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Subject: More ideas for course embedded assessment

Here is a list of our program outcomes and possible ways to apply course embedded assessment within our program.

a. **An ability to apply knowledge of mathematics, science, and engineering**.

Our current interpretation: Students should gain a fundamental background in relevant mathematics, science and engineering, including a minimum of four of the major recognized civil engineering areas and upon graduation can apply this knowledge in graduate school and/or engineering practice.

Suggested rewording: Students should gain a fundamental background in relevant mathematics, science and engineering [and can apply this knowledge in engineering courses.]

Possible rubrics for course embedded assessment:

- Can determine the appropriate formula or scientific approach for a particular engineering problem.
- Can manipulate formulas to find a desired quantity.
- Can solve engineering science problems (also see Outcome d).
- Can apply engineering science concepts to an engineering design problem.
- Can derive an engineering formula from mathematical, scientific, or engineering science principles.

Other direct assessment. This outcome will also be directly assessed in the following ways: (1) with the senior design capstone sequence (see "Design" in the CE481/482 grade descriptors), and (2) with the Fundamentals of Engineering Examination.

b. **An ability to design and conduct experiments, as well as to analyze and interpret data.**

Our current interpretation: Students should be able to plan an investigative program, conduct experiments, analyze experimental data, and properly interpret results.

Suggested rewording: none

Possible rubrics for course embedded assessment:

- After instruction, can conduct a laboratory procedure with minimal supervision.
- After analysis, can interpret the results: the reasonableness or correctness of the results, the precision of the results, or the application of results to a pre-assigned engineering problem.
- Can write a proposal for addressing an engineering problem, including the following. Can write a simple statement of the scope of work. Can present an organized program for fulfilling the scope of work. Can identify personnel or equipment required by the program.

Other direct assessment. This outcome will also be directly assessed with the senior design capstone sequence.

c. **An ability to design a system, component, or process to meet desired needs**.

Our current interpretation: Students should be able to identify civil engineering problems based on societal needs, establish design criteria, use appropriate design tools, evaluate alternatives, and select a solution based on optimization and cost analysis.

Suggested rewording: Students should be able to identify civil engineering problems, establish [or apply] design criteria, use appropriate design [methods], evaluate alternatives, and select [an appropriate solution].

Possible rubrics for course embedded assessment:

- Can identify a civil engineering problem (see Outcome e).
- Can apply established design criteria to design an engineering system, component, or process.
- Can use appropriate design methods to design an engineering system, component, or process.
- Can evaluate alternative solutions to select an appropriate solution.

Other direct assessment. This outcome will also be directly assessed with the senior design capstone sequence (see "Design" in the CE481/482 grade descriptors).

d. **An ability to function on multi-disciplinary teams**.

Our current interpretation: Students work on teams to apply the design process. These teams may include students within the civil engineering discipline, from other engineering disciplines, or from science and other disciplines.

Suggested rewording: Students can function on teams [to complete tasks] and to apply the design process. These teams may include students within the civil engineering discipline, from other engineering disciplines, or from science and other disciplines.

Possible rubrics for course embedded assessment:

- Students can collaborate on an assigned task.
- Students can organize the delivery of products for an assigned task.
- Students can collaborate in applying the design process.

Other direct assessment. This outcome will also be directly assessed with the senior design capstone sequence (see "Group interaction" in the CE481/482 grade descriptors).

e. **An ability to identify, formulate, and solve engineering problems**.

Our current interpretation: Students should gain higher level thinking skills (analysis, synthesis, and integration) and use these skills to identify problems related to civil engineering and develop workable solutions.

Suggested rewording: Students should gain higher level thinking skills (analysis, synthesis, and integration) and use these skills to identify problems related to civil engineering and develop [suitable solutions].

Possible rubrics for course embedded assessment:

- Can identify a problem by defining the problem expectations.
- Can identify a problem by collecting information about the problem and determining which information is important and which information is extraneous.
- Can formulate a problem by selecting the appropriate formula, theory, or principles that apply to the problem.
- Can formulate a problem by sketching or other graphics, when appropriate.
- Can formulate a problem by making appropriate assumptions, when necessary.
- Can solve a problem by applying the problem formulation.
- Can solve a problem by identifying the solution and giving the appropriate units, if applicable.
- Can solve a problem by verifying the reasonableness of the result.

Other direct assessment. This outcome will also be directly assessed in the following ways: (1) with the senior design capstone sequence (see "Design" in the CE481/482 grade descriptors), and (2) with the Fundamentals of Engineering Examination.

f. **An understanding of professional and ethical responsibility**.

Our current interpretation: Students should have an understanding of the importance of ethical behavior in the civil engineering profession.

Suggested rewording: None.

Possible rubrics for course embedded assessment:

To be discussed in 2005 - 2006

Other direct assessment. This outcome will also be directly assessed in the following ways: (1) with the senior design capstone sequence (see "Ethics" in the CE481/482 grade descriptors), and (2) with the Fundamentals of Engineering Examination.

g. **An ability to communicate effectively**.

Our current interpretation: Individually and cooperatively, students should be able to communicate engineering results through written technical engineering reports and oral presentations.

Suggested rewording: none.

Possible rubrics for course embedded assessment:

- Can organize a written work.
- Can describe in writing the purpose of the work.
- Can provide in writing suitable background information related to the work.
- Can clearly present, in writing, results, conclusions, and recommendations related to the work.
- Can write clearly and concisely.
- Can organize an oral presentation.
- Can effectively use visual aids in an oral presentation.
- Can deliver an oral presentation clearly and with minimal distractions.

Other direct assessment. This outcome will also be directly assessed with the senior design capstone sequence (see "Presentation" in the CE481/482 grade descriptors).

h. **The broad education necessary to understand the impact of engineering solutions in a global and societal context.**

Our current interpretation: Students should gain an understanding of the global, societal and environmental impacts of the civil engineering profession.

Suggested rewording: [Students should be exposed to courses outside of engineering and the sciences that provide the opportunity to] gain an understanding of the global, societal and environmental impacts of the civil engineering

profession.

Possible rubrics for course embedded assessment:

To be discussed in 2005 - 2006

Other direct assessment. This outcome will also be directly assessed with the senior design capstone sequence (see "Research and resourcefulness" in the CE481/482 grade descriptors).

i. **A recognition of the need for, and an ability to engage in life-long learning.**

Our current interpretation: Students should understand the need for and the methods of lifelong learning and career development, including graduate school, licensing, certification, continued education, and participation in professional societies.

Suggested rewording: Students should understand the need for and the methods of lifelong learning and career development, including graduate school, licensing, certification, continued education, and participation in professional societies.

Possible rubrics for course embedded assessment:

- Can articulate the need for continued education and participation in professional activities.
- Can recognize problems that require learning beyond that attained in their curriculum.
- Can engage in self-study to acquire learning beyond that attained in their curriculum.

Other direct assessment. This outcome can be directly assessed through surveys of students that pursue post-graduate studies (Were graduates able to successfully complete the post-graduate degree? Were graduates adequately prepared for post-graduate studies?). The outcome can also be directly assessed through the capstone course sequence (see "Research and resourcefulness" in the CE481/482 grade descriptors).

j. **A knowledge of contemporary issues**.

Our current interpretation: Students should keep abreast of new developments related to civil engineering, such as understanding the contract bidding and selection process as well as modern construction practices.

Suggested rewording: none.

Possible rubrics for course embedded assessment:

To be discussed in 2005 - 2006

Other direct assessment. This outcome will also be directly assessed with the

senior design capstone sequence (see "Research and resourcefulness" in the CE481/482 grade descriptors).

k. **An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice**.

Our current interpretation: Students should be able to use relevant computer software and equipment for engineering analysis, laboratory experiments, production of technical reports and preparation of professional presentations.

Suggested rewording: Students should be able to use relevant computer software and equipment for engineering analysis, laboratory [and surveying] experiments, production of technical reports and preparation of professional presentations.

Possible rubrics for course embedded assessment:

- Can prepare a basic Autocad drawing
- Can use Risa to model a small steel structure.
- Can verify the results of a Risa analysis.
- Can prepare an Excel spreadsheet and use solver and iteration tools
- Can write Matlab scripts and demonstrate the use of loops and conditional structures
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- Can prepare a Powerpoint presentation and deliver it with minimal technical problems.
- Can demonstrate the ability to use modern surveying equipment (also see Outcome b)

Other direct assessment. This outcome will also be directly assessed with the senior design capstone sequence.

l. **An ability to develop a sense of personal, social, and moral responsibility.**

Our current interpretation: Students should develop a sense of personal, social, and moral responsibility.

Suggested rewording: none.

Possible rubrics for course embedded assessment:

To be discussed in 2005 - 2006

/usr1.a/kuhn/admin/assessment/ABETAssessment_Rubrics_Mar05.doc