Adding a Career Conference to the Freshman Curriculum

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Abstract- To help improve the retention of engineering students in the freshman year we created a number of writing assignments in the first year Introduction to Engineering course. These writing assignments were designed to engage students to research the field of engineering they were interested in. Despite our efforts many of the students just did not take the assignments seriously and as a result they did not get the full benefit of the assignment. To encourage the students to put more effort into the assignments we created the Freshman Career Conference. The conference is a Saturday event, that was modeled after career conferences at student professional conferences such as SWE, NSBE and SHPE. In the conference we brought in cooperate speakers that gave professional development workshops to the students and talked to the students about the importance of being their career development plans now as freshman. This paper discusses the factors around creating such a conference and the impact it has made.

Introduction

ABET accreditation requirements emphasize the importance of "soft" skills in planning and achieving excellence in engineering education. In addition to "hard" knowledge, engineers need to experience and understand "communication, teamwork, and the ability to recognize and resolve ethical dilemmas."[1] These skills are powerful when combined with awareness skills involving "understanding the impact of global and social factors, knowledge of contemporary issues, and the ability to do lifelong learning."[1] What is the most effective way of incorporating this into an engineering curriculum already crowded with necessary science, math, and disciplinary courses?

For engineering schools to educate "whole engineers," they must embrace their own university's whole range of resources. Schools of engineering are parts of larger educational institutions, and, as such, have the opportunity and obligation to make the best use of the resources a whole university has to offer. Here at the University of Pittsburgh, the Swanson School of Engineering faculty and administration have worked in tandem with librarians and with faculty from the English Composition program, to develop tools and projects to educate students in process and awareness-oriented skills. To do so effectively, the Swanson School of Engineering has advocated and practiced the very skills it sees as essential to the "wholeness" that facilitates effective communication, teamwork, and responsible action. Over the past ten years, through teamwork that has valued a variety of skill sets, we have developed, and successfully implemented "soft skills" within the English/Freshman Engineering Writing Program (E/FEWP).

Most students entering the University of Pittsburgh, including those entering the Swanson School of Engineering, are required to take the University's core writing course, ENGCMP 0200 ,Seminar in Composition, during their freshman year. For freshman engineering students, this would require taking this intensive composition course along with a full load of math, science, and engineering courses. However, with the full complement of courses required, it was impossible to add another course. Given this problematic situation, ten years

ago we spearheaded a collaboration between Pitt's English Department, the Swanson School of Engineering's Freshman Program, and the Bevier Engineering Library to remove the separate writing course from the curriculum and instead make it part of the freshman engineering courses. We knew the School of Engineering faculty had neither the time nor the pedagogical expertise in freshman composition to develop and teach an engineering equivalent to Seminar in Composition. Thus, faculty, librarians, and administrators from Engineering began a collaboration with faculty and administrators from English to implement a course that would allow the incorporation of Seminar in Composition goals and requirements into the freshman engineering curriculum. English Department composition faculty, drawing on the engineering expertise of the freshman engineering faculty, would develop writing assignments for this equivalent to Seminar in Composition, and would read and grade all papers written by freshman engineering students as part of the first and second semester introductory engineering courses. For this composition-within-engineering to succeed, all freshman engineering faculty had to be willing to open their classroom doors and their syllabi to the composition instructors and assignments. Composition instructors had to be willing to work within time frames and curricula different from the standard Arts & Sciences 3-credit course.

Through the E/FEWP, freshman engineering students are afforded the writing and critical thinking experience equivalent to the University of Pittsburgh's core three-credit freshman writing course. With the E/FEWP, from day one of their first engineering class, students are introduced to the role that information literacy and university-level writing skills can play in responsible thinking, thoughtful action, professional integrity and career success. In addition, collaboration between the E/FEWP and the Swanson School's Freshman Engineering Program advising and mentoring activities has benefited all students, faculty, and advisors involved. Through writing assignments that require students to research engineering fields and achievements, while reflecting on their own interests and experiences and goals, the E/FEWP creates a substantial picture of students' own evolving academic and professional awareness—a picture that is useful to and enhanced by significant freshman advising and mentoring.

Freshman Engineering Program

The Freshman Program at the University of Pittsburgh has an academic and an advising component. The mission of both components is to create a first year experience that promotes the student's continued pursuit of an engineering degree. Part of the Engineering Library's mission has been to work with freshmen in order to give them a solid orientation to library research and information literacy in a university setting. The problem is how to create a curriculum that can satisfy all these missions.

Academic Concerns

The engineering department modified its program and created an integrated freshman curriculum [2,3] to promote a comprehensive learning environment that includes significant attention to student communication skills. The environment also employs this attention as a means to amplify students' consciousness of the academic and personal choices they make. There are two main engineering courses that are part of this curriculum: ENGR0011 and ENGR0012. The former is a required three-credit programming course with the overall goals of teaching the basic analytical, programming design as well as graphical, problem-solving, teamwork, and communication skills. ENGR0012 is a second-semester core course that completes the computer programming portion of the integrated curriculum package. This

course focuses on the following curricular goals: teach students a general-purpose programming language, promote and encourage good programming practices, and illustrate the role computers play in solving real-world engineering problems. While both courses originally covered many basic programming and problem-solving skills, they did not provide enough opportunities for written and oral presentation assignments or for effective advising.

Advising Concerns

The first-year student advising objective is to assist each student in making a smooth transition from high school to college, to aid these students in identifying their major, and to facilitate strong retention. The mentoring program within the curriculum aspires to actively involve students in every aspect of the undergraduate experience, including advising, personal decision-making, academic achievement and integrity. [4,5,6,7,8] To accomplish this, all freshman engineering students are required to enroll in the advising course, ENGR0081, which explains the university policies and procedures. In the past, this course involved more passive learning as students attended lectures on college-related matters and various engineering departments.

By incorporating writing into the integrated curriculum, the university created a new version of ENGR0081, which included small mentoring groups supervised by mentors and centered around a social or cultural activity (such as board games, sporting events, or dance in Pittsburgh) [9]

Library Concerns

The Bevier Engineering Library is one of 14 units in the Library System at the University of Pittsburgh. One of the library's goals is to present library research as a necessary skill set for successful engineers. The American Library Association defines information literacy as the ability to "recognize when information is needed and have the ability to locate, evaluate, and use effectively the needed information."[10] This includes developing search strategies, selecting appropriate literary research tools, critically evaluating the materials identified, and properly documenting sources used. Problems that future engineers will face may require knowledge and understanding from several fields outside of their areas of expertise. Graduates should have the ability to teach themselves new concepts and apply information to new and unfamiliar situations.[11] A major concern is how to introduce library skills during the freshman year.

Engineering 0081 - Freshman Seminar

ENGR0081 is a course that explains the university policies and procedures to the students. It is required for all freshmen engineers [9]. It is a zero credit class, however the freshmen are graded pass/fail based on attendance and participation.

In the past this course was a typical introduction to engineering where once a week the entire freshman class would get a lecture on the different fields of engineering. The typical syllabus was an introduction session, followed by eight separate presentations by the different departments within the school of engineering, a study skills session, presentations by the Co-op and study abroad programs, a session dealing with spring semester registration and an "open house" session sponsored by all the departments.

By student accounts, the program was "very cold" and the students' lack of respect for the course resulted in them ignoring most of the material presented in the sessions. In the Fall semester of 2001, a new ENGR0081 was enacted and linked to the first semester Engineering Analysis course ENGR0011. By linking the academic and advising courses, ENGR0081

would now be a course in which lectures would provide information needed by the students to complete assignments in other courses.

The syllabus of the ENGR0081 lecture sessions looks basically the same under both the new design and the old design. The major change is a linking of E/FEWP assignments from ENGR0011 with content and activities from ENGR0081, see Figure 1. ENGR0011 writing assignments require that students research their intended fields of engineering, discovering and analyzing what engineers in various disciplines undertake and produce as well as what the ongoing developments and achievements of various engineering disciplines are. Thus, the lecture component of ENGR0081 now has an academic component, and the students have a reason to listen to the various presentations given throughout the seminar. Sessions that students previously claimed were "boring" have been reoriented to contribute to mentoring group activities and to the "hands-on" research and writing assignments that comprise a significant, essential and graded element of the ENGR0011 Engineering Analysis course
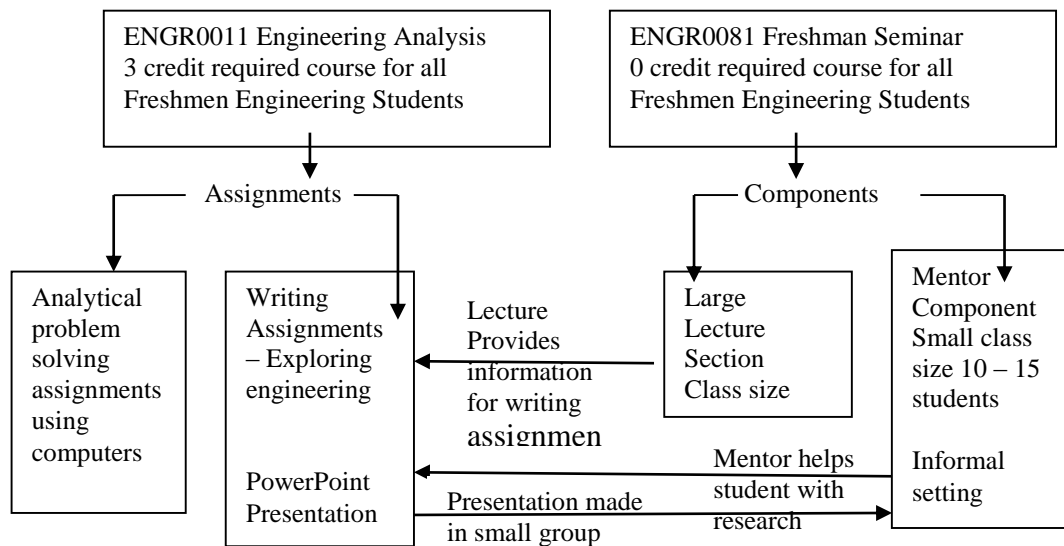
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FIGURE 1 CONNECTION BETWEEN ENGR0011 AND ENGR0081

Designing and Implementing the First Semester Writing Projects

Many universities use hands on projects or various design projects to try and help students discover what engineering is and what engineers do. At the Swanson School, we used such projects for years to try and help students discover what engineering is all about. However, we were not pleased with the projects nor did we feel they were accomplishing the goal of substantially explaining, for students, what engineers do.

In recent years, a number of writing techniques have evolved that make use of various writing-to-learn strategies within the domains of engineering, mathematics, and the sciences. [12,13,14,15,16,17,18,19,20] The use of writing in introductory classes for engineers may be an effective vehicle to help students enhance their critical thinking and problem-solving skills. Writing can also assist students in identifying and confronting personal misconceptions. [21,22,23,24] To reach these aims, the goals of ENGR0011 and ENGR0081 were modified to provide a more personalized, more immediately meaningful experience for each student. We felt that by having the students take an active role in exploring their futures

by researching and writing about their intended professions [2], we could address the various academic and advising concerns regarding communication and information literacy skills while also providing students with knowledge and experience essential to retention in engineering issues.

These writing assignments developed by English faculty in close consultation with Engineering faculty and librarians, provide one standard assignment for each writing project, with clearly defined overall standards and requirements, but each writing assignment also allows for each student to understand, through research and writing, his/her particular assumptions, evolving awareness, interests and strengths.

Assignment #1 Presenting Myself: Recent Past, Present, and Near Future，400-450 words

To gain a sense of their students' background, interests and accomplishments, the mentors in ENGR0081 had always asked the freshmen students to write letters of recommendation about themselves for an imaginary engineering scholarship. As the E/FEWP faculty began developing the program's curriculum, they immediately saw the usefulness of this peer mentoring exercise. The E/FEWP faculty composed an assignment that intensified the "letter of recommendation" scenario and expectations.

Composing the letter provides the students first step in meeting the goals of Pitt's standard first semester general writing course, ENGCMP 0200, which focuses on "thoughtfully crafted essays that position the writer's ideas among other views" and of "writ[ing] with precision, nuance, and awareness of textual conventions."[25] Students have the opportunity to introduce and describe themselves in the "voice" of someone who knows them and contextualizes them in particular ways. This allows students to consider what they might like to achieve in their freshman year of study and beyond, while allowing the university to merge advising into the curriculum. Through this assignment students have an opportunity to see that it's useful for their instructors to know them on an individual basis. The letter also provides instructors and advisors with another glimpse into the students' lives.

Assignment #2, Challenges and Issues in Engineering: My Point of View, 850-950 words

The critical importance of information literacy in engineering education is first addressed in assignment two. With this assignment, librarians help students select appropriate sources, construct efficient searches, interpret search results, and obtain identified sources. To complete this assignment, students examine the National Academy of Engineering's "14 Grand Challenges"[26] Encountering, further researching, and writing about these "Grand Challenges" introduces students to the idea of social responsibility and asks that they take a position on the role and responsibility of engineers in delineating and addressing social and environmental issues and problems. Students choose a challenge and delineate a particular topic, complete research using articles from a minimum of four trade and popular publications, and present their position on the importance of this topic to engineering, themselves, and society. With this assignment, students encounter the impact engineering can have on society, and they begin to practice making responsible arguments about significant, real-world matters.

Through the Grand Challenges assignment, students also begin practicing responsible research appropriate to academic and professional writing, as librarians introduce students to the concepts of appropriate, university-level literature research. The librarians provide

information and examples that demonstrate the quality and authenticity risks of relying on web search engines or Wikis. Librarians explain the basic research steps: taking information from a nebulous form, filtering it through a database, obtaining a list of citations which match criteria, and determining how to achieve full text access.

Through the librarians' classroom instruction and accompanying support materials, students learn that "library research" does not solely encompass finding books about a subject. Rather, it is about identifying, locating, and using various types of publications including trade and scholarly journals, books, technical reports, conference proceedings, and dissertations, along with subject-specific databases such as Inspec and Compendex.

Assignment #3 Engineering and Me—Why I Want to Be What I Think I Want to Be, 900-1100 words

In this assignment, students research and analyze the field of engineering in which they intend to major. Students must show how the actual educational requirements, jobs, atmosphere, and salary ranges of a particular field are a good "match" with their own interests, goals, and particular abilities. Through writing, in detail and with concrete examples, about their own interests, activities, and achievements, while also researching and writing about educational requirements, job prospects, professional settings, working conditions, and salary ranges, students become consciously aware of the appropriateness (or lack thereof) of the educational decisions they are currently making.

Library instruction for this assignment addresses locating verified, accurate, and authoritative career information, and includes demonstrations of using the online version of the Occupational Outlook Handbook.[27] This assignment also introduces professional society websites, including organizations such as the National Society of Professional Engineers and the Junior Engineering Technical Society. The library session also provides students with an overview of the online library catalog, with particular emphasis on finding books, career guides and handbooks, which can serve as valuable sources of information on engineering careers.

Assignment #4: Engineering Challenges, Ethics and Education: My Point of View, 1200 words

To complete assignment four, students rewrite and expand the scope of their Grand Challenges paper from assignment 2. With assignment 4, students experience how revision increases clarity, and how additional research and contextualization yields new insight and increased impact. Drawing on research into engineering codes of ethics and further research into the challenge/topic itself, students now articulate the relationship of the topic to particular codes and tenets of engineering ethics. Also required is reflection on the very act of spending time researching, thinking and writing about this challenge during the freshman year of an engineer's education

The research goals of this assignment include introducing the concept of peer-reviewed publications and the resources for identifying them, as well as teaching more advanced techniques for conducting searches. Students need to search within the context of engineering ethics, thus, this assignment revisits the professional societies that are most frequently the sources of such codes.

Assignment #5: Summary Presentation: Completing the process by presenting your findings

Students' end-of-the-semester presentations revisit, summarize, and reinforce the integral relationships between what engineering "is" (current challenges and trends, what kinds of work and compensation can be expected in particular fields, how engineering impacts society, and what are an engineer's responsibilities) and how a particular engineering degree fits within the students' interests and goals.

The purpose of this presentation is to summarize the writing assignments. The first assignment was a biography. The purpose of the paper was to get the students to think about who they are, what their interest areas are, and what are their strengths are. The second paper was an examination of a current global engineering challenge. The purpose of this paper was to have each student understand and appreciate where their intended field of engineering is headed. The third paper was a detailed investigation of a particular engineering field, and why and how a student's decision to major in this field is well-considered and appropriate The final paper continued explorations about society and engineering and how they are connected.

The purpose of the end of semester presentation is to have the student look at the big picture and complete the circle of inquiry and awareness. In their presentations, students comment on how they see the trends within an engineering area fitting with the students' own interests, intentions, and strengths. Drawing from their work on the 4 papers, students provide evidence for their emerging insights into how their plans for the future are in line with major engineering trends and challenges. Finally, students provide a convincing picture of how they, their work, and society will all come together.

In addition to a PowerPoint, students create a poster based on the above assignments. The students present the PowerPoint and poster in their small ENGR0081 seminar. This provides an initial experience in presenting their scholarship before a group. At this point in the semester, students have also drawn from their writing assignments to create a personal website, which also covers their interests and how those interests fit with their educational trajectory and with current engineering trends and challenges. Throughout the semester, ENGR0011 instructors introduced the required software for the word processing and formatting, for web design and publication, and for PowerPoint and poster presentations. Through these various modes of presenting ideas, students experience the processes and potential impacts of communicating in three formats: traditional paper, a website, and public speaking presentations with PowerPoint presentation and posters.

Connecting this Assignment to the Engineering Library

Within the library, the librarians and staff met to discuss the project. A binder containing the Library Research Project was kept at the front desk of the Engineering Library. In addition, a digital tour of the library resources was created by the library staff, and they were invited to make a presentation in the ENGR0011 course for each assignment and show the students how they could research their topic areas using various search packages. This digit tour was incorporated into a web site so the students could have access to the information at any time. All of the library staff became familiar with the project; they were aware of which assignment the students would be working on in any given week, as well as the resources students were being asked to access and use. The same basic operating system was undertaken at the University Writing Center, where all the faculty and staff were aware of the assignments.

Freshman Career Conference

Despite our efforts many of the students just did not take the assignments seriously and as a result they did not get the full benefit of the assignment. To encourage the students to put more effort into the assignments we created the Freshman Career Conference. The conference is a Saturday event that was modeled after career conferences at student professional conferences such as SWE, NSBE and SHPE. In the conference we brought in cooperate speakers that gave professional development workshops to the students and talked to the students about the importance of being their career development plans now as freshman.

Steps in Making a Career Conference

To begin the process of making this conference happen is to have a number of meetings with your Career Development Office and reviewing the plans for creating a Freshman Engineering Conference.   The following is intended to detail those steps and outline the relationships that we created with students, faculty, employers and stakeholders.

Step 1 the schedule

Step 1 is to create some sort of schedule. We decided that we would want to bring in representatives from each discipline of engineering represented at Pitt. This would allow students to come to the conference to preview and compare their top two choices of majors back-to-back. Two separate sessions would also be in the best interest of time. We decided that a Keynote speaker and two, 45-minute sessions would be the best way to proceed for the first year and that changes could be made if necessary in future years. We decided that the Keynote should be a prominent and distinguished alumni and we contacted **Institutional Advancement** to learn about connections that office had with alumni who would be willing to participate in such an event. In summary we begin the conference at 8:30 am with a check in process. To track attendance, we had ID swipers and we also created name tags for each student which students picked up for themselves the morning of the event. To determine the final attendance we cross-referenced both lists. So we setup three card readers in the lobby and the students were told to arrive around 8:30 to check in. The keynote started at 9 am, then session 1 started at 10 am and session 2 started at 11 am. Thus, the entire conference is over by noon.

The first year that we did the event we also decided that we would hold a networking event after the conclusion of the 2nd session. This networking event was held in the lobby immediately outside the doors of the rooms. We ordered pizza and invited all of the engineering student organizations to host tables where they would showcase their organization to encourage freshman to join and to interact with them. We also invited the employers who had spoken during the conference to join the Freshmen students and the student organizations. We found that about half of the employers left and many of the students grabbed some pizza and headed out. The pizza networking session did not seem to work very well, so the second year we decided that we would not do it. The second year of the conference we provided a small breakfast for the students before the conference, instead of Pizza afterwards. We will continue to do this in following years. It is up for debate whether we will try the post networking event in the future. We have some ideas that we might try next year. This "post-conference" aspect seems to be the only part of the day that is still in development. At this point everything else seems to be working well.

Step 2 Adding it to the Curriculum

Shortly after looking into the rooms it was clear that we would need to have the event on a weekend. A Saturday event would require us to have the support of the freshman engineering seminar class to ensure the students' participation. Thus the ENGR0081 syllabus included the conference as part of the ENGR0081 course. The students were given some assignments related to the event to complete in several different classes. Marketing materials were made and disseminated to students and the Career Development staff gave a presentation to the entire class explaining the event. The 2nd year the event was held, these presentations expanded beyond the ENGR0081 seminar course and were also given in the Introduction to Engineering course ENGR0011. During these class sessions the staff provided more details about the event. Another lesson we learned in the first year is you must constantly remind first semester students to plan ahead so you must address the concept of the conference sooner in the semester to make sure they knew they had to be present. It is just hard to explain the inability of 18 year old kids to plan ahead more than one day. You must repeat the date and their requirement to be present at least once a week from the first week to the week of the conference.

We also have a space problem in Engineering in that we do not had a single room big enough to hold the entire first year class. Thus, we worked significantly with the Director of Marketing and Communication and the Director of Technology to stream the keynote speaker to the monitors we have in the hallways throughout the building and into separate classrooms within Benedum Hall. The keynote presentation was streamed live and recorded. We then had walkie-talkies in each room so questions could come from any room and the keynote speaker could answer the questions. Once the keynote was over, the seven different corporate engineering discipline speakers took over and began their presentations within their rooms.

Step 3 Picking the Date

The first year we did the event it was in the Spring, however it was 1 week after the students had chosen their majors. In the feedback forms it was clear that the information presented in the conference was good but it was too late. Thus, the second year the Freshman Career Conference was held in November of the Fall semester. This was seen as a better time and will be the time of year that the event is held from now on. Since it is on a Saturday, you must also work around home football games and Thanksgiving break. Can't be the week before Thanksgiving and can't compete with a tailgating event.

Step 4 Picking the Speakers

The Employer Development Specialist, along with assistance from **Institutional Advancement** set about contacting engineering companies, alumni, and HR professionals from prominent companies in the Pittsburgh area. Institutional Advancement was inclined to invite employers who have been generous donators. The Career Development and Placement Assistance Office was interested in bringing in specific companies who have a history of donating to the office and who hire many Pitt students. Outreach was made to the Co-op Office as well to solicit information regarding companies that they would be interested to create a relationship with.

The Employer Development Specialist worked hard to connect with employers and eventually landed the necessary speakers, with several cancelling, needing to be substituted for. This was stressful and in the future it would be wise for anyone considering this to have a few backup ideas incase some companies aren't able to show up at the last minute.

Thankfully, everything worked out well for our events and all the employers showed and were very pleased. In the end we had speakers for the following disciplines: Bio Engineering, Chemical Engineering, Civil Engineering, Computer Engineering, Electrical Engineering, Industrial Engineering and Mechanical Engineering.

Step 5 - Connecting this Assignment to the Engineering Course

The whole concept of the writing is to encourage the students to take an active role in their own career choices and pick the correct field of engineering for themselves. So all the writing assignments are designed to be individual assignments, in that each student should have a different experience while doing the same assignment. The third writing assignment is the one that requires them to dig into an actual engineering field and start looking at the small daily picture of being an engineer. Thus, the date of the conference is also selected to match when the students are involved with the third writing assignment. We also add a requirement to the writing assignment that the students must reference something the speakers say in their paper.

Thus, attending the conference starts as meeting a course requirement and recording some data that can become part of the paper. But the speakers are also talking about what it is like to be an engineer and what it feels like, what you do in a typical day, and most importantly what personal satisfaction comes from being an engineer. Thus, the students think they are going to a conference to collect data, but what really happens is we are providing motivation as to why you should want to be an engineer. It is this motivation that is the big pay off. It is impossible for faculty to interact with the students at the level that corporate engineers can.

Future Work

Data from student surveys show that the conference was helpful for the students. We asked if the conference made you: 1. More self-aware of employment options, 2. Gained new professional development skills, 3. Recommend event to future freshmen, 4. Clearer understanding of what major to choose, and the results were over 70% of the students agreed with the statements. This is a positive beginning, but what we really want to do is survey them when they are getting ready to graduate and ask them what impact the conference had on helping them select a major or how it helped in their career development. Obviously, that is going to take at least three more years. So the future plans is to continue the conference and also begin a longitudinal study of the impact as the students' progress through their programs. Hopefully this data will allow us to modify the program to meet the long term goals.

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