**ENR 100 SLOAT ASSESSMENT STUDY**

Spring 2011 Final Report by Alkis W. Dimopoulos

**I. INTRODUCTION**

This report focuses on student learning outcomes in the course ENR 100, Introduction to Engineering Technologies and Sciences, offered by the Engineering Technologies and Computer Sciences Division at ECC. The material taught in this course is the foundation upon which the upper-level courses depend for students to have the skills necessary to master more advanced material.

*“Tell me and I forget. Teach me and I may remember. Involve me and I learn.”*

Benjamin Franklin

The philosophy in teaching ENR 100 is to help the students move beyond the point of where everything is presented as lecture, handouts and memorization of problem-solving methods and where the instructor is looking for the “correct” answer. The students learn how to apply the material taught (e.g., mathematics, physics, equations, etc.) to real-world applications. Real-world problems in engineering rarely come with all of the information required for their solution, and typically they cannot be solved by looking at how someone else solved the exact same problem.

The student learning outcomes (SLOs) chosen for this evaluation involve ethics, mathematics and science, speaking and presentation, engineering design, problem solving and decision making, and project management and teamwork. Practicing engineers often make decisions that will affect the lives of other people. Without a firm understanding that all decisions must be based on ethical principles, there is a high probability that the consequences will be disastrous. Additionally, most engineering projects are too large for one individual to be accomplished and, thus, practicing engineers must learn early on the importance of functioning effectively within a team, putting aside personal differences and achieving goals by combining individual talents and ideas.

In teaching ENR 100, the following instruments were utilized in addition to lectures and assigned homework:

* Research papers evaluating and identifying common traits engineers possess, as well as activities engineers engage in.
* Videos on real-world engineering and architectural projects, as well as hypothetical situations in engineering ethics, project management and time management.
* In-class workshops/surveys designed to obtain the opinion of the students about learning outcomes, as well as quantifying the student learning outcomes.
* A term project, in which the students working in a team environment, design and build scale models of certain structures following given specifications and applying design concepts, project management and time management strategies taught in class, with the primary idea being for the students to have a first "hands-on" practical experience. It is notable that, upon completion of the project, the students present a technical paper identifying issues faced during the construction of the scale model, deliver an oral PowerPoint presentation, and finally perform a strength test of the structure designed and built.

**II. SLOAT ASSESSMENT PLAN**

**a. Population**

The data for the assessment of the course MPOs was collected from the students enrolled in ENR 100 section OAC, which originally included 17 students and concluded the semester with 16 students. One student received an incomplete for the course due to extended illness.

**b. Administration**

The following SLOs were chosen for the assessment:

* SLO #1 (Course Goal 2): Discuss the type of work that engineers and other professionals perform and describe the specific writing, speaking, mathematics, computer, engineering design, problem-solving and decision-making skills needed to perform such work.

Measurable Course Performance Objectives (MPOs) corresponding to SLO #1, are as follows:

2.1 *determine the common traits engineers possess and the common activities engineers engage in;*

2.2 *explain the importance of communicating with others both orally and in written form;*

2.3 *discuss the importance of time management in project execution;* and

2.4 *describe the importance of quality and value in engineering.*

* SLO #2 (Course Goal 3): Describe requirements of the engineering profession.

MPOs corresponding to SLO #2, are as follows:

3.1 *identify and describe the professional behavior standards, including ethics, under which engineers must perform;*

3.2 *describe the importance of safety and health considerations in engineering activities;*

3.3 *name and describe the various engineering professional societies;* and

3.4 *explain the requirements for obtaining engineering licensure.*

**c. Instrumentation**

Sample questions used for MPO determination are presented in the table below. A minimum of two questions pertaining to each MPO were used during the semester for the evaluation of student achievement of the MPOs.

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| --- | --- |
| **MPO** | **Sample Question Used to Determine Student Achievement of MPO** |
| 2.1 *determine the common traits engineers possess and the common activities engineers engage in* | Discuss five traits of a good engineer. |
| 2.2 *explain the importance of communicating with others both orally and in written form* | Discuss the importance of effective communication skills in engineering. |
| 2.3 *discuss the importance of time management in project execution* | As a requirement for the completion of this course you were required to complete a term project. Discuss what was learned from the class project. |
| 2.4 *describe the importance of quality and value in engineering* | Is there any connection between the concepts of project management, productivity, training and quality? Discuss. |
| 3.1 *identify and describe the professional behavior standards, including ethics, under which engineers must perform* | Having watched the class video “Incident at Morales”, can you identify any ethical issues? Briefly discuss. |
| 3.2 *describe the importance of safety and health considerations in engineering activities* | In the class video “Incident at Morales”, what safety actions would you have taken if you were the design engineer of the new chemical plant? |
| 3.3 *name and describe the various engineering professional societies* | Name and describe the services of five engineering professional societies. |
| 3.4 *explain the requirements for obtaining engineering licensure* | What are the requirements for a Professional Engineering License? |

**III. RESULTS**

Based on the results of data collected on exams given during Spring 2011 in ENR 100, all MPOs for the course were achieved. Specifically, the percentages of student mastery of MPOs were as follows:

**SLO #1**

* **MPO 2.1:** *MPO achieved*. 88% of the students answered the questions correctly and 12% answered the questions partially.
* **MPO 2.2:** *MPO achieved*. 81% of the students answered the questions correctly and 19% answered the questions partially.
* **MPO 2.3:** *MPO achieved*. 75% of the students answered the questions correctly and 25% answered the questions partially.
* **MPO 2.4:** *MPO achieved*. 94% of the students answered the questions correctly and 6% answered the questions partially.

**SLO #2**

* **MPO 3.1:** *MPO achieved*. 94% of the students answered the questions correctly and 6% answered the questions partially.
* **MPO 3.2:** *MPO achieved*. 88% of the students answered the questions correctly and 12% answered the questions partially.
* **MPO 3.3:** *MPO achieved*. 75% of the students answered the questions correctly and 25% answered the questions partially.
* **MPO 3.4:** *MPO achieved*. 88% of the students answered the questions correctly and 12% answered the questions partially.

In addition to using exam questions for MPO assessment, several surveys were administered during the semester with interesting results.

* At the end of the second week of the semester, 47% of the students had not purchased the textbook and, at the end of the fourth week of the semester, 29% of the students had still not purchased the textbook.
* In the beginning of the fourth week of the semester, 82% of the students could name at least three topics that were discussed during the previous (third) week of the semester.
* 76% of the students reported having anxiety prior to the first exam, 53% prior to the second exam, 25% prior to the third exam, and 38% prior to the final exam.
* 69% of the students reported doing the assigned homework by themselves, 19% with some help from others, and 12% occasionally copy the homework from other students.
* 13% of the students study two hours per week for the course, 81% three hours per week, and 6% 4 hours per week.

A summary of the MPO assessment findings is presented in the table below.

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| --- | --- | --- | --- | --- |
| **Course Goal** | **MPO** | **Achieved** | **Partially Achieved** | **Not Achieved** |
| **2.** Discuss the type of work that engineers and other professionals perform and describe the specific writing, speaking, mathematics, computer, engineering design, problem-solving and decision-making skills needed to perform such work. | **2.1** Determine the common traits engineers possess and the common activities engineers engage in. |  |  |  |
| **2.2** Explain the importance of communicating with others both orally and in written form. |  |  |  |
| **2.3** Discuss the importance of time management in project execution. |  |  |  |
| **2.4** Describe the importance of quality and value in engineering. |  |  |  |

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| --- | --- | --- | --- | --- |
| **Course Goal** | **MPO** | **Achieved** | **Partially Achieved** | **Not Achieved** |
| **3.** Describe requirements of the engineering profession. | **3.1** Identify and describe the professional behavior standards, including ethics, under which engineers must perform. |  |  |  |
| **3.2**Describe the importance of safety and health considerations in engineering activities. |  |  |  |
| **3.3** Name and describe the various engineering professional societies. |  |  |  |
| **3.4** Explain the requirements for obtaining engineering licensure. |  |  |  |

**CONCLUSION/RECOMMENDATIONS**

Based on the writer's experience (having taught sections of ENR 100 during the previous five semesters at ECC) and as should be expected, absenteeism has a negative effect on student performance in the course, especially regarding sequential topics. The students enrolled in Spring 2011 ENR 100 Section OAC were exceptional. Absenteeism was minimal, the students were focused, prepared their homework on time, performed remarkably well in their exams. Collectively, these attributes, of course, was reflected in their class performance/grades. In fact, no student completing the course earned a grade lower than B.

As stated previously, this particular cohort of students (Spring 2011 ENR 100 Section OAC) were exceptional. However, the following recommendations can be suggested:

* Some students are not able to learn without adequate help. The balance between structure and flexibility must be managed carefully. Too much structure will result in rigidity and too much flexibility will result in insufficient guidance.
* ECC students are very diverse and, therefore, so are their learning styles. Some students need to listen to a lecture, some need to read the text, some need to do both, and some need to make mistakes so they can learn what they don't understand. Instructors should be able to make the distinction and provide the students the amount of help they need to be successful.
* Schedule in-class workshops during which the students work in groups on various topics and, thus, answers can be provided by the instructor on any questions they may have.
* During the first week of the semester, administer an anonymous test on several topics that serve as the foundation of the course. This way any weaknesses the students may have will be identified early and the instructor will be able to provide necessary help to the students.