

Assessment Update 2009

Prepared: July 27, 2009

CHBE assessment activities during AY 2008-09 included the following:

- Inputs Assessment
 - Threshold Response Review
 - Course Reviews: all CHBE courses
Note: The Faculty modified to course assessment process in May 2008, and decided to apply the new process to all courses in 2008-09. Starting Fall 2009 we will return to reviewing one-third of the courses each year.
- Direct Outcomes Assessment
 - Final Design Reports (Outcome C)
 - Senior Lab Reports (Outcomes B and G)
 - Various Examples of Student Work (Outcomes H, I, and J)
 - Intern Performance Evaluations (Outcome D)
- Objectives Assessment (no scheduled assessment in 2008-09)
- Assessment Plan Review
 - Response Thresholds

Details of Assessment Activities

Inputs Assessment

- **Threshold Response Review**

The Faculty tightened the response thresholds proposed by the Department Head. DAC review occurred in March 2009. New response thresholds are as follows:

Tool	Scale	Threshold
Student Portfolio Assessment Rubrics	0 – unacceptable 1 – marginal 2 – acceptable 3 – exceptional	Combined score for any outcome below 2.0 invokes inquiry.
Senior Exit Interviews	1 – poor 2 – not well 3 – fairly well 4 – well 5 – very well	Combined score for any outcome below 3.0 invokes inquiry.
Alumni Surveys - Objectives	1 – poor 2 – fair 3 – average 4 – good 5 – excellent	Combined score for any objective below 3.0 invokes inquiry.
Alumni Surveys – Strengths and Abilities	1 – poor 3 – average 5 – strong	Combined score for any objective below 3.0 invokes inquiry.
Employer Surveys	Not Quantitative	DAC members and faculty review employer comments
FE Exam Results –		DAC members and faculty review results. Scores below national average

Overall Pass Rate		invokes faculty inquiry.
FE Exam Results – Individual Topics		DAC members and faculty review results. Scores below national average discussed by faculty for potential response. (Not all lower than average scores require responses, or rather, the decision may be to not respond in some cases.)

- **Response to Outcome C Deficiency**

Two of five reviewers gave scores of 1 (marginal) on one assessment element of Outcome C: Has safety been considered appropriately? The other three reviewers gave that element a 2 (acceptable). The average is 1.6, below the threshold of 2, thereby invoking an “inquiry”.

Note: The two reviewers giving marginal scores reviewed different design reports.

Faculty Response:

The Design instructor has already responded by moving safety lectures earlier in CHBE 412. A Design Report Guide will be developed to help students cover all required areas. A Safety section will be a required component of design reports from this point on.

We will assess outcome C again using this year’s final design reports by sending sample reports to DAC members (the members who were unable to attend this year’s DAC meeting so that we get fresh eyes) with the Outcome C scoring rubric. The assessment outcome will be presented to the faculty as soon as it is available so that additional responses can be made, if needed.

DAC Review and Response

- I have reviewed some of student design reports and determined that satisfactory steps have been taken to address the deficiency relating to safety.
- Safety in Senior Design Reports. Fish oil: score = 2/acceptable. Craft Brewery: score = 2/acceptable (would have been a 3 except for suggesting signs rather than mechanical guarding)
- Safety in Senior Design Reports: I viewed the Coal Bed Methane Water Treatment Project and the Coal to Methanol Projects. I rated both at level 2, "Safety awareness has clearly been part of the proposed design." Each could have been improved by emphasizing safety early on, for example, in the early summary. The report would point out that, like the economics, safety will be getting close scrutiny at every step of the way throughout the design, construction, and operation of the project to all of the stakeholders.
- Benzene Remediation: 3 Exceptional, Demonstrated understanding of basic process safety through use of HAZOP which was beyond just personal (slips, trips, and falls).
- Coal Bed Methane Water Treatment: 1 Marginal, Only discussed safety from a very high level and did not indicate specific process design elements for building an inherently safer plant.
- Craft Brewery: 3 Exceptional, This team recommended process related equipment beyond the use of procedural barriers, dependant on human intervention.
- Safety in Senior Design Reports. Benzene: score = 3/excellent. CO2 Sequestration: score = 2/ acceptable. I actually thought they were both pretty good, especially the HAZOP portions. I had a slight impression that the Benzene folks took it a little more seriously.

- I took a look at four of the reports – those that look like they would have the most substantial safety concerns (e.g., methanol synthesis). The quality of the safety considerations was highly variable. I did like the inclusion of the HAZOP analysis. However, there were a number of superficial suggestions. I did not see an instance of where safety was built into the system. Most of the time it was suggested that a sensor be put into the system to detect the failure. How about a fail-open (or fail-closed) valve where appropriate to make the system fail-safe rather than relying on sensors (think of what happened at Three Mile Island). I would also like to have seen details given. Rather than just saying that personal protective equipment is needed, specify what equipment (ear protection, steel-toes shoes, respirators, air packs, etc.) is actually needed. Saying the operators need PPE is easy to write without really understanding what it means. What I saw was an improvement. In some cases the students did an excellent job; in others clearly more thought about safety was needed.

- **Course Reviews**

All CHBE courses were reviewed in 2008-09. The review process was as follows:

1. The faculty member prepared a course notebook containing:
 - The Instructor's assessment of the course:
 - Expected primary and secondary outcomes
 - Major changes since last review
 - Instructor's assessment
 - Student assessment summary
 - Overall assessment
 - All course handouts
 - Syllabus
 - Instructional Outcomes
 - Other handouts
 - Homework Problems
 - Exams
2. The assessment was distributed to faculty members at a faculty meeting, and presented by the instructor. The course notebook was passed around as the course was discussed.
3. Faculty members discussed the course and the assigned outcomes. Changes to expected outcomes were recorded if needed.
4. Ultimately, the Department Head asked for a vote on whether the course as presented has the potential to meet the expected outcomes.

There were some updates of the expected outcomes for the courses, but all votes were positive.

Outcomes Assessment

- **CHBE 411 Interim Design Report, Outcome g (ability to communicate effectively)**

Interim Design Reports were collected and assessed by faculty and DAC members. The DAC concluded that the targeted outcome is being met, and that the assessment rubric was useful.

Objectives Assessment

There were no scheduled objective assessment activities in 2008-09.

Assessment Plan Review

- **Course/Outcomes Matrix**

The matrix relating courses to program outcomes was reviewed as the courses were reviewed. Some updates were made.

- **Response Thresholds**

Response thresholds as updated by the Faculty in 2008 were approved by faculty and DAC.

Department Advisory Committee (DAC) Input

The complete DAC Report to Faculty is available on the Department's Assessment website. Only the Assessment Results are included here.

ABET Assessment Results

The DAC evaluated the following ABET accreditation categories

Students will have:

B. The ability to design and conduct experiments as well as to analyze and interpret data

C. The ability to design a system, component, or process to meet desired needs

D. The ability to function on multi-disciplinary teams

G. The ability to communicate effectively

H. Broad education necessary to understand the impact of engineering solutions in a global / societal context

I. Recognition of the need for and ability to engage in lifelong learning

J. Knowledge of contemporary issues

ABET Assessment Results, cont'd...

The DAC found all the areas listed above to be performing at, or well above average. The lowest performing area was "C", the ability to design a system, component, or process to meet desired needs. The committee felt Senior Capstone reports to be weak in the areas of process related safety issues and communication through the use of process flow diagrams.

- The DAC felt both staff and students both demonstrated exceptional research ability as evident in Final Design Reports, Senior Lab Results, Coursework, and discussions with students.
- The DAC recommends the following to demonstrate competency in the area of multi-discipline teams
 - The DAC felt the assessment rubric presented by Dr. Carolyn Plumb for ENGR 310 was a good measure and should be maintained
 - The DAC felt the selection of projects carries a very important role in the learning opportunity for ENGR 310. The committee recommends addition of pre-defined structured problem statements, so members from each engineering discipline can contribute to the technical design.
 - The DAC recommends internship evaluations be continued and encouraged (in addition to ENGR 310) as a 3rd party evaluation of program.