Learning Communities and Engineering Design Course to Help Students Pick the Right Major

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***Abstract* - Starting in Fall 2015, the Engineering Science major in the Newark College of Engineering at New Jersey Institute of Technology (NJIT) has been repurposed for certain incoming first year students. Students in Engineering Science major either decided to be "undecided," or they were placed in that major based on their SAT scores, because they were not yet ready for one of NJIT's engineering/engineering technology programs. A variety of strategies and programs are being designed to help these students transition smoothly to college life and further more into a major that they feel is right for them. This paper describes planning phase of Learning Communities and a new engineering design course that are being designed specially to cater to needs of students that are 'still-deciding.'**

Index Terms – Choosing the right major, engineering design freshman course, Learning Communities, transition to college.

INTRODUCTION

Some students go to college knowing exactly what they want to do, but many don't. Majority of freshmen, even those who have declared a major, are uncertain about which major to pursue for their college degree. Recent trend in college admissions suggests that more and more students are choosing to be undecided in their freshmen year. They want to spend time in getting to know what different disciplines are about before opting to join one of them. Most colleges and universities allow students to enroll without declaring a major. About 20% of all freshmen enroll as undecided, making it one of the most popular "majors." Keeping up with demands of the students, NJIT recognizes the need to encourage not-yet-sure students to explore variety of academic disciplines offered; before making their decision on a major. By exploring different options with guidance from peer mentors, academic advisors, faculty, staff, and career research, they are most likely to find the major that matches the best with their skills and interests. [1]

Several studies suggest that students who connect with their major and their college have higher retention rates and are also more likely to graduate in four years. [1, 2, 3, 4] But it is also a well-known fact that deciding on a major can be overwhelming. Rushing to a decision about major can lead to a wrong choice, which may cost students a lot of time in terms of added semesters, extra tuition money and not to mention frustration that comes with it. With unpredictable fluctuations of the economy and job market, students cannot really afford to make a mistake in choosing their major. More and more of them clearly need the extra help in deciding on a major and graduating from college successfully. "*Exploratory"* is the new undeclared/undecided. Colleges have moved away from the negative-sounding "undecided" label to encourage students to experiment with unfamiliar disciplines and, perhaps, discover a passion and career path". [2]

Newark College of Engineering (NCE) at NJIT houses six engineering departments: Biomedical Engineering, Civil and Environmental Engineering, Chemical, Biological and Pharmaceutical, Electrical and Computer Engineering, Engineering Technology, and Mechanical Engineering. Until Fall 2014 semester, students were also allowed to enroll into 'Undecided Engineering.' Starting Fall 2015, 'Undecided Engineering' major was completely eliminated for all new freshmen. Engineering Science major was repurposed to cater to needs of these (previously undecided engineering) students.

Students in Engineering Science clearly need more time either to get acclimated to college life and/or to find out more about other engineering disciplines to make an informed decision about their major. To help students make this decision, NJIT is offering a variety of programs and resources. Learning Communities and Freshman Design course (Fundamentals of Engineering Design 101) are two of these strategies that are likely to have the highest impact. These two are the main focus of this paper and are explored further in following sections.

ENGINEERING SCIENCE MAJOR FOR STUDENTS THAT ARE STILL-DECIDING

The structure and design of Engineering Science program is such that it enables most students to transfer in time to other engineering programs offered at NJIT. Though it is possible to graduate from the Engineering Science program; it is not recommended. Engineering Science major students are restricted to 15 credits or less per term until they transfer to another major. This allows them to focus more time and energy on making decision about their major. Students in Engineering Science also need to qualify for transfer to any of the other engineering majors. NJIT established standardized criteria for qualification and transfer into other programs:

1. Transfer after first semester: Student completes at least 12 credits during the first semester with a 3.0 or higher GPA and student has a B or better in both Calculus-I and Physics-I

2. Transfer after first year: Student completes at least 24 credits during the first year, student maintains a 2.5 or higher GPA, and student has a C or better in both Calculus-I and Physics-I
3. Other options:
    a. Transfer later
    b. Transfer into another non-engineering program at NJIT.
    c. Continue in Engineering Science.

For the scope of this paper, we will focus on 2 of the most high impact resources: Learning Communities and Fundamentals of Engineering Design 101 (FED 101) course specially designed for students in Engineering Science.

Learning Communities: Learning Communities at NJIT engage students within a network of faculty, advisors, and peer mentors focused on facilitating their transition to college and enhancing their learning experience. The Learning Community structure creates an environment where students can celebrate a common purpose with integrity and civility.

Through Learning Communities:

- Students are grouped into communities/cohorts of 20-25 students (all Engineering Science major)
- Each community is guided by two upper class mentors
- Students in the community are enrolled in the same three courses, which includes a hands-on course (FED101), a writing course (HUM101) and a Freshman Seminar course which prepares students for the rigors of STEM study through practice and discussion.
- Peer mentors are hand picked students, who are exemplary in their field of study and serve as role models for incoming freshmen
- Students in the community share study sessions, exam preparation, field trips, and social activities
- Students will get to know members of faculty and staff, their department and academic advisor.
- Students develop strong connections with one another and support one another's efforts to achieve.

Throughout their first year, Engineering Science major students will participate in programs, activities, events, and assignments specifically designed to expose them to more information about various engineering disciplines at NJIT. One of the three Learning Communities within Engineering Science major will be reserved for students, who chose to stay on campus. These students will be given an option to stay on the 'Engineering Floor.' In addition to their Learning Community support and activities, these students will also be part of ResLife events and activities that are specifically designed keeping their interests and passions in mind. Several of these activities will be offered within their dorms and after hours to avoid any time conflict with their classes.

Fundamentals of Engineering Design (FED101) for Engineering Science Major Students: All students in Engineering Science Program will be enrolled into special sections of FED101 during their first year. FED101 is designed to introduce them to engineering design process, engineering projects, engineering software, and an exposure to what various engineering departments NJIT has to offer. Students will get an opportunity for hands-on engineering design work as well as interaction with research and teaching engineering faculty members. Students will get an idea about various engineering disciplines and will be in a better position to make an informed decision about their major.

FED101 for Engineering Science is a two-credit course that teaches students the basic concepts of engineering design and exposes them to various tools and techniques used to optimize design process. Students will be introduced to and taught about various disciplines at NJIT, Student Chapters of Professional Societies, engineering software and many other aspects of engineering that will help them to excel in their respective careers and become world-class engineers. The course will run for three hours a week divided into two parts of 1 ½ hour each. 1 ½ hour lecture in which all students will be together and then separate 1 ½ hour lab sections spread throughout the week to offer flexible schedule.

The course will focus on teaching AutoCAD and MATLAB which will help them to design and implement their respective project works in the future. In the second half of the semester, students will be required to implement their knowledge on a final project based on materials taught during the first half of the semester.

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