time expectations for college success of students leaving high school are far below the time minimally required for success in higher education. Commonly across the higher education landscape and especially at a commuter campus such as IUPUI, new freshman look at the number of class hours they have, observe the abundant uncommitted time, then schedule their time with other activities that have little to do with their coursework. At our university the biggest challenge to student success is that students are working too much. Typically, a few weeks into their first semester they find themselves dangerously overscheduled. Topics discussed in all learning community courses attempt to intercept and address these issues and move students towards more realistic expectations of what they need to do to reach their educational goals.

Pedagogic Practices and Approaches to Engineering and Technology Learning Communities

Students in all learning communities are given guidance on study skills and introduced to the various services on campus that support student success. These include our Math Assistance Center as well as the Writing Center, the Speaker's Lab and other relevant tutoring resources. In addition, there are other template topics common to every learning community at IUPUI. These are detailed in the *Template for First-Year Seminars at IUPUI* and some of them include the following: understanding the structure of higher education, developing basic communication skills important in an academic setting, understanding critical thinking and evaluating problems from multiple perspectives, applying technology in support of academic work, and developing an awareness of their own strengths and abilities. We cover all of these topics in both our engineering and our technology learning communities. Many of the topics addressed are consistent with Chickering and Reisser's psychosocial development model[7]. Specifically, learning communities strive to assist students in moving along two of Chickering and Reisser's developmental vectors: developing competence and purpose.

Essentially, the curriculum that addresses the competence component of the learning community curriculum is common for both our engineering and our technology sessions. It is the curriculum that addresses purpose where the curriculum diverges. According to Chickering and Reisser, developing purpose involves moving from a status of unclear vocational goals to having clear and focused goals[7]. Although both our engineering and technology students have generally declared a major, the vast majority of them have many questions about their field and the opportunities that they might have if they complete their degree. Two important issues must be considered. One relates to the major itself. Questions students have often revolve around understanding their plan of study and what their courses mean, and what careers are available to them and how might they best access them. The second issue, one that is important from a retention perspective, includes engaging and exciting students about their major and hopefully encouraging them to form a stronger commitment to it.

Over the years we have developed a collection of instructional strategies designed to develop both competence and purpose. Again, as students gain those skills that are attributes of successful students they achieve competence. Early in the semester we discuss the nature of the university and provide students with what we call "basic survival information." We also give students an online "scavenger hunt" that forces them to learn some of these basics of being a college student. Most of the items included deal with policies or services that impact students. These include knowing about Bursar and Registrar services, how many credits are typically required for a degree, what can you do if you fail a class, what are students' rights and responsibilities, and what is the structure of the University. Specific exercises done in the learning community include having students evaluate their class, work, study, and other commitments in their week. They then create a time study in Excel (see appendix A). For many of them, this exercise also either introduces them to Excel or to some functionality in Excel that they did not know.

Each learning community has a librarian as part of the instructional team. There are two library assignments. One is an exercise that challenges students to question the credibility of web sources. The other instructs students in how to use the library databases for research purposes. The library exercises form the research component of the final, collaborative project – a research paper - done in the course. Much of the latter part of the semester is directed toward the completion of the final research paper. We do a brief instruction in teamwork skills that is designed to assist them in working with others. In essentially all of our developing competence pedagogy the assignments and learning objectives remain the same for both our engineering and technology groups. Differences may occur due to different characteristics in cohorts of students. These may include such things as SAT or ACT scores, class rank, and high school GPA.

In the area of developing purpose our pedagogy diverges. With the engineering sections our goals are to engage and excite students about engineering. There are different areas of engineering but the field is not as broad from "an information about careers" perspective as technology. In the technology sections while we likewise want to engage and excite them about the technology majors, we offer a variety of different degree programs and need to include them all. In engineering we direct students to explore the web sites of the various engineering professional societies and ask that they write a short reflection about what they found interesting. There are not the same types of opportunities for all of the technology majors. Finding career opportunity information for the students is more of an instructional challenge. Design is a huge component of both engineering and some areas of engineering technology. However, we have three degree options in computer graphics technology. Certainly it can be said that these students do "design", but the term means something different to them and another thing to an engineering or engineering technology major. Hence, one of our biggest challenges is to address the purpose needs of all of the varied majors in our learning community courses.

The way we have addressed this problem is to have the technology students in a descriptive fashion utilize the knowledge of their major's contributions to a question that can be addressed by technology. We devised several questions. There is one question for each group of five students. One of our engineering technology department chairs recommended using different aspects of green technology. Actually, the engineering learning communities were already researching alternative energy questions so green technology seemed like an excellent direction

to go in constructing the research paper component for the technology learning community. There are other assignments done throughout the semester that when combined with those described above help students gain knowledge about their majors and in doing so develop a clearer sense of purpose in their lives.

Conclusion: Lessons-to-Date and Next Steps

IUPUI has been involved in first-year experience courses for several years. Indeed, the engineering and technology programs at IUPUI were early-adopters of this approach, and, as greater coordination has emerged between these two areas, some lessons-to-date and next steps have emerged.

There are four primary lessons learned so far. First, while engineering and technology disciplines focus on different approaches to technical issues in upper-level courses, there exists a need to equip all first-year students, regardless of program-of-study, with a common orienting experience. This ensures that students are provided with consistent information about college-level expectations, and are given appropriate advice, direction, and resources to permit their functioning in the collegiate environment. Second, while the academic preparedness of engineering and technology majors might vary, first-year experience courses are a good way of building community and forging peer-to-peer mentoring relationships that can foster a sense of connectedness with the institution. For campuses such as IUPUI, where much of the population are commuter and first-generation college students, such engagement can aid in student retention. Third, engineering and technology faculty consistently agree that there is a clear need to better educate, prepare, and position students for success in the major. While first-year experience courses represent a small portion of the overall admission, orientation, and advising process, its credit-bearing nature signals to students a seriousness-of-purpose the institution places on the subject matter. Finally, there is the potential for greater similarities and consistency in both engineering and technology first-year experience courses, as described earlier in the paper. This is important for resource allocation and efficiency efforts, faculty development approaches, and in providing a common starting point from which student success can be measured and evaluated.

As a result of these lessons learned, there are several next steps in the first-year experience evolution at IUPUI, specifically in engineering and technology contexts. First, greater involvement of both engineering and technology faculty teaching upper-level courses should be garnered for the first-year experience course. This is important in order to ensure that the appropriate preparatory lessons can be emphasized, and that such experiences will be reinforced and built-upon in subsequent course. Second, more direct and indirect measures of student learning outcomes must be identified and refined. Already, common measures of success are embedded in the course (e.g. quizzes), and data on student retention and persistence is tracked. A more systemic, holistic approach to assessing and evaluating the long-term impact of first-year experience courses must continue to be a part of the school's assessment agenda, as this will enhance pedagogic practices both within the first-year experience course, but in upper-level engineering and technology courses, too. Finally, ongoing improvement of the type and nature of learning experiences offered to students in first-year experiences courses should continue. Emerging engineering and technology innovations, coupled with the increasing diversity—in all

its forms—of entering students, will require that faculty involved in first-year experience courses keep abreast of the best practices from industry partners and from colleagues in engineering and technology programs at other institutions. The ultimate goal of such learning communities should continue to be the ability for students to succeed in college, preferably in an engineering or technology major, but, ultimately, in whatever field-of-study they ultimately pursue.

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