Expected Outcome 1: Design a system, component, or process

Our graduates have acquired the ability to design systems, components, or processes to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability

Assessment methods

Method: Design Rubric

This rubric considers the following elements: Design Problem and Boundaries, Alternative Designs, Use of Computer-Aided Tools, Application of Engineering Principles, Final Design, Process Economics, Interpretation of Results. Our criterion for success is that 80% of the teams would receive a rating of 'Acceptable' or 'Exceptional' and that less than 10% of the teams would receive a rating of 'Unacceptable'.

Findings:

Considering the spring 2013 data, 99% of the teams scored 'Acceptable' or 'Exceptional' in every category on the design rubric. This outcome is well above our criterion for success, hence we feel our current methods are very satisfactory. During the time period for this assessment report, 62 students graduated from chemical engineering.

How did you use findings for improvement?

The chemical engineering department’s Curriculum Accreditation Planning and Action Committee (CAPAC) has communicated these results to the faculty as well as other stakeholders. The CAPAC is a small committee of 3-5 faculty members that review assessment data, make curriculum changes and policies for the undergraduate program. CAPAC will continue to look for opportunities to improve the program and the learning experience for the students. We continue to look for opportunities to better integrate design elements into all levels of the curriculum.

Additional comments:

None

Method: EBI Survey

Each semester the nationally administered EBI Engineering Student Survey is administered to each of our graduating seniors. We expect that the difference (DIFF) between our student's responses (CHEN) and the All School Average (ALL) should not be less than -0.25 on each survey question or survey factor considered. There were approximately 54 respondents from our department in the EBI survey and there were approximately 1100 responses in total representing 62 institutions.

Findings:

The text and question number of pertinent questions from the EBI survey change slightly each cycle. From the 2012-2013 EBI survey, the following questions pertain to the Design a system,
component, or process outcome. These questions are reproduced, verbatim, below:

Q051. Program Outcomes and Assessment - Skill Development - Degree that engineering education enhanced ability to: Design a system, component, or process to meet desired needs

Q072. System Design - To what degree did your system design experience address the following: Economic issues

Q079. System Design - To what degree did your system design experience address the following: Sustainability issues

Q073. System Design - To what degree did your system design experience address the following: Environmental issues

Q078. System Design - To what degree did your system design experience address the following: Manufacturability issues

Q081. Laboratory Facilities

Q080. Laboratory Facilities [duplicate, sic]

Q074. System Design - To what degree did your system design experience address the following: Social issues

Q075. System Design - To what degree did your system design experience address the following: Political issues

In 2013, our scores on the above questions from the EBI survey were +0.42, +0.66, +0.35, +0.56, +0.55, 0.02, 0.00, +0.46, +0.42 above the (ALL), respectively. Our ranking ranged from 1st to 23rd of 62 schools participating with most scores in the upper quartile. This is a good indication of the quality of instruction with regard to these issues.

How did you use findings for improvement?

The CAPAC Committee has communicated these results to the faculty as well as other stakeholders. We will continue to look for opportunities to improve the program and the learning experience for the students.

Additional comments:

None
Expected Outcome 2: Design and conduct experiments, analyze data

Our graduates have acquired the ability to design and conduct experiments, as well as to analyze and interpret data.

Assessment methods

Method: Data Analysis, Experimental Design Rubric

This rubric considers the following elements: Effectiveness of Experimental Design and/or Procedures, Execution of Procedures, Statistical Methods: Error Analysis, Regression, ANOVA, Focus of Results and Discussion, Interpretation of Data. Our criterion for success is that the score of 80% of the teams is “Acceptable” or “Exceptional” and that the score of less than 10% of the teams is “Unacceptable”.

Findings:

Considering the Spring 2013 data, 100% of students scored ‘Acceptable’ or ‘Exceptional’. This outcome is well above our criterion for success, hence we feel our current methods are very satisfactory. We will continue to identify the weaknesses and revise the course and teaching methods to improve.

How did you use findings for improvement?

The CAPAC Committee has communicated these results to the faculty as well as other stakeholders. We will continue to look for opportunities to improve the program and the learning experience for the students. We continue to look for opportunities to better integrate design elements into all levels of the curriculum.

Additional comments:

None

Method: EBI Survey

Each semester the nationally administered EBI Engineering Student Survey is administered to each of our graduating seniors. We expect that the difference (DIFF) between our student’s responses (CHEN) and the All School Average (ALL) should not be less than -0.25 the All School Average on each survey question or survey factor considered. There were approximately 54 respondents from our department in the EBI survey and there were approximately 1100 responses in total representing 62 institutions.

Findings:

The text and question number of pertinent questions from the EBI survey change slightly each cycle. From the 2012-2013 EBI survey, only one question pertained to the Design and conduct experiments, analyze data outcome. The question is reproduced, verbatim, below:

Q048. Program Outcomes and Assessment - Skill Development - Degree that engineering education enhanced ability to: Design experiments

In 2013, our score on the EBI survey question was +0.19 above the (ALL). Our rank for the pertinent question was 11 of 62 in the nation for all questions. This is a good indication of the quality of instruction with regard to these issues.
How did you use findings for improvement?

The CAPAC Committee has communicated these results to the faculty as well as other stakeholders. We will continue to look for opportunities to improve the program and the learning experience for the students.

Additional comments:

None

Expected Outcome 3: Apply mathematics, science, and engineering

Our graduates have acquired and can apply knowledge in the areas of mathematics, science and engineering to solve problems encountered in the practice of chemical engineering.

Assessment methods

Method: EBI Survey

Each semester the nationally administered EBI Engineering Student Survey is administered to each of our graduating seniors. We expect that the difference (DIFF) between our student’s responses (CHEN) and the All School Average (ALL) should not be less than -0.25 the All School Average on each survey question or survey factor considered. There were approximately 54 respondents from our department in the EBI survey and there were approximately 1100 responses in total representing 62 institutions.

Findings:

The text and question number of pertinent questions from the EBI survey change slightly each cycle. From the 2012-2013 EBI survey, the following questions pertain to the Apply mathematics, science, and engineering outcome. These questions are reproduced, verbatim, below:

Q047. Program Outcomes and Assessment - Skill Development - Degree that engineering education enhanced ability to: Apply your knowledge of engineering

Q046. Program Outcomes and Assessment - Skill Development - Degree that engineering education enhanced ability to: Apply your knowledge of science

Q045. Program Outcomes and Assessment - Skill Development - Degree that engineering education enhanced ability to: Apply your knowledge of mathematics

In 2013, the DIFF values for these questions was +0.42, +0.34 and +0.32, respectively. Our rank in the (ALL) was 5th-7th of 62 nationally on all questions. Thus, we were successful in meeting our target level.

How did you use findings for improvement?

The CAPAC Committee has communicated these results to the faculty as well as other stakeholders. We will continue to look for opportunities to improve the program and the learning experience for the students.

Additional comments:
Method: Progress Assessment Course Exam CHEN2AA0

The exam consists of 5 “show work” questions and 15 multiple choice questions similar to those seen in standard “course outlines” such as the Schaum’s Series and other study aids. Show work questions require the student to write out the intermediate steps of the problem solution and may involve construction of a figure, graph or chemical equation. Show work questions are graded based on the accuracy, completeness and solution method employed. Students are required to achieve at least 60% in order to pass the exam and course. Our criterion for success is that the score of 50% of the students pass the exam the first time attempted and that at least 80% pass the exam by the third attempt.

Findings:

We have found during 2013 that 60% of students passed the exam on the first attempt and 96% passed by the third attempt. Therefore, we were able to again achieve our target and feel our increased emphasis that was begun years ago continues to be successful. In general our students struggle with retention of basic knowledge from their math and science courses. The 2AA0 exam assists them in revisiting this material prior to advancing in the Chemical Engineering Curriculum.

How did you use findings for improvement?

The changes made in the orientation sessions of CHEN2AA0 to provide for much more contact with the students seem to be very effective. During the orientation sessions, the course instructor goes through a practice exam with the students to illustrate the expectations of the “show work” problems and to illustrate the type of problems to expect on the exam. We will continue to use this format in the course and the progress assessment exam.

Additional comments:

None
Expected Outcome 4: Proficiency in oral communication

Our graduates have acquired the ability to communicate effectively when employing oral communications.

Assessment methods

Method: EBI Survey

Each semester the nationally administered EBI Engineering Student Survey is administered to each of our graduating seniors. We expect that the difference (DIFF) between our student’s responses (CHEN) and the All School Average (ALL) should not be less than -0.25 the All School Average on each survey question or survey factor considered. There were approximately 54 respondents from our department in the EBI survey and there were approximately 1100 responses in total representing 62 institutions.

Findings:

The text and question number of pertinent questions from the EBI survey change slightly each cycle. From the 2012-2013 EBI survey, only one question pertained to the proficiency in oral communication outcome. The question is reproduced, verbatim, below:

Q058. Program Outcomes and Assessment - Skill Development - Degree that engineering education enhanced ability to: Communicate using oral progress reports

Our 2013 data reflected a DIFF value of +0.30. Our national ranking was 10 of 62. This is still very acceptable.

How did you use findings for improvement?

We continue to stress the importance of oral communications throughout our curriculum and hope to move upward in the ranking because of these efforts.

Additional comments:

None

Method: Oral Communications Rubric

This rubric considers the following elements: Organization & Structure, Content & Knowledge, Visual Aids & Neatness, Delivery & Speaking Skills, and Presentation Length. Our criterion for success is that 80% of the teams would receive a rating of ‘Acceptable’ or ‘Exceptional’ and that less than 10% of the teams would receive a rating of ‘Unacceptable’

Findings:

In 2013, 97% of teams received the marks of “Acceptable” or “Exceptional”, thus exceeding our target. This is very acceptable performance.

How did you use findings for improvement?

Video taping of student presentations is being done so that presentations can be reviewed and critiqued. Additionally, poster sessions are being used in lower level courses where students are publicly displaying the results of mini-projects and communicating with public viewer of their posters.
Expected Outcome 5: Proficiency in written communications

Our graduates have acquired the ability to communicate effectively when employing written communications.

Assessment methods

Method: EBI Survey

Each semester the nationally administered EBI Engineering Student Survey is administered to each of our graduating seniors. We expect that the difference (DIFF) between our student’s responses (CHEN) and the All School Average (ALL) should not be less than -0.25 the All School Average on each survey question or survey factor considered. There were approximately 54 respondents from our department in the EBI survey and there were approximately 1100 responses in total representing 62 institutions.

Findings:

The text and question number of pertinent questions from the EBI survey change slightly each cycle. From the 2012-2013 EBI survey, only one question pertained to the proficiency in written communications outcome. The question is reproduced, verbatim, below:

Q059. Program Outcomes and Assessment - Skill Development - Degree that engineering education enhanced ability to: Communicate using written progress reports

Our 2013 data reflected a DIFF value of +0.53. The department’s national ranking was 4th of 62. This is very acceptable.

How did you use findings for improvement?

Despite our solid ranking, we continue to stress the importance of written communications throughout our curriculum.

Additional comments:

None

Method: Written Communications Rubric

This rubric considers the following elements: Organization & Style, Content & Knowledge, Format & Aesthetics, Spelling & Grammar, References. Our criterion for success is that 80% of the teams would receive a rating of ‘Acceptable’ or ‘Exceptional’ and that less than 10% of the teams would receive a rating of ‘Unacceptable’

Findings:

From the spring 2013 data, 97% of teams produced technical reports earning marks of “Acceptable” or “Exceptional” from our faculty instructor and external reviewers. This is very acceptable performance.
How did you use findings for improvement?

We will continue to stress 'doing one's best' and 'meeting professional expectations' in several of our undergraduate courses. We are currently considering altering the course(s) in which technical writing is taught and assessed.

Additional comments:

None

Expected Outcome 6: Leadership and teamwork

Our graduates have acquired an ability to function effectively on multidisciplinary teams.

Assessment methods

Method: EBI Survey

Each semester the nationally administered EBI Engineering Student Survey is administered to each of our graduating seniors. We expect that the difference (DIFF) between our student’s responses (CHEN) and the All School Average (ALL) should not be less than -0.25 the All School Average on each survey question or survey factor considered. There were approximately 54 respondents from our department in the EBI survey and there were approximately 1100 responses in total representing 62 institutions.

Findings:

The text and question number of pertinent questions from the EBI survey change slightly each cycle. From the 2012-2013 EBI survey, only one question pertained to the leadership and teamwork outcome. The question is reproduced, verbatim, below:

Q052. Program Outcomes and Assessment - Skill Development - Degree that engineering education enhanced ability to: Function on multidisciplinary teams

In 2013, the DIFF value was +0.48. This merited a national ranking of 8th out of 62 nationally and thus shows an acceptable level of performance in this category.

How did you use findings for improvement?

Despite our improved ranking, we continue to stress the importance of leadership and teamwork throughout our curriculum.

Additional comments:

None

Method: Other Work Skills Rubric

This rubric considers the following elements: Need for Life-Long Learning, Teamwork. Our criterion for success is that 80% of the teams would receive a rating of ‘Acceptable’ or ‘Exceptional’ and that less than 10% of the teams would receive a rating of ‘Unacceptable’.

Findings:

In 2013, we found that 98% of teams were considered Acceptable or Exceptional with regard to leadership and team-work related issues. Even though this is obviously acceptable considering
our target, we recognize the importance in today’s marketplace of leadership and teamwork. Hence we are satisfied with our methods to cover this outcome.

**How did you use findings for improvement?**

More undergraduate courses are employing special team projects and ‘make it real’ experiments to foster leadership and teamwork.

**Additional comments:**

None

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**Expected Outcome 7 : Contemporary, Environmental, Safety, Public issues**

Our graduates have acquired the broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context. Our graduates have acquired an understanding of contemporary issues and their impact on the professional practice of chemical engineering.

**Assessment methods**

**Method : EBI Survey**

Each semester the nationally administered EBI Engineering Student Survey is administered to each of our graduating seniors. We expect that the difference (DIFF) between our student’s responses (CHEN) and the All School Average (ALL) should not be less than -0.25 the All School Average on each survey question or survey factor considered. There were approximately 54 respondents from our department in the EBI survey and there were approximately 1100 responses in total representing 62 institutions.

**Findings:**

The text and question number of pertinent questions from the EBI survey change slightly each cycle. From the 2012-2013 EBI survey, the following questions pertain to the Design a system, component, or process outcome. These questions are reproduced, verbatim, below:

Q069. To what degree did your engineering education enhance your ability to understand the impact of engineering solutions in: A global/societal context

Q071. To what degree did your engineering education enhance your ability to understand the impact of engineering solutions in: An environmental context

Q070. To what degree did your engineering education enhance your ability to understand the impact of engineering solutions in: An economic context

Q061. Program Outcomes and Assessment - Skill Development - Degree that engineering education enhanced ability to: Understand contemporary issues

Our 2013 data reflected a DIFF values of +0.45, +0.62, +0.59 and +0.20, respectively, with ranking of 3rd to 13th of 62 in the nation. Although we have met our criteria, we are making significant changes to the curriculum to accommodate changes in our professional accreditation in 2016.
How did you use findings for improvement?

We are proud of the emphasis in this outcome in our curriculum. We understand that our professional accreditation will place a greater importance on safety and related matters beginning next year. Therefore, we will need to reevaluate how we provide coverage of this material.

Additional comments:
None

Method: Ethics, Safety, Society, Environment Rubric

This rubric considers the following elements: Professional Integrity & Ethical Decision Making, Safety & Health Issues, Environmental Aspects, Public Interest & Societal Impact. Our criterion for success is that 80% of the teams would receive a rating of ‘Acceptable’ or ‘Exceptional’ and that less than 10% of the teams would receive a rating of ‘Unacceptable’

Findings:

In 2013, our faculty instructor and external reviewers found that 95% of design teams demonstrated an Acceptable or Exceptional awareness of the ethical, safety, health, environmental and public interest issues related to the practice of chemical engineering. This level of performance is quite acceptable.

How did you use findings for improvement?

We are continuing to employ a ‘contemporary issue’ assignment in each chemical engineering course where appropriate to further sensitivity to these issues. Additionally, our professional accreditation requires a greater depth of safety awareness, and we are considering modifications of our core courses to effect this change.

Additional comments:
None