Another Look at the Freshman Engineering Course

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Abstract

The curriculum in most engineering programs includes some type of freshman level course designed to introduce new engineering students to the various engineering career fields open to them and to introduce these students to the different university resources available to help them make a successful transition to university life. Some programs expand the freshman engineering course to include topics such a teamwork, professionalism and ethics, and fundamentals of the engineering design process.

Over the past four years the author has been responsible for teaching the introductory engineering course for students on the Missouri State University (MSU) campus who are participating in the Cooperative Engineering Program operated by Missouri University of Science & Technology (Missouri S&T) in cooperation with MSU.

During that time, a number of different ideas and topics have introduced in the course. Some were successful but others failed for a variety of reasons. This paper discusses both the successes and failures and offers suggestions for other teaching similar courses.

Introduction

On August 21, 2006, the Governor of the state of Missouri, along with the Curators of the University of Missouri, the Chancellor of Missouri University of Science and Technology (Missouri S&T), and the President of Missouri State University (MSU) signed a Memorandum of Understanding that allowed Missouri S&T to offer bachelor's degrees in Civil and Electrical Engineering on the MSU campus. The first classes in the new cooperative program were held on the MSU campus in the fall semester of 2008. Some of the students in this first class will graduate in May, 2012.

As part of this new program, a freshman engineering class similar to the one offered at Missouri S&T in their Freshman Engineering Program had to be developed since Missouri State did not already have such a course in place. Students in the cooperative engineering program are typically not officially admitted to the Missouri S&T portion of the program until they have completed approximately 33 credits at MSU, so the freshman engineering course had to be an MSU course as opposed to the FE 10 course from Missouri S&T. The Missouri S&T course, FE 10, entitled, "Studies and Careers in Engineering," is a one credit hour lecture course that covers the various fields of engineering and career opportunities in those fields. The class also introduces some campus resources available for assisting student success.

In the fall of 2008 the MSU freshman engineering course, Engineering (EGR 110), entitled, "Studies and Careers in Engineering," was offered for the first time. Like the course at Missouri S&T this, too was and remains a one credit hour semester long course. There were 33 students enrolled in this first class. For the first two years of the program this course was offered every semester and since then it has been offered only every fall semester. Enrollment in the course has now grown to the point where approximately 80 students sign up for the course every fall.

The learning outcomes for EGR 110 are as follows:

1. Students should gain an understanding of the study habits necessary to succeed as an engineering major.
2. Students should be aware of the campus resources available to them to assist them in making progress in their engineering major.
3. Students should have an understanding of the position of discipline of engineering in the spectrum of technical professions that also includes scientists, technologists, technicians, and craftsmen.
4. Students should understand the differences between the various engineering disciplines and begin to decide on particular engineering major.
5. Retention of students in the engineering program.

Initial Offering

In that initial offering, the course was based on FE 10, the Studies and Careers in Engineering class offered at Missouri S&T, with a couple of exceptions.

One was that a picnic was added to the list of activities. This event was scheduled in the evening and students were awarded points for attending. Students unable to attend were given alternate assignments. This has proved to be a popular event and has continued to be held every fall. Upper level students in the program are also invited and continue to attend and meet the new freshmen. A local engineering firm has donated the hot dogs and hamburgers for this event.

Another exception was that local engineers in private practice were invited as guest speakers in the course. This was done to take the place of university faculty who have traditionally made presentations to the FE 10 classes at Missouri S&T. The speakers from industry have generally been the most popular part of the course, although not all speakers were received with equal enthusiasm. Some just did not present well, while a few others got into tedious detail about some specifics of their engineering work and lost many of the students.

Since then we have tried to screen the individuals from industry we use to speak to our class. Industry representatives who can present well and at a level that will keep the students' interest are invited back to speak to future classes.

Subsequent Classes

By the time the course was offered for the third time a number of other issues came up and had to be addressed.

First, the enrollment in the class increased to the point that approximately 80 students were enrolling in the class every fall. With this many students in the class it was no longer possible to verbally call roll in the class. Calling each student by name took almost the whole class period. We then introduced a signup sheet where students simply sign in to indicate their attendance on any given class period. This is not a perfect solution. Some students simply sign the sheet and leave or have another student sign in for them when they do not attend. We have not found a solution to this problem as of yet.

In addition to the increases in enrollment, the makeup of students enrolling in the class has changed considerably. The first students enrolled in this class were all declared engineering majors who planned to spend four years on the MSU campus and obtain and engineering degree through the cooperative engineering program. Now the class has a mixture of at least three or possibly four different groups of students.

One group is made up of students who plan to stay in Springfield and complete their engineering degree through the MSU/Missouri S&T cooperative engineering program similar, to those students who initially enrolled in the course when it was offered for the first time.

A second group of students are those who plan to major in engineering and plan to start at MSU but then transfer to Missouri S&T or another engineering program. This typically because they either do not reside in the nine county area in southwest Missouri covered by the cooperative engineering program agreement or plan to major in an engineering discipline other than Civil or Electrical.

A third group of students are those who are not sure about majoring in engineering but want to learn more about engineering as a career. This course provides a relatively low cost probe for such students.

Finally, there are now a few students who enroll in the course, not because they have any particular interest in engineering, but simply because they need a one credit hour course to satisfy requirements in some other major at MSU. This is a relatively easy course and students needing one credit hour in any subject have discovered this class and are enrolling in it.

We have made changes in the course to attempt to address the first three of these groups of students. Those who enroll in the course just to the needed one credit hour will probably continue to enroll unless we change the course credit hours.

Other Issues

Initially we spent approximately 30% of the class time discussing the campus resources available to students. This included items such as the library, writing center, math tutoring, placement

office, study away program, and other similar resources. Responses from students in the course have consistently rated the coverage of these topics as the least favorite part of the class. As such we are in the process of reducing the amount of time spent on such topics. In response, we have reduced the amount of time spent of such topics and replace it with more outside speakers.

Similarly, tours of campus facilities, such as the library, have not been popular. Many students in the class do not show up for these tours.

Students have expressed interests in off-campus tours of engineering related facilities but the logistics of organizing such tours has proven to be difficult. Still we hope to try this at some point in the future.

Students have also expressed interest in doing some kind of laboratory project in the course. At this point we have not found a suitable lab exercise that could be done within the time frame of the class. Laboratory space available for such projects has also been an issue.

Class Survey

Each time we have offered the class we have administered a survey of students enrolled during the last class period. This survey asks the students to rate the various presentations made in the class. A sample of this survey for a typical semester is included in Table 1. This survey represents the topics typically covered on the MSU course.

Table 1. Engineering 110 Evaluation

Your responses will help us to make changes in the EGR 110 class to make it better. We'd also like your opinion of the overall engineering program here at MSU, so please answer the following questions as honestly as possible.

1. What is your overall opinion of the EGR 110 course? (pick one)
   a. Great
   b. Okay
   c. Boring
2. Specifically, what topics in EGR 110 did you like the **most** (pick all that apply)?
   a. Lecture on study habits _____
   b. Lecture on tips for taking exams _____
   c. Lecture on the different fields of engineering _____
   d. Career Center presentation _____
   e. Public Affairs presentation on sustainability _____
   f. Professionalism, ethics, and licensing presentation _____

   g. Communication skills and working as a team presentation _____
   h. Design teams and solar car presentation _____

i. Presentation on study abroad opportunities _____
j. Presentation on Service Learning Opportunities _____
k. Presentation on use of the MSU library _____
l. Presentation on the MSU Writing Center _____
m. Presentation on overseas engineering work _____

3. Specifically, what topics in EGR 110 did you like the **least** (pick all that apply)?
   a. Lecture on study habits _____
   b. Tips for taking exams _____
   c. Different fields of engineering _____
   d. Career Center presentation _____
   e. Public Affairs presentation on sustainability _____
   f. Professionalism, ethics, and licensing presentation _____
   g. Communication skills and working as a team presentation _____
   h. Design teams and solar car presentation ____
   i. Presentation on study abroad opportunities _____
   j. Presentation on Service Learning Opportunities _____
   k. Presentation on use of the MSU library _____
   l. Presentation on the MSU Writing Center _____
   m. Presentation on overseas engineering work _____

4. What else can be done to improve EGR 110? List other topics, changes in the organization, grading policies, etc.

5. **Based on your experience so far, how would you rate the following aspects of the <u>overall MSU engineering program</u>? Use 5 for high and 1 for low.**

   a. Advising _____
   b. Faculty (Dr. Egbert) _____
   c. Program Director (Dr. Carroll) _____
   d. Administrative Assistant (Ms. Misty Stewart) _____
   e. Facilities _____
   f. Curriculum _____

Assessment

As this point, the primary tool for assessment has been the student responses to the above questionnaire. Students have generally indicated that they generally either view the course as great or okay. The most popular presentations are those by practicing engineers, although those judged to be long or with too much detail were less preferred than those that gave more a more simple presentation. Those presentations dealing with study skills and university resources were less popular. Most students felt that the course gave them a better picture of the engineering

profession and the type of work done by engineers. A few students reported that this course was helpful in that it revealed to them that engineering was not the best field for their skills and interests and that as a result they would be investigating alternate majors.

Overall we believe that the course is accomplishing the stated objectives. However we also feel that there is still room for improvement in EGR 110.

Conclusions

The freshman engineering course at Missouri State University continues to evolve. The most popular presentations are those done by local engineers, provided they communicate well and are not overly technical. Presentations on university facilities and programs to aid students are the least popular but to date we have not replaced them with any other material. We still feel that these topics are important for new engineering students.

We are attempting to determine why topics related to study habits and university resources available to students are so unpopular with students in the class. It may be that they are already getting much of this material during the visit to campus during the summer early enrollment period.

We are continuing to explore new options for the course while hopefully providing the students a meaningful introduction to the engineering profession.

Bibliography

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Biographical Information

Dr. Robert I. Egbert received B.S., M.S., and Ph.D., degrees in electrical engineering from the University of Missouri – Rolla (now Missouri University of Science & Technology). He was a member of the faculty at Wichita State University for 20 years and then in 2008 accepted a faculty position in the new cooperative engineering program between Missouri S & T and Missouri State University.