Establishing "Connections" with Students in Just Fifteen Minutes

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Abstract:

Faculty wishing to increase student engagement and improve the atmosphere in their classes may wish to host a "Connections" class in their courses. Connections classes are designed to enhance faculty-student interaction in 1st and 2nd year engineering/STEM courses, but are a good strategy for all course levels. All faculty members need to do is spend 15-20 minutes during one class period sharing information about themselves, their research, their career path, their interests, how they decided to become a professor, and/or any other information they feel comfortable sharing with the class. Students can ask questions and the dialogue is intended to be informal and open. Connections classes have been implemented in several freshman and sophomore-level engineering courses at Oakland University as part of a mini-grant from the NSF-funded ENGAGE program (http://engageengineering.org) and the response from students in follow-up surveys was very positive. In this paper we describe this ongoing initiative and present assessment results.

Introduction:

Much has been made in the media and in scholarly publications about the need to attract and retain students into Science, Technology, Engineering and Mathematics (STEM) fields of study if the U.S. is to remain competitive and innovative in an increasingly global economy. While many initiatives have been implemented at the K-12 level to attract more students to these fields, retention remains a big issue facing colleges and universities. Case in point: the U.S. has one of the lowest ratios of STEM to non-STEM bachelor's degrees worldwide[1] with less than one third of college entrants selecting a STEM major at some point in their college career[2]; according to a 2013 report by the National Center for Education Statistics, about 48% of STEM B.S. degree and 69% of STEM associate's degree students left these majors or fields between 2003 and 2009[2]. The numbers are even more bleak when one looks at the retention of women, underrepresented minorities (URMs), low-income and first-generation students who tend to leave STEM majors at even higher rates[3, 4].

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Many factors contribute to the persistence or lack thereof of undergraduate students in STEM fields, including the campus climate, high school preparation, social support systems, unspoken biases, self-efficacy issues, lack of role models, etc. Yet, one factor that has been proven by multiple studies to have a positive impact on student retention is faculty-student interaction (FSI)[5-7]. The importance of this factor is highlighted in a quote by Dr. Norman Fortenberry, former director of the National Academy of Engineering Center for the Advancement of Scholarship in Engineering Education and current Executive Director of ASEE[5]: "*Two of the most significant factors affecting engineering student engagement, retention, and academic performance are the quality and extent of students' interactions with engineering faculty.*" He then goes on to add that "*Positive student learning outcomes are correlated with faculty discussion with students about the nature of engineering work and affirmation of students' ability to successfully perform such work.*" The extent and quality of a faculty member's interaction with his/her students, whether "*open or closed, responsive or non-responsive*"[5] can have a significant impact on students' achievement and persistence in a major[8]. The impact is even greater on students at higher risk of dropping out and on students in the first two years of their college career.

As faculty members, we interact with students in many ways and in many different settings. Whether it's in the classroom, during office hours, in the hallway, in the laboratory or through written comments that we provide to students on exams or reports, these interactions, however small or casual they may be, can have an influence on whether a student feels *at home* in a given field of study and chooses to stay. Finding the time to interact in a constructive way with students is of course often a challenge for faculty trying to juggle the competing demands of teaching, research and service. With this in mind, the goal of this paper is to present a simple, research-based, easy to implement strategy, called a *Connections class*, aimed at improving Faculty-student interactions, particularly in first and second year STEM courses. This strategy, which is being piloted by several universities across the U.S., including Oakland University (OU), is part of a series of strategies being tested by the NSF-funded ENGAGE program[9].

About the ENGAGE Program:

Funded by the National Science Foundation (PI: Susan Staffin Metz, Stevens Institute of Technology), the overarching goal of the ENGAGE program is to increase the capacity of engineering programs to retain undergraduate students by facilitating the implementation of three research-based strategies to improve students' day-to-day classroom and educational experience[9]. All three strategies were selected because a) prior research evidence points to their effectiveness at increasing the retention of undergraduate engineering students, particularly women, and b) because they all involve enhancements rather than changes to the curriculum and are hence easier for universities or faculty to implement. General information on each strategy can be found on the ENGAGE website[9]. The three strategies include:

- Everyday Examples in Engineering
- Spatial Visualization Skills
- Faculty-Student Interaction

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The ENGAGE program has partnered with over 70 universities to implement and test these strategies, including Oakland University which was selected in Winter 2013 for a mini-grant to pilot several FSI strategies (PI: Guessous), including the *Connections class* concept.

Connections Class:

First developed at the University of Texas at Austin, *Connections classes* are designed to enhance faculty-student interactions in freshman and sophomore engineering/STEM courses[9]. To run a *Connections class*, all faculty members have to do is spend 15-20 minutes during one class period sharing information about themselves; they can for instance talk about their career path, their interests or hobbies, their research, what lead them to become a professor, any challenges, quandaries or successes that they had as students, or any other information that they feel comfortable sharing with their students. The dialogue is intended to be relaxed and informal and students are encouraged to ask questions. Implementing a *Connections class* in a course is a very simple process:

1. Select one class period, preferably in the first third of the semester (but, if you can only implement this at the end of the semester, that's OK.).
2. Reserve the last 15-20 minutes for a *Connections class.*
3. Announce to the class that you are going to stop the class lecture early in order to focus on something different, then proceed to share information about yourself, your research, your interests, how you decided to become professor, etc.
4. You can get the discussion started by prompting students to ask you any questions about yourself, you career, or any topic that you are comfortable discussing with them.
5. If students seem a bit shy about asking questions at first, break the ice by volunteering some information or saying something along the lines of "I remember when I was a student…"
6. If possible, bring a snack such as cookies to class (not necessary). This will create a more social, engaging and fun atmosphere and will make students feel even more comfortable. Ultimately, the overarching goal of a Connections class is to **humanize** the faculty member and **improve faculty-student interactions**.

Oakland University Survey Results:

Undergraduate engineering students at Oakland University complete a common, 21-credit, engineering core curriculum that consists of 6 courses in their first and second year at OU. The core courses include EGR 120 - Engineering Graphics and CAD; EGR 141 - Computer Problem Solving in Engineering and Computer Science; EGR 240 - Introduction to Electrical and Computer Engineering; EGR 250 - Introduction to Thermal Engineering; EGR 260 - Introduction to Industrial and Systems Engineering; and EGR 280 - Design and Analysis of Electromechanical Systems. During the winter, summer and fall semesters of 2013, the OU ENGAGE FSI-strategies coordinator (Guessous) contacted the faculty teaching these courses to see if they would be willing to host a *Connections class* in the core EGR courses that they were teaching. She modified a sample e-mail provided by the ENGAGE program in its Connections class toolkit[10] and provided the faculty members with additional information about the program. She also met with some of the faculty members in person to explain the rationale for the strategy. Eight different faculty members, including two of the co-authors on this paper) agreed to

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implement the strategy in their classes. Connections classes were held in a total of 10 sections involving five of the core courses (EGR 120, 141, 240, 250, and 260). The class sizes varied between 10 and over 120 students. The lead author of this paper then coordinated a date and time for a *Connections class* with each faculty member and delivered cookies or other individually packaged snacks (such as pretzels) to the classroom at the beginning of class. In order to assess student and faculty's response to the strategy, two online Survey Monkey®[11] surveys (one for students and one for faculty) were set up and distributed to the faculty members via email and to the students via the course management platform Moodle. These surveys were adapted from sample surveys provided by the ENGAGE program[10]. 156 student and 7 faculty responses were received. Responses to these surveys will be consolidated with those of other institutions by the NSF-funded program's PI's at a later date.

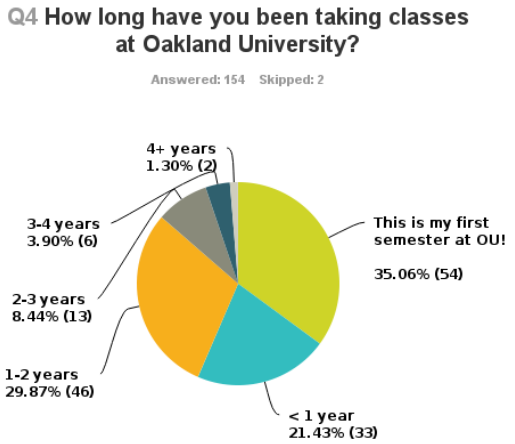

Figure 1 - Classification of student respondents to survey

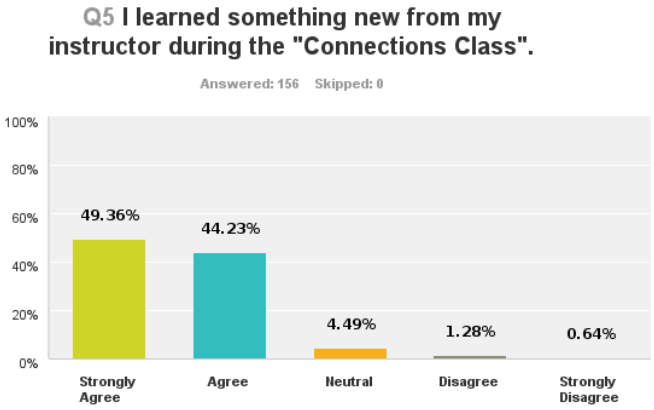

Figure 2 – Student learning from a *Connections class*

One of the stated goals of this initiative is to target engineering students in their first and second year. Figure 1 shows that indeed more than 85% of the student respondents had been at OU for less than 2 years. Demographic data further showed that 23.7% were female students. Next, when asked whether they had learned something new from their professor during the *Connections class*, more than 93.5% of the students agreed or strongly agreed, as shown in Figure 2. More importantly, Figure 3 shows that over 91% of student respondents see value in having a *Connections class* in their engineering classes. Even more telling are the student comments, some of which are shown in Table 1, which almost invariably point to the fact that by simply spending 15-20 minutes talking about themselves and their background,

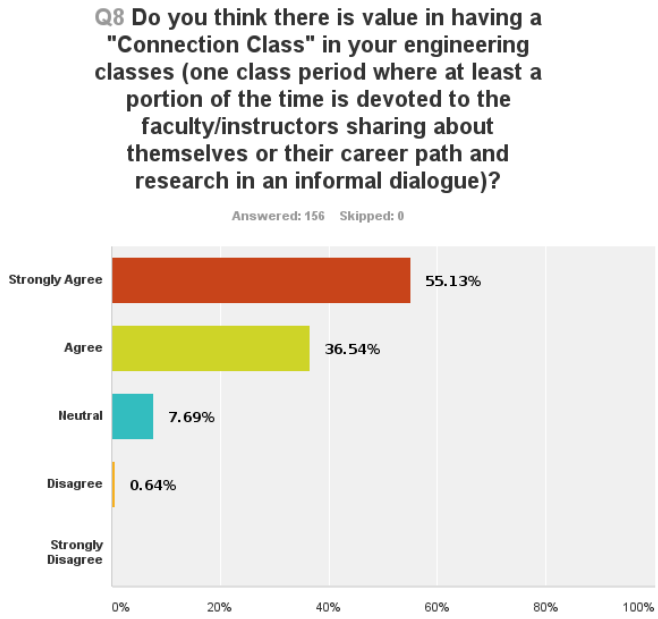

Figure 3 – Student perception of value of a *Connections class*

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faculty members appear more **human** and more approachable. It also helped reinforce some students' choice of engineering major and reassured others who might have been struggling that they were not alone in that situation.

Table 1 – Sample Student Responses to Survey Questions (Emphasis added by authors to some responses; faculty names were also removed).

Please describe your impressions of your professor during and after the "Connections Class": • "I liked that he shared more about himself personally. He seems to be involved in a lot of things I, too, am interested in." • "**Human**. Most professors will come off as if they do not care what is going on around them, they just want you to shut up so that they can hear the sound of their own voice. Having this time with Dr. X was very helpful to my ability to learn from her." • "Knowing some information about him made him seem more down to earth and personable, he seems **more approachable** afterwards." • "**He was genuinely interested** in answering our questions and encouraging questions and conversation. He intends to help guide his students in what they want to do instead of simply teaching us" • "I was very impressed with the research he was doing and his level of knowledge on the subject. It was also interesting to hear about the process of his career up to this point!" • "She seems like both a knowledgeable and "open" person who is easily approachable on all aspects of life regarding both education and career choices."
What value, if any, did you find in the "Connections Class?": • "I found it helpful because the professor gave insight **to the real world** and their experience as a student that made envisioning my own future easier and **made me less stressed** of what to expect after graduating." • "It was really cool to see some **real-world applications** with the schooling that our professor had. I liked knowing how many possibilities are out there for engineers! I would like to hear about one of the Electrical Engineering PHD professors sometime." • "Created a real **human connection** between me and my instructor; seems more approachable and connected." • "I found it more refreshing than a usual lecture. It also reassured my belief that an **engineering degree is right for me**. "
Other Comments: • "I found it very helpful, for as many other engineering students, **I am a bit unsure** of whether it is the correct pathway for me. " • "I thought the connection class was a **fantastic idea**. I think it is something that should be done in every engineering class at least once a semester. " • "Dr. X handled the time wonderfully and it was interesting to hear about her background. Knowing some of her struggles and experiences **makes engineering less daunting**." • "The lecture also made me feel more **comfortable seeking out assistance** from my professor"

A total of seven faculty responses to the faculty survey were received. Three were from assistant professors and four were from associate professors. The respondents came from all four departments in the School of Engineering and Computer Science at OU. As was the case with the students, faculty responses were predominantly positive. Six out of the seven respondents agreed that the process for leading a *Connections class* was clear and easy; the seventh response was neutral. All chose to discuss their research area, schooling/academic background, and work background, while 57% also discussed their hobbies, as well as shared some personal and family information. A review of faculty comments shows that they felt that students were interested and engaged and appreciated the opportunity to learn more from and about their professor. Several commented on the fact that it made the classroom atmosphere more comfortable or encouraged more students to stop by the faculty member's office to ask questions. A quote by one of the

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faculty respondents seems to summarize the overall faculty opinion about the *Connections class* experience:

> *I am a believer in the saying "People don't care how much you know unless they know how much you care". However, it is difficult, with a large class, to connect with students on a personal level. The connections class was a great tool to let the students get to know me better and to see that I truly care about their education. At the conclusion of the class I had multiple students approach me with great questions about their education. I have had two students stop in my office for advising purposes (these are students that have never stop by before). The biggest benefit of the connections class is that it helped to break down or thin the perceived dividing wall between student and professor. I will be doing a connections class in every lower classman class I teach from now on.*

Conclusions:

Prior research has shown that improving faculty-student interactions can have many positive benefits on undergraduate students in STEM fields. In this paper, we presented results of a very simple strategy, the *Connections class*, which can be easily implemented by all faculty in STEM and non-STEM fields without any significant investment in time or money. The positive response by students and faculty at OU mirror those seen at some of the other institutions across the U.S. that have been testing this strategy as well. While initially proposed by the NSF-funded ENGAGE program for first and second year engineering courses, the benefits of this strategy can be extended to courses at all levels.

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Bibliography:

1. National Science Board (NSB), “Science and Engineering Indicators 2012,” Arlington, VA, National Science Foundation, 2012.
2. Chen, X. (2013). “STEM Attrition: College Students’ Paths Into and Out of STEM Fields (NCES 2014-001).” National Center for Education Statistics, Institute of Education Sciences, U.S. Department of Education. Washington, DC.
3. Hill, C., Corbett, C., and Rose, A.S. “Why So Few? Women in Science, Technology, Engineering, and Mathematics,” Washington, DC, American Association of University Women, 2010.
4. Anderson, E., and Kim, D. “Increasing the Success of Minority Students in Science and Technology,” Washington, DC: American Council on Education, 2006
5. ENGAGE Research Brief: Faculty-Student Interaction; Accessed on February 24, 2014 at http://www.wskc.org/documents/281621/307235/ENGAGE+Brief+-+Faculty+Interactions.pdf/e1beb413-8c10-4b2d-9212-14d717e14937?version=1.0

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6. Umbach, P. D., & Wawrzynski, M. R., "Faculty Do Matter: The Role of College Faculty in Student Learning and Engagement," *Research in Higher Education*, 46(2), 153–184, 2005
7. American Society for Engineering Education, "Creating a Culture for Scholarly and Systematic Innovation in Engineering," 2009.
8. Vogt, C.M., "Faculty as a critical juncture in student retention and performance in engineering programs," *Journal of Engineering Education*. (97)1: 27-36, 2008.
9. http://engageengineering.org
10. http://www.engageengineering.org/?page=135
11. http://www.surveymonkey.com

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MEGAN CONRAD: Megan Conrad, Ph.D. is an assistant professor in the department of industrial and systems engineering at Oakland University (OU) in Rochester, MI. Her research interests include ergonomics, neuromechanics, and rehabilitation engineering. She has implemented the *Connections class* concept in her Introduction to Industrial and Systems Engineering course and has recently been developing new courses and labs on ergonomics and human factors for her department.

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