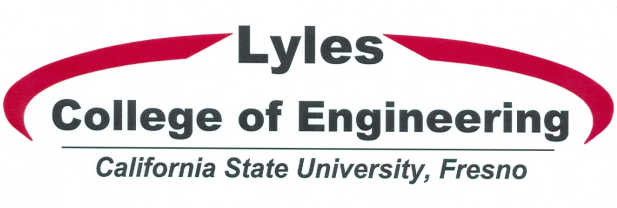


Assessment Project

Title:

Direct Assessment of Student Learning Outcomes via Qualitative Measures

Final Report

Submitted to
IRAP

By
M. Zoghi (LCOE)
on Behalf of:
N. Bengiamin (ECE)
I. Sorensen (ME)
B. Hyatt (CM)
C. Ogaja (GME)
C. Choo (CE)
G. Kriehn (ECE)

20 June 2012

I. Background

The Lyles College of Engineering was awarded $20,000 grant for the proposal entitled: "*Direct Assessment of Student Learning Outcomes via Quantitative Measures*," sponsored by the IRAP on 29 April 2012. The research team, comprising representatives from all programs in LCOE, have been collaborating on this project since May 2011. The following individuals are members of the team:

1. N. Bengiamin (ECE)
2. Ching Chiaw Choo (CE)
3. Brad A. Hyatt (CM)
4. Gregory Kreihn (ECE)
5. Clement Ogaja (GME)
6. Ira Sorenson (ME)
7. M. Zoghi (LCOE)

A progress report, summarizing the results of completed to date, was submitted on 1 March 2012. This final report complements the reference progress report by furnishing the missing data regarding the incomplete tasks, remaining from the date the progress report was submitted.

The original tasks of the proposed study include:

Task 1- Conduct a literature search to identify challenges and opportunities for utilizing grades as an assessment tool.

Task 2 - Examine the SOAPs of different programs in the college and identify two or three learning outcomes to be used in this project.

Task 3 - Examine how the identified learning outcomes are addressed in each program. Identify best practices and attempt to improvise on the present assessment techniques.

Task 4 - Identify at least one course in each program for pilot testing in this project. Preferably a course taught by one of the project members.

Task 5 - Each participant takes one of the courses and structures its activities such that the targeted learning outcomes are explicitly emphasized.

Task 6 - Create common rubrics for assessing the targeted learning outcomes in the courses based on the expected level of competency in the course.

Task 7 - Develop a grading process (system) where the grade addresses specific learning outcomes; mechanize the process as possible.

Task 8 - Develop a system where student grades are monitored per learning outcome. Student's progress can then be monitored in the next course of the sequence and student is informed of progress.

Task 9 - Establish activities and processes to help students, with identified deficiencies in learning outcomes; remove their deficiencies before the last course of the sequence is completed. A final assessment of the targeted learning outcome

takes place in that final course. A process is then put in place to address the student's weakness.

Task 10 - Identify five or six students from different programs to work with project team on addressing the means to engage students in the assessment process.

Task 11 - Implement the developed process in the pilot courses and work with the departments on implementing the proposed grading approach across the curriculum.

Task 12 - Revisit the developed grading system for effectiveness based on results from the Fall '11 pilot courses. Revise the process and test again in Spring '12.

Task 13 - Share findings and devise scheme with the college.

Task 14 - Document findings and prepare a national publication as possible.

Following an introduction, summaries of activities/achievements for different tasks will be presented. Concluding remarks and recommendations will follow the task summaries.

II. Task Summaries

At the onset of the project in early May 2011, the team established a time frame to accomplish the first nine tasks over the summer. These tasks and allotted time frame are tabulated below.

Week	Task 1	Task 2	Task 3	Task 4	Task 5	Task 6	Task 7	Task 8	Task 9
June 1	x	x	x	x					
2	x	x	x	x					
3	x				x	x	x		
4	x				x	x	x		
July 1	x				x	x	x		
2	x				x	x	x		
3					x	x	x		
4					x	x	x		
August 1								x	x
2								x	x
3								x	x
4									

Task 1 – Review of Literature Survey

The first task was to conduct a thorough literature review by each member of the team, related to the grade-based direct assessment, and report the summaries back to the team. The group summarized the potential of effective grading (pros) versus traditional grading (cons) based on readings of available literature. Assessment based grading is referred to as "effective grading" henceforth.

Effective grading (pros):

1) Grades are a major source of data

2) No extra work
3) Grades are objective-quantitative; "Explicit"
4) Grades can be used to improve student learning
5) Grades help students identify their areas of strength/weakness – and the need for improvement

Traditional grading (cons):

1) Grades are based on more than just the learning outcomes.
2) Reflect multiple outcomes lumped together
3) Represent multiple variables lumped together
4) Different instructors will have different grading patterns
5) Can be subjective
6) Overall grades don't provide feedback on specific skills
7) Not suitable to every type of outcome

The group brainstormed about some of the possible **techniques/characteristics** for effective grading:

1. Grades need to be decomposed into the components/indicators of learning outcomes vs. those that are indicators of behaviors.
2. Separate grades into sub-scores to enable the evaluation of students' strength and weaknesses.
3. Clearly articulate criteria that are consistently applied.
4. Activities need to be mapped to learning outcomes.
5. Rubrics should be applied.
6. The grading system must be manageable and not cumbersome.

Task 2 – Review of SOAPs and Identifying Learning Outcomes

The SOAPs of different programs in the college were examined and two or three learning outcomes were identified for use in this project. These entailed:

- Students will have the ability to apply knowledge of mathematics, science, and engineering.
- Students will have the ability to identify, formulate, and solve engineering problems.
- Students should be able to use engineering tools.

Task 3 – Assessment of Learning Outcomes and Determination of Best Practices

Accordingly, the group was charged with identifying at least one course and structuring its activities such that the targeted learning outcomes would be explicitly emphasized. Additionally, common rubrics for assessing the targeted learning outcomes in the identified courses would be created in accordance with the expected level of competency in each designated course. Finally, the group would develop a grading process (system) where the grade addresses specific learning outcomes; mechanize the process as possible.

The identified courses, common rubrics, and the grading process are listed in subsequent sections.

Task 4 – Identifying One Course (in Each Program) for Implementing the Proposed Assessment Method

The group identified courses with potential commonality of outcomes. The following are courses proposed by each department/program:

Fall 2011

- Electrical Engineering: ECE 151, ECE 186 (proposed by Dr. Bengiamin)
- Computer Engineering: ECE 124 (proposed by Dr. Kriehn)
- Civil Engineering: CE 130 and/or CE 132 (proposed by Dr. Choo)
- Geomatics Engineering: GME 143 and/or GME 181 (proposed by Dr. Ogaja)
- Construction Management: CM 166 and/or CM 144 (proposed by Prof. Hyatt)
- Mechanical Engineering: ME 115 and/or ME 156 (proposed by Dr. Sorensen)

Spring 2012

- Electrical Engineering: ECE 186B, Senior Design II (Dr. Bengiamin)
- Computer Engineering: ECE 155, Control Systems (Dr. Kriehn)
- Civil Engineering: CE 130, Theory of Structures (Dr. Cho)
- Geomatics Engineering: GME 145 (Dr. Ogaja)
- Construction Management: CM 164, Building Electrical Systems (Prof. Hyatt)
- Mechanical Engineering, ME 159, Mechanical Engineering Laboratory (Dr. Sorensen)

Task 5 – Finalize the Courses and Structure Their Activities Such that the Targeted Learning Outcomes are explicitly emphasized

Following is the final list of courses adopted by the individual team members from respective programs for the grade-based direct assessment.

Fall 2011

- ECE 151
- ECE 124
- CE 121
- GME 143
- CM 162
- ME 156

Spring 2012

- ECE 186B
- ECE 155
- CE 130
- GME 145
- CM 164
- ME 159

There was a general agreement that "applying mathematics, science and engineering" is practically an integral part of most (if not all) graded students' work in almost all technical engineering courses. Therefore, the overall grade in these courses can be one of the methods to accurately measure achieving this learning outcome. Similar learning outcomes may need to be identified to streamline the assessment process!

After a deliberation, the consensus was to assess highly emphasized learning outcomes in each course with a grade while less emphasized outcomes should be highly emphasized in other courses such that the grade in these courses ensure achieving that learning outcome. Only then, passing the courses of the curriculum may insure achieving multiple learning outcomes. Identified weaknesses in less emphasized outcomes for students who pass the course, may require remedial action through a follow-up course or in the culminating experience. Furthermore, to reduce the burden of grading for assessment, it was discussed that asking students to self assess their work according to an assessment rubric may help students identify their weaknesses and work on correcting them. Also, the instructor would evaluate students' self-assessment and provide objective feedback.

Task 6 – Create Common Rubrics

It was evident that it would be desirable to create generally uniform rubrics across the board as possible. These rubrics need to be simple and easy to be utilized by students. Perhaps each identified course should assign a level of significance to each learning outcome and the grade should reflect that level of significance. The less significant learning outcomes can be still assessed but will receive a lesser weight. These latter learning outcomes can be assessed further via other courses in the program, where they are considered highly significant.

In light of above guidelines, various programs developed different rubrics. Others deemed the rubric developed by Dr. Choo for CE 121, Mechanics of Materials course, a good example for use. In this course, two separate student-learning outcomes have been selected: (1) Apply knowledge of math and science in engineering; and (2) Provide solutions to engineering problems. Furthermore, a 0-4 grade point scale has been employed for assessment purposes.

Task 7 – Develop a Grading System

It was proposed that the grading scheme of courses should be structured such that a final passing grade signifies satisfactorily achieving the highly significant outcomes as a minimum.

Task 8 – Monitor Student Grades in Relation to Learning Outcomes

Accordingly, each identified course would assign a level of significance to each learning outcome and the grade will reflect that level of significance. The less significant learning outcomes can be still assessed but will receive a lesser weight. These latter learning outcomes can be assessed further via other courses in the program, where they will be considered highly significant.

The above scheme has been implemented successfully in all designated courses, listed previously, and the results are included in the attached courses summaries.

Task 9 – Continuous Monitoring and Improvement of Student Learning in Subsequent Courses

Student grades, per learning outcome(s), were determined during the fall semester; deficiencies were identified and, as appropriate, were followed through during the spering semester to close the loop.

Task 10 – Students Focus Group

The criteria for selecting the student group was to comprise of six students total; one from each program. It was important to identify students with strong communication and critical thinking skills. Each student was allotted $300 stipend ($12/hour for a total of 25 hours).

The following students constitute the list of student focus group:

- David Ponce-Dick (Civil Engineering)
- Steve Field (Construction Management)
- Mark Barry (Geomatics Engineering)
- Ron Flautz (Mechanical Engineering)
- Songita Choudhury (Electrical Engineering)
- Christopher Krohn (Computer Engineering)

Task 12 – Student Learning Outcomes (SLOs) Assessment via Grading – Student Focus Group

The following objectives and activities were identified for student group's contributions.

Objectives

1. Bring awareness among students regarding SLOs (and common assessment practices).
2. Incorporate students' perspective into this project.
3. Help establish a new culture of grades as an assessment tool among faculty/students.

Activities

Fall Semester:

Task 1 - Meet with the assessment faculty group for acquaintance of the scope of the project and to receive a packet that includes a copy of the SOAPs, designated course syllabi including assessment rubrics, and a list of tasks to be completed.
Task 2 - Meet to select a group leader and develop a plan. Discuss the material received and review the remainder of the tasks for a time schedule. (One faculty member present)
Task 3 - Review samples of graded students work and provide input relative to feedback to students by the course instructor as part of grading. Each group member prepares a review statement.
Task 4 - Meet to discuss findings and prepare for holding a student focus group. (One faculty member present)

Spring Semester:

Task 4 - Hold a "student focus group" activity to discuss SLOs and the assessment process. Invite students from student organizations and junior/senior level classes. (Prepare a summary document.)
Task 5 - Visit classes (teams of two) to inform students of SLOs and assessment activities. Visit two classes in each program.
Task 6 - Meet with the faculty team to share thoughts and experiences.
Task 7 - Review samples of graded students work and provide written comments.

Summaries of student group's activities during fall and spring semesters are enclosed.

Task 13 – Share Findings and Devise Scheme with LCOE Faculty

This task will be carried out at the conclusion of the project, at the beginning of fall semester (2012).

Task 14 – Compile the Results in a Final Report and Disseminate the Findings

At the conclusion of the spring semester, each faculty member who had participated in this project, submitted a final report (as part of the course assessment submittal) which included his experience in adopting the grade-based direct assessment technique. In addition, student focus group drafted a final report summarizing their interpretations. All these reports are enclosed in the appendix. Following is a distillation of faculty and student groups' observations/ recommendations:

- The two student learning outcomes (SLOs) common among all courses assessed were:

  - *Ability to apply knowledge of mathematics and engineering sciences*
  - *Ability to formulate and solve engineering problems*

- The effective grading rubrics, adopted by all faculty members in the project, are based on a 4-point distribution (exhibited in all attached syllabi). A representative sample of the rubric can be found in CE 130. In a nutshell, the faculty and students reported that though rubric-grading system is subjective, it does highlight student's strengths and weaknesses.

- A class survey was also conducted for the reference courses. The results of these surveys are included in syllabi of all courses. In particular, questions (d) and (e) are directly related to the aforementioned rubrics. These questions are reproduced below:

  - *Assessment rubrics were direct and effective (i.e., reflective of course outcomes) – (d)*
  - *Use of assessment rubrics provided an opportunity to enhance learning – (e)*

- Overall, faculty members have mixed feelings in adopting the assessment-based grading scheme. They all believe that the principle of effective grading is sound and provides a better insight into student learning of outcomes being assessed. It is, however, cumbersome and time-consuming to implement (specially in relation to large classes), reflect the majority of faculty.

- Student group's reflections, summarized in their enclosed final report, reveal that effective grading and the proposed rubric have the best results if introduced at lower level courses first. Faculty should take time to thoroughly explain the technique with myriad of examples. In essence, one needs to develop a new culture of grading and assessing courses (i.e., grade-based direct assessment). This was evident with students who were first introduced to the new effective grading system in the fall and subsequently continued in the spring semester. They performed better and had a greater appreciation for the significance of the new approach.

- The student group also mentioned that the current textbooks are not published for the new effective grading approach and the problems/questions are not conducive to this way of teaching and evaluating.

The following manuscripts have been drafted to date for publications and/or presentations (manuscripts enclosed):

Nagy Bengiamin, "Direct Assessment via Effective Grading – A Natural Way to Engage in Assessment," Presentation and Workshop, The Second Annual Conference of Association for the Assessment of Learning in Higher Education (AALHE), Albuquerque, NM, June 3-5, 2012. (Dr. Bengiamin presented his part only of the project in addition to his own research work that extends beyond the tasks of this particular project.)

"Effective Grading and Direct Assessments in Engineering," to be Submitted to ASEE (American Society of Engineering Education) Annual Conference.

Additional articles and presentations are being prepared for submission to relevant journals.

III. Conclusions and Recommendations

The grade-based direct assessment pilot project was an illuminating experience for the faculty and student focus group involved. It has provided the faculty a new perspective concerning the grade as a direct assessment tool. The impact on students' learning has been noteworthy. The student focus group has been actively engaged in the process of implementing and advocating the project. They have assisted the respective faculty members in different programs regarding the grading various assignments and providing valuable feedback. These students have recommended that the proposed effective grading scheme be implemented first in the introductory courses and then continued in upper division courses. This will help students to better understand the pedagogy and will establish a culture within the program/college.

We highly recommend engaging other faculty members to adopt this process (system) in other courses. The IRAP funding has served as a seed grant. We will be exploring external funding sources to expand our efforts in the future.

APPENDIX

Learning Outcomes Based Grading

The grades in this course are based 100% on applying the rubrics of the learning outcomes of the course.

ECE 186B Senior Design II Spring '12
Nagy Bengiamin

This is a Culminating Experience course. Fourteen students enrolled (9 EE and 5 CompE) of whom 12 passed the course. The following data doesn't include those who failed.

Upon successful completion of this course, you should be able to,

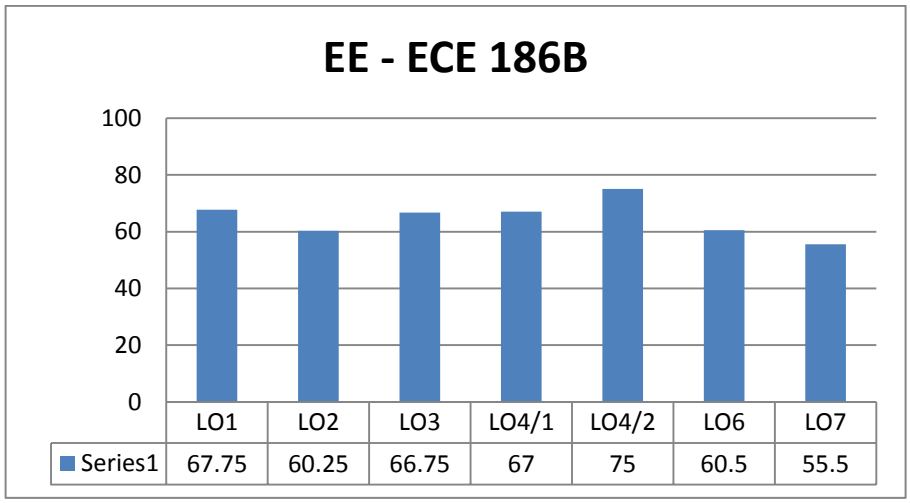
LO #1 - Formulate and solve open-ended engineering design problems using mathematics; physics and engineering science concepts.
LO #2 - Demonstrate depth in knowledge of EE and CompE subjects.
LO #3 - Function in a team environment and conduct independent work
LO #4/1 - Communicate effectively in writing
LO #4/2 - Communicate effectively via oral presentations
LO #6 - Demonstrate good hands-on experiences
LO #7 – Demonstrate effective use of modern engineering tools

Student activities included

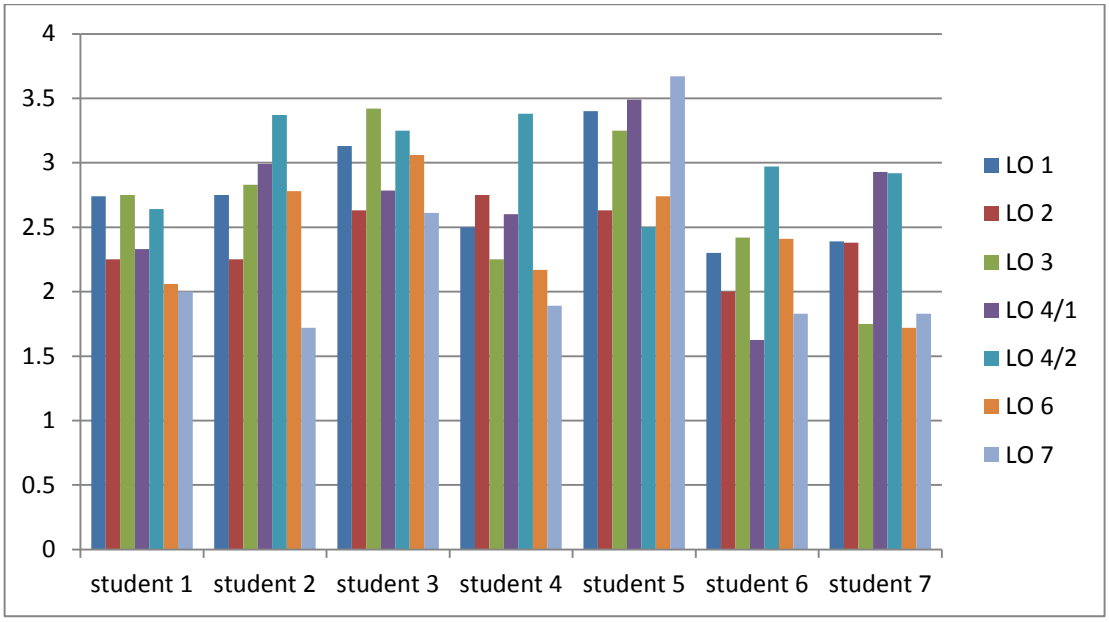
1) Two essays
2) Two progress reports
3) Two oral presentation
4) A poster presentation
5) Final report
6) Weekly meetings and group discussions

The data is grouped for EE and CompE separatly, for specific program assessment purposes.

EE Class average data:



EE Student specific data:



	LO 1	LO 2	LO 3	LO 4/1	LO 4/2	LO 6	LO 7	Ave in %
student 1	2.74	2.25	2.75	2.33	2.64	2.06	2.00	59.89
student 2	2.75	2.25	2.83	2.99	3.37	2.78	1.72	66.75
student 3	3.13	2.63	3.42	2.79	3.25	3.06	2.61	74.59
student 4	2.5	2.75	2.25	2.60	3.38	2.17	1.89	62.64
student 5	3.4	2.63	3.25	3.49	2.50	2.74	3.67	77.43
student 6	2.3	2	2.42	1.63	2.97	2.41	1.83	55.55
student 7	2.39	2.38	1.75	2.93	2.92	1.72	1.83	56.86

EE Data Analysis:

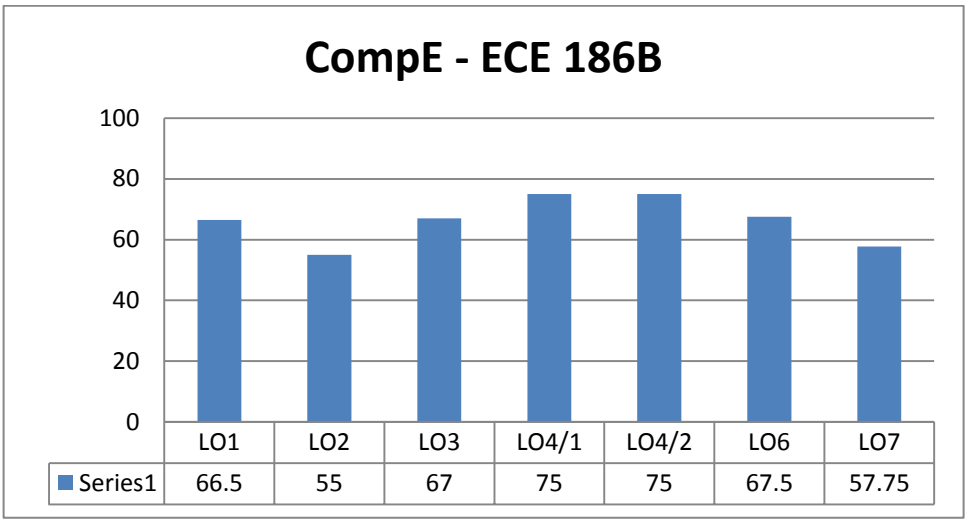
1) Students couldn't attain the learning outcomes at the 75% benchmark set by the department. However, since the passing grade of 55% (D grade), the students passed the course with the corresponding attainment percentage.

2) While students achieved the passing overall average attainment level of 55%, it is evident that attainment of some of the LOs is well below the passing grade of 55%. Students #3 and #5 only have attained each LOs at a rate above the 55%.

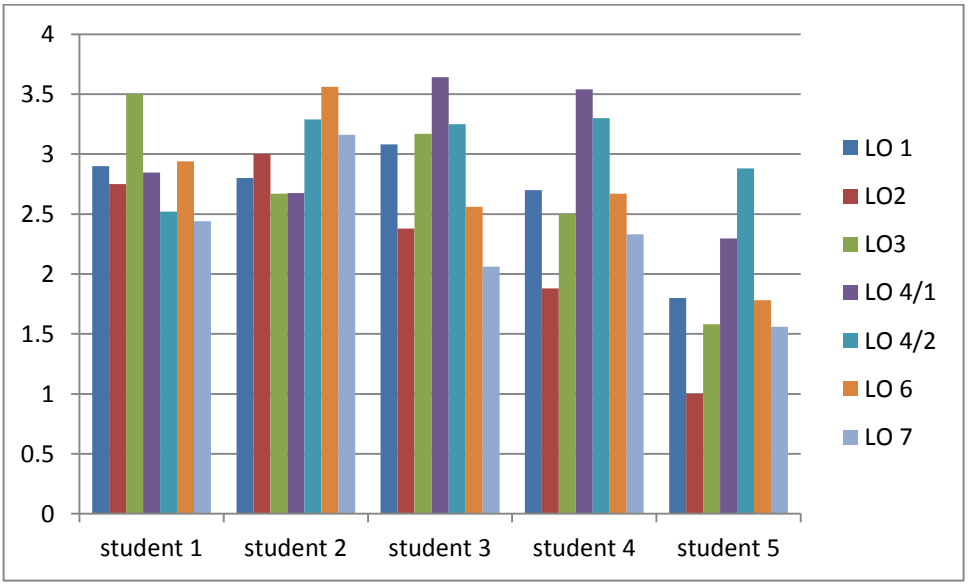
3) It seems challenging to impose a policy of passing every LO in order to pass the course!

4) Since this is a special course (culminating experience) where it is project oriented and student activities are nontraditional, the assessment process needs to be reevaluated to determine whether the data is an accurate reflection of student attainment or the assessment process needs adjusting for that particular type of student activities.

CompE Class average data:



CompE student specific data:



	LO 1	LO2	LO3	LO 4/1	LO 4/2	LO 6	LO 7	Ave in %
student 1	2.9	2.75	3.5	2.85	2.52	2.94	2.44	71.05
student 2	2.8	3	2.67	2.68	3.29	3.56	3.16	75.55
student 3	3.08	2.38	3.17	3.64	3.25	2.56	2.06	71.93
student 4	2.7	1.88	2.5	3.54	3.30	2.67	2.33	67.57
student 5	1.8	1	1.58	2.30	2.88	1.78	1.56	46.05

CompE Data Analysis:

1) Students couldn't attain the learning outcomes at the 75% benchmark set by the department. However, since the passing grade of 55% (D grade), the students passed the course with the corresponding attainment percentage. It appears that the low score of student #5 is due to giving

different weighs to the LOs in the grading process. Also, this particular student didn't perform all assigned work which skewed his grades due to the zeros he received in the missed work.

2) While students achieved the passing overall average attainment level of 55%, it is evident that attainment of some of the LOs is well below the passing grade of 55%. Students #1 and #2 only have attained each LOs at a rate above the 55%.

3) It seems challenging to impose a policy of passing every LO in order to pass the course!

4) Since this is a special course (culminating experience) where it is project oriented and student activities are nontraditional, the assessment process needs to be reevaluated to determine whether the data is an accurate reflection of student attainment or the assessment process needs to be changes.

Formulate & Solve Engineering Problems Rubric

	0	1	2	3	4	N/A
Recognition and understanding the problem	No evidence of understanding the problem		Vague and not very clear		Understands the problem and recognizes its implications	
Problem Formulation	No meaningful formulas		A serious attempt is made but wrong mathematical model	Good line of thought but wrong mathematical model	Right formulas and correct mathematical model	
Problem Solution	No meaningful attempt		Proper approach but incorrect solution	Correct solution but no analysis of results	Correct solution and proper analysis of results	

Breadth and Depth Rubric

	0	1	2	3	4	N/A
Breadth of knowledge in EE and/or CompE	Didn't utilize possible related subjects		Presented broad subjects but not integrated properly		Utilized appropriate relevant topics in an integrated fashion	
Depth of knowledge in EE and/or CompE	No advanced concepts are utilized		Good attempt of utilizing advanced concepts but analysis and evaluation are incomplete		Utilized advanced concepts with detailed analysis and design	

Teamwork Rubric

	0	1	2	3	4	N/A
Initiative	Doesn't seem aware of responsibilities		Aware of responsibilities but does the absolute minimum		Engaging and brings new ideas to the table.	
Responsiveness	Behind most of the time		Delivers on time but doesn't seem to be engaging		Always on top of what is going on and delivers on time	
Attitude	Rarely supports the efforts of others		Respects the views of others but not assertive in his views		Tries to make people work together and assertive in his actions	

Written Communication Rubric

	0	1	2	3	4	N/A
Spelling and grammar	many errors	more than 8 errors per 50 words	more than 4 errors per 50 words		minor or no errors	
Focus and Organization	not organized and lacks clarity		kind of organized but not very clear		well organized and very clear	
Sentence structure	poor structure		acceptable structure but not very logical		well structured	
Use of references	not cited		some citations but incomplete		cited properly	
Transition between paragraphs	ideas are not flowing smoothly		some paragraphs are illogical		Document flows smoothly	

Oral Communication Rubric

	0	1	2	3	4	NA
Spoken communication Clarity Formality	Unclear pronunciation and lacking vocabulary		Clear pronunciation but lacking vocabulary		Clear pronunciation and appropriate vocabulary	
Presentation Clarity of Voice Eye Contact	Unclear voice and no eye contact		Clear voice but no eye contact		Proper level of voice and good eye contact	
Ability to express ideas and answer questions	Not able to express ideas or answer questions		Ideas expressed reasonably well but answers to questions is lacking		ideas expressed clearly and all questions are answered properly	
Technical content Depth Soundness	No depth and unclear approach		Sufficient depth but unclear approach		Appropriate depth and sound approaches	

Hands-On Rubric

	0	1	2	3	4	N/A
Methodology and data analysis	Improper design or technique		Proper methodology but lacking in data analysis		Appropriate design or technique to evaluate a specific process	
Performance in lab	Unable to operate equipment or write software		Sufficient skills in using hardware or software but not both		Proficient in using the proper equipment and software	
Communication	Not able to explain basic concepts		Sufficient skills in communication but line of thought is not very clear		Communicates ideas and conclusions effectively	

Modern Engineering Tools (Hardware and Software) Rubric

	0	1	2	3	4	N/A
Task Statement and formulation for the Proper Tool	Task statement is unclear	Task statement is acceptable but not familiar with the capabilities of the engineering tool	Clear task statement but not well formulated for the proper tool		Clear task statement and proper preparation for the engineering tool based on its capabilities	
Utilization of the Tool	No evidence of understanding the tool and its capabilities		Tool is kind of utilized but capabilities are not well exploited		Tool well utilized and proper results received	
Level of proficiency	Not familiar of the capabilities of the tool		Some tool capabilities are utilized but presentation and analysis of results are lacking		Effectively exploited the capabilities of the tool and properly presented and evaluated results received	

Learning Outcomes Based Grading

The grades in this course are based 100% on applying the rubrics of the learning outcomes of the course.

ENGR 201 - Systems Modeling and Realization Spring '12
Nagy Bengiamin

This is a lecture course with a significant associated laboratory component. Eight students enrolled.

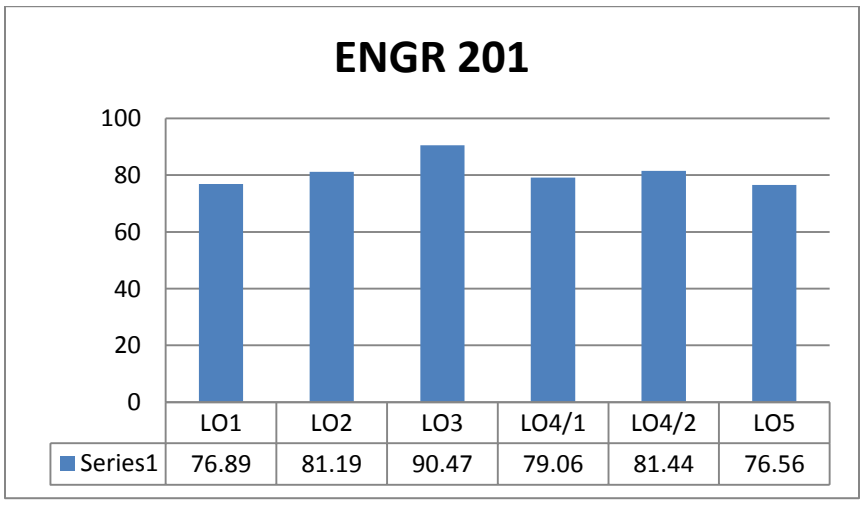
Student Learning Outcomes:
At the completion of this course, students will be able to:

1) Apply advanced mathematics and engineering science to practical problems.
2) Demonstrate knowledge in advanced electrical engineering subjects and utilize advanced engineering tools to solve engineering problems.
3) Conduct experiments and analyze collected data.
4) Communicate effectively orally (LO 4/1) and in writing (LO/2).
5) Conduct literature searches and formulate ideas via critical thinking practices.

Student activities included

1) Six 20-minute quizzes
2) Five laboratory reports
3) One oral presentation
4) End of the semester project
5) End of the semester project

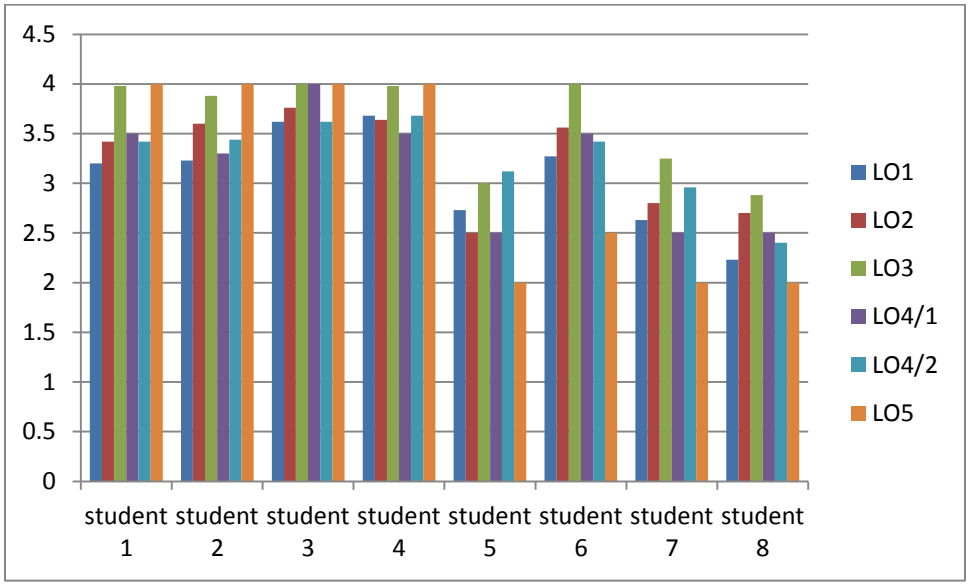
Class average data:



Data Analysis

Overall scores in class indicate that all SLOs have been attained on the average. The lowest attainment level is 76.56% which exceeds the 75% benchmark established by the department.

Per student data:



Data Analysis (benchmark is 75% or 3.0/4.0)

- Knowing that the passing grade for the course is a "D" at 58%, students # 5, 7 and 8 have passed the course but they couldn't attain many of the learning outcomes at the 75% level.
- While students #6 demonstrated attainment of most of the SLOs at a higher level than the benchmark, outcome 5 falls below the threshold.
- SLO #5 seems to be the most challenging in attainment. Critical thinking will need to be emphasized more in the graduate program.

MS Program Rubrics

SLO	Score			
	1	2	3	4
SLO 1 Apply theoretical concepts to Engr. problems	Theoretical concepts partially identified	Theoretical concepts identified and explained clearly	Theoretical concepts applied correctly	Theoretical concepts applied and evaluated correctly
SLO 2 Knowledge of advanced EE subjects and use of engr. tools to solve problems	Demonstrated little knowledge and needed tools	Established a proper framework and tools needed	Used the tools well to produce results but little analysis	Produced the correct results to solve problems, and analyzed them (no major errors)
SLO 3 Hands-on and design of experiments	Shows little mastery of the tools available and their features	Can use the tools well but integration with the experiment is not complete	Acceptable experiment design but data collection is incomplete	Complete experiment design and data analysis
SLO 4 (1) Oral communication	Not well organized	Organized but eye contact and/or level of voice are lacking	Organized and logical in presenting ideas (good eye contact and level of voice)	Technical content and organization are complete (good presenter overall)
SLO 4 (2) Written communication	More than 5 grammar and sentence structure errors per 1000 words	Ideas are semi clear and less than 5 grammar and sentence structure errors per 1000 words	Clearly presented idea and less than 5 grammar and sentence structure errors per 1000 words	Utilized concise English to clearly present the idea and few grammar and sentence structure errors
SLO 5 Literature searches and/or formulate ideas through critical thinking	Not familiar with search techniques and no clear line of thought	Can identify resources but no clear line of thought	Can identify sources and grasp content as demonstrated by logical analysis	Can identify sources and grasp content as demonstrated by logical analysis using critical thinking to connect subjects

DIRECT ASSESSMENT OF STUDENT LEARNING OUTCOMES
VIA QUANTITATIVE MEASURES

Learning Outcomes Based Grading – ECE 155
May 28, 2012

ECE 155 – Control Systems

Each student's grade in ECE 155 (Control Systems) was 100% based upon evaluating student's work for following three learning outcomes:

1. Recognize and apply basic concepts in science and engineering (CONCEPTS).
2. Formulate and solve problems (PROBLEMS).
3. Utilize software engineering tools to solve problems (TOOLS).

The learning outcomes apply directly to Computer Engineering Outcomes 5 and 6, and Electrical Engineering Outcomes 2, 7, and 13 within the Electrical and Computer Engineering Department at California State University, Fresno. The following table summarizes the data analysis of the three learning outcomes LO1, LO2, and LO3:

Electrical Engineering

	LO1 – CONCEPTS				
	HOMEWORK	MIDTERM	PROJECTS	FINAL	WEIGHTED AVE
STUDENT	30%	20%	20%	30%	100%
1	44.8	15.0	90.0	70.0	**55.4**
2	99.7	35.0	100.0	70.0	**77.9**
3	105.2	45.0	95.0	85.0	**85.1**
4	85.1	77.5	92.5	85.0	**85.0**
5	110.4	50.0	100.0	85.0	**88.6**
6	84.4	45.0	100.0	80.0	**78.3**
7	99.0	80.0	92.5	77.5	**87.4**
8	97.9	40.0	90.0	100.0	**85.4**
9	106.3	50.0	87.5	90.0	**86.4**
10	97.9	55.0	90.0	70.0	**79.4**
11	103.1	47.5	87.5	65.0	**77.4**
12	106.3	50.0	97.5	95.0	**89.9**
13	93.8	50.0	97.5	95.0	**86.1**
14	104.2	55.0	100.0	100.0	**92.3**
15	111.5	90.0	92.5	95.0	**98.4**
16	86.5	80.0	100.0	90.0	**88.9**
17	110.4	45.0	100.0	80.0	**86.1**
18	95.8	52.5	90.0	42.5	**70.0**
19	81.6	70.0	90.0	85.0	**82.5**

20	101.0	40.0	87.5	100.0	**85.8**
21	104.2	75.0	90.0	90.0	**91.3**
22	103.1	90.0	100.0	100.0	**98.9**
23	110.4	82.5	100.0	100.0	**99.6**
24	95.5	80.0	100.0	100.0	**94.6**
25	45.5	60.0	100.0	100.0	**75.6**
AVERAGES	**95.3**	**58.6**	**95.0**	**85.8**	**85.1**

	LO2 – PROBLEMS				
	HOMEWORK	**MIDTERM**	**PROJECTS**	**FINAL**	**WEIGHTED AVE**
STUDENT	**30%**	**20%**	**20%**	**30%**	100%
1	58.3	81.3	85.0	30.0	**59.8**
2	81.9	67.5	90.0	40.0	**68.1**
3	103.5	92.5	95.0	97.5	**97.8**
4	81.3	52.5	87.5	45.0	**65.9**
5	102.1	80.0	95.0	27.5	**73.9**
6	75.0	82.5	90.0	65.0	**76.5**
7	93.1	81.3	87.5	75.0	**84.2**
8	104.2	86.3	90.0	60.0	**84.5**
9	88.9	75.0	90.0	62.5	**78.4**
10	101.4	63.8	90.0	92.5	**88.9**
11	91.7	71.3	90.0	57.5	**77.0**
12	106.3	87.5	92.5	92.5	**95.6**
13	88.2	95.0	87.5	80.0	**87.0**
14	109.0	62.5	100.0	97.5	**94.5**
15	105.6	85.0	95.0	95.0	**96.2**
16	84.0	72.5	95.0	90.0	**85.7**
17	100.0	80.0	95.0	90.0	**92.0**
18	81.9	50.0	95.0	58.8	**71.2**
19	57.6	67.5	85.0	75.0	**70.3**
20	100.7	85.0	87.5	68.8	**85.3**
21	96.5	75.0	100.0	62.5	**82.7**
22	102.8	90.0	100.0	82.5	**93.6**
23	109.7	92.5	95.0	95.0	**98.9**
24	102.1	85.0	95.0	97.5	**95.9**
25	43.8	81.3	90.0	80.0	**71.4**
AVERAGES	**90.8**	**77.7**	**92.1**	**72.7**	**83.0**

	LO3 – TOOLS				
	HOMEWORK	**MIDTERM**	**PROJECTS**	**FINAL**	**WEIGHTED AVE**
STUDENT	**30%**	**20%**	**20%**	**30%**	100%
1	61.7	82.5	90.0	67.5	**73.3**
2	86.4	92.5	92.5	52.5	**78.7**
3	100.0	82.5	95.0	88.8	**92.1**
4	81.8	85.0	95.0	88.8	**87.2**
5	98.7	85.0	92.5	72.5	**86.9**
6	86.4	92.5	97.5	67.5	**84.2**
7	87.7	90.0	92.5	75.0	**85.3**
8	98.7	87.5	95.0	75.0	**88.6**
9	85.7	67.5	92.5	82.5	**82.5**
10	101.9	100.0	95.0	80.0	**93.6**
11	90.0	67.5	92.5	63.8	**78.4**
12	90.9	67.5	92.5	63.8	**90.6**
13	98.7	95.0	100.0	80.0	**92.6**
14	101.9	97.5	95.0	95.0	**97.6**
15	105.8	95.0	100.0	78.8	**94.4**
16	74.7	80.0	92.5	85.5	**82.4**
17	99.4	65.0	100.0	90.0	**89.8**
18	90.9	80.0	95.0	63.8	**81.4**
19	67.5	92.5	92.5	67.5	**77.5**
20	98.1	72.5	95.0	65.0	**82.4**
21	93.5	95.0	97.5	81.3	**90.0**
22	105.2	92.5	100.0	80.0	**94.1**
23	108.4	93.8	97.5	95.0	**99.3**
24	98.1	100.0	92.5	90.0	**94.9**
25	27.3	92.5	95.0	80.0	**69.7**
AVERAGES	**89.6**	**86.8**	**95.1**	**78.3**	**86.7**

	STUDENT OUTCOMES SUMMARY				
	LO1 AVE	**LO2 AVE**	**LO3 AVE**		**GRADE**
STUDENT	**20%**	**40%**	**40%**		**100%**
1	55.4	59.8	73.3		**64**
2	77.9	68.1	78.7		**74**
3	85.1	97.8	92.1		**93**
4	85.0	65.0	87.2		**78**
5	88.6	73.9	86.9		**82**
6	78.3	76.5	84.2		**80**
7	87.4	84.2	85.3		**85**
8	85.4	84.5	88.6		**86**
9	86.4	78.4	82.5		**82**
10	79.4	88.9	93.6		**89**

11	77.4	77.0	78.4		**78**
12	89.9	95.6	90.6		**92**
13	86.1	87.0	92.6		**89**
14	92.3	94.5	97.6		**95**
15	98.4	96.2	94.4		**96**
16	88.9	85.7	82.4		**85**
17	86.1	92.0	89.8		**90**
18	70.0	71.2	81.4		**75**
19	82.5	70.3	77.5		**76**
20	85.8	85.3	82.4		**84**
21	91.3	82.7	90.0		**88**
22	98.9	93.6	94.1		**95**
23	99.6	98.9	99.3		**99**
24	94.6	95.9	94.9		**95**
25	75.6	71.4	69.7		**72**
AVERAGES	**85.1**	**83.0**	**86.7**		**84.9**

Data Analysis:

1. The above data is for students who passed the course only. Those who did not pass the course are not included because they must repeat the class and achieve the minimum score for the learning outcomes.
2. For an individual outcome, a weighted average was comprised of Homework (30%), two Projects (20%), a Midterm (20%), and the Final Exam (30%).
3. The averages for each learning outcome were between 83.0% and 86.7%, indicating consistency between the rubrics used for evaluation of student grades.
4. To calculate a student's final grade, LO1 – CONCEPTS was weighted at 20%, LO2 – PROBLEMS at 40%, and LO3 – TOOLS at 40%. These percentages were based upon the relative weight of each outcome with respect to the focus of ECE 155.
5. All students exceeded the benchmark of passing each learning outcome with a weighted average of 60% or higher, except for Student 1 for LO1 and LO2 (55.4% and 59.8%). The student was able to pass overall (with a 64%) because he scored higher on LO3 (73.3%). If learning outcomes are more important than an average grade, then he would not have passed since he failed 2 out of 3 outcomes.
6. All students exceeded the benchmark of passing the course with a final weighted average between the 3 outcomes of a 60% or higher.
7. Extra Credit opportunities were provided to students for each learning outcome due to the unique nature of this grading scheme (this why some percentages are above 100%).
8. Many Electrical Engineering students had the greater difficulties with LO2. This highlights the need for students to be better taught how to solve Control Systems problems by hand, opposed to understanding the concept and using MATLAB to solve the problem.
9. Two extra credit homework assignments were deemed necessary throughout the semester because the learning outcome rubrics so highlighted student weaknesses that the overall distribution of student grades became skewed. Allowing students to make up points provided students with further opportunity to strengthen areas in which they were weak and balance student grades.
10. Using the learning outcome rubrics was highly successful in highlighting students' strengths and weaknesses. The drawback of using the rubrics, however, was a dramatic increase in the

amount of time it took to grade student work, making long term application of this type of grading scheme doubtful. Students also noticed an increase in the time it took to complete assignments as well.

Computer Engineering

	LO1 – CONCEPTS				
	HOMEWORK	MIDTERM	PROJECTS	FINAL	WEIGHTED AVE
STUDENT	**30%**	**20%**	**20%**	**30%**	**100%**
1	105.2	95.0	100.0	100.0	**100.6**
2	50.0	25.0	50.0	75.0	**52.5**
3	65.6	55.0	95.0	65.0	**69.2**
AVERAGES	**73.6**	**58.3**	**81.7**	**80.0**	**74.1**

	LO2 – PROBLEMS				
	HOMEWORK	MIDTERM	PROJECTS	FINAL	WEIGHTED AVE
STUDENT	**30%**	**20%**	**20%**	**30%**	**100%**
1	99.3	96.3	95.0	95.0	**96.5**
2	57.8	78.8	40.0	50.0	**56.0**
3	75.0	53.8	95.0	87.5	**78.5**
AVERAGES	**77.4**	**76.3**	**76.7**	**77.5**	**77.0**

	LO3 – TOOLS				
	HOMEWORK	MIDTERM	PROJECTS	FINAL	WEIGHTED AVE
STUDENT	**30%**	**20%**	**20%**	**30%**	**100%**
1	103.9	95.0	92.5	75.0	**91.2**
2	72.7	85.0	65.0	55.0	**68.3**
3	71.4	100.0	95.0	72.5	**82.2**
AVERAGES	**82.7**	**93.3**	**84.1**	**67.5**	**80.6**

	STUDENT OUCTCOMES SUMMARY				
	LO1 AVE	LO2 AVE	LO3 AVE		GRADE
STUDENT	20%	50%	30%		100%
1	100.6	96.5	91.2		95
2	52.5	56.0	68.3		60
3	69.2	78.5	82.2		78
AVERAGES	74.1	77.0	80.6		77.7

Data Analysis:

1. The above data is for students who passed the course only. Those who did not pass the course are not included because they must repeat the class and achieve the minimum score for the learning outcomes.
2. For an individual outcome, a weighted average was comprised of Homework (30%), a Project (20%), a Midterm (20%), and the Final Exam (30%).
3. The averages for each learning outcome were between 74.1% and 80.6%, indicating consistency between the rubrics used for evaluation of student grades.
4. To calculate a student's final grade, LO1 – CONCEPTS was weighted at 20%, LO2 – PROBLEMS at 40%, and LO3 – TOOLS at 40%. These percentages were based upon the relative weight of each outcome with respect to the focus of ECE 124.
5. All students exceeded the benchmark of passing each learning outcome with a weighted average of 60% or higher, except for Student 2 for LO1 and LO2 (52.5% and 56.0%). The student was barely able to pass overall (with a 60%) because he scored higher on LO3 (68.3%). If learning outcomes are more important than an average grade, then he would not have passed since he failed 2 out of 3 outcomes.
6. All students exceeded the benchmark of passing the course with a final weighted average between the 3 outcomes of a 60% or higher.
7. Extra Credit opportunities were provided to students for each learning outcome due to the unique nature of this grading scheme (this why some percentages are above 100%).
8. Most Computer Engineering students had the greatest difficulties with LO1. Because ECE 155 is highly concept driven and Computer Engineering majors do not take EE 102 (and ECE 155 is a technical elective), it is not surprising that Computer Engineering students had difficulty with the fundamental concepts of Control Systems.
9. Two extra credit homework assignments were deemed necessary throughout the semester because the learning outcome rubrics so highlighted student weaknesses that the overall distribution of student grades became skewed. Allowing students to make up points provided students with further opportunity to strengthen areas in which they were weak and balance student grades.
10. Using the learning outcome rubrics was highly successful in highlighting students' strengths and weaknesses. The drawback of using the rubrics, however, was a dramatic increase in the amount of time it took to grade student work, making long term application of this type of grading scheme doubtful. Students also noticed an increase in the time it took to complete assignments as well.

DIRECT ASSESSMENT OF STUDENT LEARNING OUTCOMES VIA QUANTITATIVE MEASURES

Civil Engineering Program
Ching Chiaw Choo

Progress Report – May 22, 2012

Class: CE130 – Theory of Structures (Spring 2012)

Performance Criterion: To obtain a passing grade (i.e., "D" or better), a student must achieve a prescribed level of competency, 55% or better, in all Student Learning Outcomes (SLOs).

Learning Outcomes: Two SLOs were assessed in CE130, Spring 2012.

SLO 1: Ability to apply knowledge of mathematics and engineering science (50%)
SLO 2: Ability to formulate and solve engineering problems (50%)

Grading Rubric: The grading rubric for effective grading is as follows:

SLO (a): *Math, Science, and Engineering Rubric* (0 – 4 grade point scale)						
Description	**Grade Point**					**Point**
	0	1	2	3	4	
Engineering & Science Principal, Concept, and Application	Irrelevant application of science and engineering concept		Unclear or use of physics and science concepts that is not most appropriate		Correct use of physics & science concepts in engineering application	
Mathematical Model & Representation	Incorrect mathematics, model & representation		Correct model, but incorrect execution of model or analysis		Correct and clear use of mathematical model & representation	
SLO (e): *Problem Formulation and Solution Rubric* (0 – 4 grade point scale)						
Description	**Grade Point**					**Point**
	0	1	2	3	4	
Problem Formulation & Recognition	No attempt. No evidence of problem formulation or problem recognition		Unclear or insufficient work to demonstrate understanding. Problem formulated incorrectly	Demonstrate sufficient understanding, but execution containing flaws	Understand problem & recognize its implication. Proper formulation of problem	
Problem Solution & Process	No sufficient evidence of attempt	Not following engineering or logical approach	Demonstrate proper logic, but incorrect solution	Correct solution but incorrect unit measurements. No evaluation & summary of results	Correct engineering approach & logic and unit measurement. Proper evaluation & summary of results	
					TOTAL	/16

Gradebook: Table below shows how a grade is assigned to students in CE130 (see also **Performance Criterion**):

CE130 – Outcome Based Grading and Assessment												
Student[1]	SLO 1 (50%)					SLO 2 (50%)					Weighted Total (%)	Assigned Grade
	Homework (20%)	Quizzes (20%)	Exams (60%)	Total (100%)	Grade	Homework (20%)	Quizzes (20%)	Exams (60%)	Total (100%)	Grade		
1	0.78	0.73	0.96	0.88	A	0.69	0.65	0.94	0.83	B	85.5	A
2	0.80	0.48	0.44	0.52	F	0.64	0.30	0.30	0.37	F	44.2	F
3[2]	0.82	0.30	0.65	0.61	D	0.74	0.28	0.52	0.51	F	56.4	F

NOTE(S):
[1] Scores of actual students (to remain anonymous) in CE130, Spring 2012
[2] Student 3 who has a weighted total exceeding the passing score (> 55%) did not pass the class because he/she was failing to achieve the minimum performance criterion in BOTH outcomes.

Work Criterion: A student must complete <u>all</u> of the work indicated below to be eligible for a grade (or otherwise a grade of "WU" will be assigned)

- Homework (11 sets throughout the semester) (20%)
- Quizzes (5 sets throughout the semester) (20%)
- Midterm exams (2 sets) (20% each)
- Final exam (20%)

Additionally, for students missing more than 50% of the assigned homework and quizzes throughout the semester a letter grade of "WU" will be assigned. Missing any one of the three exams will also result in a letter grade of "WU". A letter grade of "WU" signifies that the instructor has insufficient information to evaluate a student's performance; even though technically the grade is similar to a grade of "F".

Class Survey: One class survey was conducted and the summary is provided as follows

Question	Average	Standard Deviation
a. Course syllabus described fully pre-requisites, content, objectives, assessment rubrics, grades and grade distribution	4.41	0.63
b. Course related activities (assignment, quiz, exam) were sufficient and appropriately distributed	3.93	0.92
c. Quizzes and exams were reflective of course content and outcomes	3.72	0.84
d. Assessment rubrics were direct and effective (i.e., reflective of course outcomes)	3.76	1.02
e. Use of assessment rubrics provided an opportunity to enhance learning	3.52	1.09
f. The course grading was not based on non-instructional measurements, such as attendance, bonus credits, curve, etc.	3.90	1.08
g. The course increased my knowledge and interest in this area of study	4.17	0.89
h. The course enhanced my critical thinking and problem solving skills	4.17	0.71
i. Class size was not too large for the subject and format	3.93	0.92
j. Fellow students were academically prepared for the course	3.24	0.87

NOTE(S):

- A rating of 3.50 for each questions presented in the survey is deemed satisfactory in the opinion of the class instructor (Dr. Choo)
- In general students expressed a level of satisfaction (greater than 3.50) with the content of the class, the assessment techniques, and frequency of these techniques (see a – d).
- Students in general agreed that the assessment rubric provided an opportunity to enhance learning (show strengths and weakness from each feedback)
- It is interesting to note that while students were in general satisfied with the fact that an assigned grade was based solely on instructional measurements (see f) the rating was only at 3.90 (the instructor expected a much higher rating for this question).

Observations and Summary:

- 29 out of 47 (61.7%) students in the class earned a passing grade of "D" or better.
- 16 out of 47 (34.0%) students failed the class (i.e., grade of "F"). Four of these students actually have an accumulated score exceeding the minimum passing score (55%), failed the class however because they failed to achieve the minimum performance criterion in one of the two assessed SLOs.
- 2 out of 47 (4.3%) students received a grade of "WU".
- Students appeared to be have mixed reactions to the grading scheme (i.e., a score of 3.76 & 3.52 for Questions d & e, respectively) per survey. This may be due to lack of exposure of students to sure a scheme and at their rank (students in CE130 are mostly juniors/seniors).

- As an instructor, I find this method of grading to be extremely effective but time consuming (especially with large class sizes). Finding a qualified TA to help with the process is also difficult, but doable.

Assessment Based Grading
CM Program

Brad Hyatt
May 20, 2012
Spring 2012 Summary Report

1) **Course Number:**
   - CM 164 – Building Electrical Systems

2) **SLO's being assessed:**
   - Program Learning Outcome #4 – Problem Solving

3) **Rubric Utilized**
   - The problem-solving rubric developed by the ECE.

4) **The grading process:**
   - There were four (4) primary groups of graded activities for the course:
     1) Online Quizzes (10%)
        - Covered basic problems from the textbook and conceptual questions.
        - The rubric was not used, rather automatic online grading of problems in Blackboard.
     2) Homework Assignments (30%)
        - These assignments were more complex in nature and developed to ensure that students understood both the concepts and practical aspects of the problems from the assigned chapter. The rubric was used to grade these assignments.
     3) Assessments – i.e., exams (60%)
        - These exams were very complex in nature and very challenging. Students were expected to provide solutions to both conceptual and practical problems with minimal data provided. The "real world scenarios" were developed to ensure that students fully understood the problems and the nature of problem solving in practice.

5) **Direct Assessment Results:**

	No. Students	Overall Average	Average Quiz	Average HW	Average Exam
Total	*62*	*72%*	*77%*	*81%*	*67%*
Passing	***55 (89%)***	***77%***	***82%***	***87%***	***71%***
Not Passing	***7 (11%)***	***35%***	***37%***	***31%***	***37%***

6) **Evaluation of Results:**
   - A higher percentage of students passed the course this semester versus the students that took CM 162 (the prior course in this case study) last semester. [It should be noted that 2 of the 7 students that failed the course did not take

any of the assessments.] In Fall 2011, 79% of the students passed the course compared to 89% in this semester.
    - 3 students that failed CM 162 in the Fall also took CM 174 in the Spring. Two of the three passed CM 164 this semester. The other only completed a portion of the class.
- Another interesting comparison between semesters is that students that passed the course also 'passed' all assessment tools (quizzes, homework, and exams). Last semester, a few of the 'passing students' did have passing scores.

7) Analysis of Results:

- Per feedback from students (both in the student led survey and informal talks), students that took the Fall 2011 course felt that they were better prepared for the problem solving content in the Spring 2012 course.
    - It should be noted, though, that further analysis of the data does not support this 'perception' by the students. Only 12 of the 33 students that took both courses improved their grade semester to semester. Additionally, the average change in score was -4.8% semester-to-semester.
- On the positive side, more students passed the course compared to this semester than last semester. A combination of factors my have supported this improvement.
    - First, a better system of covering problem solving techniques and 'practices' in class periods better prepared students for assessments.
    - Second, the instructor better understood how to write exams questions to focus on problem solving (both conceptual and quantitative) for students.
    - Finally, the feedback from students to offer 'example test questions' during exam reviews helped to prepared students for exams.

8) Plans for Next Semester:

- Continue to find ways to better prepare students to for problem solving in homework and exams.
- Having a grader for the course is essential. Having to grade 60+ homework submissions or exams on a weekly basis is extremely time consuming. If a grade is not available, this rubric format may have to be re-assessed as a viable option for a class of this size.

9) Final Comments:

- Using the problem-solving rubric for assessing the program outcome for this course worked extremely well. I would highly recommend continued use of this system as long as a grader is available to the instructor in large class settings (i.e., more than 30 students).

GME 145 ASSESSMENT BASED GRADING REPORT
GME Program
Dr. Clement Ogaja

Spring 2012

COURSE OBJECTIVE:

The course objective as stated in the syllabus is as follows:

> *Students will design, plan and conduct a real GPS geopositioning project while demonstrating the ability to design and plan the project, process and adjust the data in accordance with appropriate criteria, and effectively communicate the results of this effort orally and by written report. Also, each student shall demonstrate a basic understanding of the operational theory associated with GPS project design during examination.*

The learning outcomes (as listed in the syllabus), in line with ABET's (a) through (k), included:

> **Outcome (a)--Ability to apply knowledge of mathematics, science and engineering,**
> Outcome (b)--Ability to design and conduct experiments, as well as to analyze and interpret data,
> **Outcome (e)--Ability to identify, formulate, and solve engineering problems,**
> Outcome (g)--Ability to use written and oral skills for effective communication, and
> **Outcome (k)--Ability to use the techniques, skills, and modern tools needed for GME practice**

The bold lines indicate the outcomes that are relevant to the group assessment project.

COURSE ASSESSMENT ACTIVITIES:

Students were assigned assessment problems and case study projects based on ongoing lectures. There were two case study projects culminating in project reports and oral presentations and a final exam based on lectures and assigned reading. Grading was based on the learning outcomes, weighted as follows: learning outcome (a) 10%, learning outcome (b) 30%, learning outcome (e) 15%, learning outcome (g) 15%, and learning outcome (k) 30%. The rubrics applied for each outcome are shown at the end of this report.

Each of the learning outcomes was assessed by a group of activities as shown in the table below.

Table 1. Outcome Assessment Matrix (GME 145, Spring 2012)

	COURSE ASSESSMENT ACTIVITY					
	Hwk	Hwk	Hwk	Case Project 1	Case Project 2	Final Exam
Outcome (a)				**X**	**X**	**X**
Outcome (b)				**X**	**X**	**X**
Outcome (e)				**X**	**X**	**X**
Outcome (g)				**X**	**X**	
Outcome (k)	**X**	**X**	**X**	**X**	**X**	**X**

Hwk=Homework, **X** means outcome assessed using the correlated activity

ANALYSIS OF GRADING FROM ALL ASSESSMENTS:

The class comprised of 13 seniors, all majoring in geomatics. Their final scores are summarized in Table 2. For each student, the score per outcome is the arithmetic mean from all activities assessing that particular outcome (as shown earlier in Table 1). The minimum acceptable achievement value for each outcome is 2.2 on a 0 to 4 scale (i.e., 55% on a percentage basis). The ideal case is that a student getting an overall passing grade in class should achieve the minimum acceptable value in all of the outcomes.

Table 2. Final Grade from all Assessments (GME 145, Spring 2012)

Outcome				**Student Number**									
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**
Outcome (a) (10%)	2.9	3.1	2.7	2.7	3.1	3.4	3.0	3.1	3.5	3.0	3.4	3.4	3.4
Outcome (b) (30%)	3.4	3.3	3.1	3.0	3.3	3.4	3.2	3.5	3.8	3.2	3.6	3.7	3.4
Outcome (e) (15%)	3.4	3.1	3.2	3.2	3.4	3.4	3.5	3.6	3.9	3.3	3.7	3.8	3.4
Outcome (g) (15%)	3.0	3.3	3.5	3.5	3.3	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.3
Outcome (k) (30%)	3.4	3.8	3.6	3.4	3.6	3.6	3.7	3.6	4.0	3.8	3.9	3.1	3.2
Final Score*	**3.3**	**3.4**	**3.3**	**3.2**	**3.4**	**3.5**	**3.4**	**3.5**	**3.8**	**3.4**	**3.7**	**3.4**	**3.3**
Percent	**82.6**	**84.7**	**82.4**	**79.6**	**84.4**	**87.3**	**85.4**	**87.6**	**94.5**	**85.4**	**91.7**	**86.0**	**83.4**
Final Letter Grade	B	B	B	C	B	B	B	B	A	B	A	B	B
*weighted mean of column (weighted on the basis of the percentages shown in parentheses)													

The final letter grade is based on the following general scale:

A	90 – 100%
B	80 – 89.99%
C	65 – 79.99%
D	55 – 64.99%
F	0 – 54.99%

In the final analysis of Table 2, all students passed the class with a grade higher than the minimum overall passing grade (55%) and all class learning outcomes were achieved by all students. Therefore for this particular class, the assessment-based grading indicate that it is reasonable to assume that by getting a passing grade, a student has achieved all the learning outcomes, and that if all students have passed the class then all the learning outcomes are achieved. However, it is important to underscore that the results are preliminary and may be only useful as "baseline data". Future interpretation will depend on whether the same grading approach/scheme is applied in this particular course during the next and subsequent future offerings.

This was the first time rubrics was applied in assessing the class, and assessment-based grading has changed the way the course is designed, delivered, and assessed. In my opinion, there still is an element of subjectivity in grading a class, even with the use of rubrics. The rubric approach seem to have worked well for this class where student activities included homeworks, two major case projects, and a final exam.

The rubrics used in assessing the class are appended on the pages that follow.

Submitted by,
Clement A. Ogaja, PhD
Assistant Professor of Geomatics Engineering

May 17, 2012

Rubrics for outcome (a)--ability to apply knowledge of mathematics, science and engineering

Criterion	0	1	2	3	4
Applied Knowledge	No attempt made or Does not understand the problem requiring applied knowledge		Understands and only partially demonstrates applied knowledge; unclear or wrong steps		Clearly and fully demonstrates applied knowledge, with correct solution

Rubrics for outcome (b)--ability to design and conduct experiments, as well as to analyze and interpret data

Criterion	0	1	2	3	4
Design/Obs. Plan (Design a GPS project that meets designated goals)	No evidence of understanding the problem		Design is vague and not very clear; could be better		Fully demonstrates understanding of the problem. Plan/design meets expectations
Execution of Plan (Collect GPS observations in the field that meet designated goals)	No attempt, very poorly executed		Plan well executed but could be done better		Plan very well and fully executed
Analysis/Presentation (Process and analyze GPS observations to insure results meet expectations)	No attempt, Does not understand the problem analysis, very poor presentation		Analysis/interpretation could be improved, partially understands, average presentation		Complete analysis/interpretation of results, excellent presentation

Rubrics for Outcome (e)--ability to identify, formulate and solve engineering problems

Criterion	0	1	2	3	4
Recognition and understanding of the problem	No evidence of understanding the problem		Vague and not very clear		Understands the problem and recognizes its implications
Problem Solution	No attempt or no meaningful attempt		Partial attempt, incomplete, incorrect		Complete Correct solution

Rubrics for outcome (g)--ability to use written and oral skills for effective communication

Criterion	0	1	2	3	4
Information is complete and accurate, easy to read, no spelling or grammatical errors. Clear evidence of research (and solution approach)	No attempt or no serious effort Totally unprepared no evidence of research		Good presentation. Formatted with some errors. Could be improved. Little evidence of homework.		Excellent presentation. Properly Formatted. Good Grammar. Well prepared.
Quality and clarity of oral presentation. Appropriateness and length of material for targeted audience. Time management. Enthusiasm.	Very poor quality Totally unprepared and disorganized Unclear, unprofessional No regard for time. Lacks enthusiasm No attempt		Acceptable quality. Speakers are reasonably organized, but could do better reads the slides w/o explanations and/or examples Good level of interest unnecessary details		Speakers are clear and well organized and balanced Well suited to the audience Excellent time management Addresses audience Fully interested & engaged

Rubrics for outcome (k)--ability to use the techniques, skills, and modern tools needed for GME practice

(A critical skill for the geomatics professional is the ability to properly utilize the techniques and tools of professional practice. Students will be evaluated on the ability to utilize hardware and software to perform GPS projects).

Outcome element	0	1	2	3	4
Use of acquired techniques and skills†	Lacks skills, does not understand techniques, cannot apply the right skills and techniques		Partially demonstrates skills and understanding of techniques		Fully understands and applies appropriate skills and techniques, can relate theoretical concepts to practical, appropriate solutions
Use of appropriate tools and resources, to develop a solution	No evidence of use of appropriate tools and resources, does not understand use of tools and resources		Partially demonstrates use of appropriate tools and application, partially understands use of tools and resources		Demonstrates an understanding of tools, resources, and application

† (For example, in designing a GPS project for in-vehicle road grade estimation, student will learn and demonstrate ability to use appropriate GPS technique and skills to perform slope estimation analysis on the basis of vehicle speed and GPS sampling rate. Similarly, student will learn and demonstrate ability to use appropriate GPS technique and analysis skills when designing a GPS network to meet specified network standards.)

Assessment Based Grading
ME Program
Ira Sorensen
January 17, 2012
Spring 2012 Summary Report

1) Course Number:

- ME 159 – Mechanical Engineering Laboratory

2) SLO's being assessed:

- Outcome a. Apply fundamental concepts of mathematics to solve problems in engineering applications.
- Outcome b. Apply fundamental concepts of science to solve problems in engineering applications.
- Outcome c. Apply analytic skills to solve engineering problems
- Outcome d. Conduct experiments, analyze data and present results
- Outcome i. Prepare and present technical information effectively in document / report format

3) Rubric Utilized

• Five rubrics were developed for the experiments and associated lab reports and applied to four lab reports submitted by the students. The final project was only graded on the basis of Outcome d and was assessed with a separate rubric.

Outcome a. Apply fundamental concepts of mathematics to solve problems in engineering applications.

Score	Description
5	Mathematics of solution properly executed
4	
3	Correct mathematical solution procedure adopted
2	
1	Proper mathematical or statistical model applied

Outcome b. Apply fundamental concepts of science to solve problems in engineering applications.

Score	Description
5	Data analysis, results, and conclusions demonstrate excellent level of understanding of engineering science concepts applicable to experiment performed – correct theory and equations used, proper assumptions made based on experiment performed.
4	
3	Data analysis, results, and conclusions demonstrate satisfactory level of understanding of engineering science concepts applicable to experiment performed – theory, equations, and assumptions may not be the most appropriate, but are reasonable to use at this level.
2	
1	Data analysis, results, and conclusions demonstrate a lack of understanding of engineering science concepts applicable to experiment performed – theory, equations, and assumptions are generally incorrect or not applicable to the experiment performed.

Outcome c. Apply analytic skills to solve engineering problems

Score	Description
5	Problem properly formulated – what is given and what needs to be solved properly identified. Correct solution methodology – all appropriate steps to correct solution present.
4	
3	Problem properly formulated – what is given and what needs to be solved properly identified. Partially correct solution methodology – some appropriate steps to correct solution present.
2	
1	Problem properly formulated – what is given and what needs to be solved properly identified. Incorrect or missing solution methodology.

Outcome d. Conduct experiments, analyze data and present results

Score	Description
5	Experiment properly conducted, data analysis done correctly, and expected results obtained and properly presented.
4	Experiment properly conducted, data analysis done correctly, and some errors or gaps in results obtained and/or their presentation.
3	Experiment properly conducted, minor errors in data analysis, results consistent with analysis and properly presented.
2	Experiment properly conducted, serious errors in data analysis producing incorrect results.
1	Experiment properly conducted, data analysis and results missing / incomplete or experiment improperly conducted with data analysis and results consistent with incorrect experiment.

Outcome i. Prepare and present technical information effectively in document / report format

Score	Description
5	All sections of report included; no grammatical or spelling errors; proper formatting for technical documents; writing is at an appropriate level for a college-senior and clearly describes the experiment and results in sufficient detail to replicate experiment and all results; results and conclusions are sound and clearly conveyed to reader.
4	All sections of report included; no grammatical or spelling errors; proper formatting for technical documents; writing is at an appropriate level for a college-senior and describes the experiment and results in sufficient detail that the reader understands what was done and the important results.
3	All sections of report included; no grammatical or spelling errors; proper formatting for technical documents; writing is at an appropriate level for a college-senior; some elements of the experiment or results unclear to the reader.
2	All sections of report included; some grammatical or spelling errors and/or improper formatting for technical documents; writing is not at a level appropriate for a college-senior; some elements of the experiment or results may be unclear to the reader.
1	Some sections of report missing; serious grammatical or spelling errors and/or improper formatting for technical documents; writing is not at a level appropriate for a college-senior; some elements of the experiment or results may be unclear to the reader.

Weighting – the total score of each lab report was a weighted average of the scores from the five rubrics listed with weighting as follows:

- Outcome a – 10%
- Outcome b – 20%
- Outcome c – 10%
- Outcome d – 30%
- Outcome i – 30%

4) The grading process:

There were two primary groups of graded activities for the course:

1) Experiments and lab reports (70%)
    - Students conducted four experiments (biaxial stress, two-stage air compressor, gas turbine engine, and internal combustion engine) and wrote detailed laboratory reports.
2) Final project (30%)
    - Students were required to develop an experiment to demonstrate / test a theory or test the performance of a mechanical component or system.

Table 1 – Average Scores for Lab Experiments and Final Project

Outcome	Experiment 1	Experiment 2	Experiment 3	Experiment 4	Final Project
a	5.00	5.00	5.00	5.00	-
b	3.53	3.53	3.67	4.67	-
c	4.08	4.20	4.67	4.00	-
d	3.46	3.5	3.33	4.00	4.04
i	3.39	3.67	3.33	3.50	-

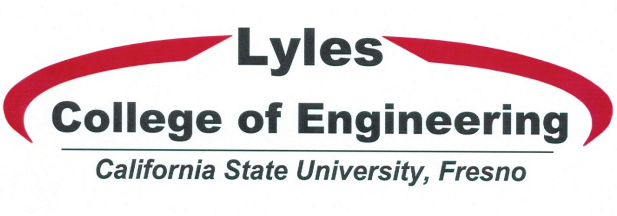
Observations

- Table 1 indicates that all of the learning outcomes were met, with the lowest outcomes being d and *i* being well above the benchmark of 3.0 and the highest being in outcome a. The average of 5 in outcome *a* is primarily a reflection that students were not required to perform advanced mathematical analysis in these experiments. It may be that this is not an appropriate outcome for this course.
- All students achieved a passing grade in the course. However, some students has averages lower than the benchmark of 3.0 in outcomes *d* and *i*, but were able to offset this with stronger scores in other outcomes. I personally do not feel this is a problem, as I do not believe it is feasible to require students to achieve the benchmark in every outcome to pass the course.
- While some students complained they found the grading scheme confusing, most students were familiar with the concept of assessment-based grading from the previous semester. While some students felt the method helped highlight their strengths and weaknesses, most students were indifferent; they just wanted to know their overall score and if they were passing the class.

- I found the assessment-based rubric style of grading to be better suited to a laboratory course and lab write-ups than traditional engineering courses focused on problem-solving. The rubrics should (at least in theory) provide some guidance to the students when preparing their reports and remove some of the subjectivity in grading.
- My overall feelings regarding assessment-based grading is mixed. While I think it is a good concept, it is cumbersome and time-consuming to implement. There is also a higher degree of subjectivity that both engineering instructors and students find uncomfortable, at least based on my conversations with students in my courses. Finally, after this experience I have come to believe that program-level assessment and grading are fundamentally different activities and should be kept separate.

Future Plans

- While I will continue to refine and apply rubrics to assignments with a heavier subjective component, such as design projects and lab write-ups, I will probably not continue to utilize assessment-based grading schemes. I do not feel that they are practical to implement in the current university environment, as they are simply too time-consuming; with lower teaching loads and smaller class sizes this could change in the future.



LCOE Rubric Student Focus Group Report

8 May 2012

Mark Barry, Songita Choudhury, Steve Field, Ronald Flautz, Christopher Krohn, David Ponce-Dick

California State University Fresno

Contents

Overview

The goal of this student focus group was to evaluate the new learning outcomes based rubric and gather student opinions on it as well as come to some conclusions of our own. There was one student assigned to each department, bringing the group total to 6 former, current and graduate students. Through each of our own studies as well as a student forum open to the entire College of Engineering, a few recurring themes were found. The rubric itself shows promise in all 6 programs, but has a few issues that need to be resolved. One main issue found was that the rubric presented a significant amount of subjectiveness in the grading. Also, in order for the rubric to be effective, the problems in which it is used for must be adapted to the rubric itself. The rubric offers some advantages in that it helps the students see where they are having issues and allows them to focus on their lower performing areas. The transition to this new rubric would be best if first instituted in freshman and sophomore courses and brought up as they advanced through the program, lessening the steep learning curve associated with the changing of the grading. When properly used, this rubric will help students further enhance their engineering understanding past simple physics and math and more into the core of what engineering is.

ECE SLO Review – Computer Engineering

ECE Student: Christopher Krohn

Classes Reviewed: ECE 155

Over the past two semesters the student focus group has held multiple group meetings, reviewed Student Learning Outcomes rubric graded material, analyzed student survey results, held a student forum, and discussed student feedback.

Several conclusions have been formulated.

First, it is apparent that there is a slight learning curve associated with the SLO rubric's implementation for faculty and students alike. This learning curve can be attributed to the fact that the SLO rubric grading method is new to LCOE courses. For example, tests and quizzes must be modified to test learning outcomes and explicitly state solution requirements.

Second, the SLO rubric grading method can force students to better understand their course material and its application. Students can no longer work out problems mechanically and receive full credit on coursework without explanation or analysis. Understanding of concepts is emphasized by the grading rubrics.

Third, the SLO rubric grading method is an excellent source of direct feedback to students on coursework. The SLO grading rubrics highlight weaknesses very well. Because the SLO focus on skill-sets required in industry, students can identify their weak points while still in school and work to achieve efficiency in problematic areas.

Fourth, incorporating the SLO rubric grading method into freshman courses first and then working up to senior courses will provide a smoother transition from traditional grading methods to the SLO rubric grading method. By transitioning smoothly between grading methods, students will become

accustomed to the new SLO method gradually which will ensure better understanding of SLO requirements.

Ultimately, although the SLO rubric grading method is new, and will require some adjustment, it is proving to be an effective grading method in LCOE courses. The SLO rubric is proving to be most beneficial to students by both providing feedback and requiring industry standards before graduation.

Mid-Term Course Student Survey
ECE 155 - Control Systems (Spring 2012)

DATE:_____

1. Classification (*circle one*): Freshman / Sophomore / Junior / Senior / Graduate Student/Other
2. Engineering Major (*circle one*): Electrical / Computer / Other
3. Course (*circle one*): Required / Elective / Free Elective / Other
4. Please rate the following aspects (**a** through **j**) of the course (*blacken one*):

	Strongly Disagree		Neutral		Strongly Agree
a. Course syllabus described fully pre-requisites, content, objectives, assessment rubrics, grades and grade distribution					
b. Course related activities (assignment, quiz, exam) were sufficient and appropriately distributed					
c. Quizzes and exams were reflective of course content and outcomes					
d. Assessment rubrics were direct and effective (i.e., reflective of course outcomes)					
e. Use of assessment rubrics provided an opportunity to enhance learning					
f. The course grading was not based on non-instructional measurements, such as attendance, bonus credits, curve, etc.					
g. The course increased my knowledge and interest in this area of study					
h. The course enhanced my critical thinking and problem solving skills					
i. Class size was not too large for the subject and format					
j. Fellow students were academically prepared for the course					

Please use the back page for additional comments/suggestions

Mid-Term Course Student Survey Results

A total of 26 students took the survey.

Question	Average	Standard Deviation
a. Course syllabus described fully pre-requisites, content, objectives, assessment rubrics, grades and grade distribution	4.35	1.02
b. Course related activities (assignment, quiz, exam) were sufficient and appropriately distributed	4.12	0.91
c. Quizzes and exams were reflective of course content and outcomes	4.38	0.85
d. Assessment rubrics were direct and effective (i.e., reflective of course outcomes)	3.58	1.27
e. Use of assessment rubrics provided an opportunity to enhance learning	3.50	1.03
f. The course grading was not based on non-instructional measurements, such as attendance, bonus credits, curve, etc.	4.15	0.83
g. The course increased my knowledge and interest in this area of study	4.23	1.07
h. The course enhanced my critical thinking and problem solving skills	4.27	0.87
i. Class size was not too large for the subject and format	4.23	0.91
j. Fellow students were academically prepared for the course	3.92	0.74

ECE Student: Songita Choudhury

Classes Reviewed: ECE 186B

After observing the new grading system via student learning outcomes (SLO), it is clear that the system shows promise. As a graduate, I can understand how such a system would be beneficial to all graduates whether they pursue higher education or enter the job market. The SLO system gives students a goal to work towards through their whole college career – a focus that was unclear previously or was more oriented towards just graduating. However, there are several issues that need to be addressed before the new grading system should/could be implemented throughout the whole college.

I believe that this system would be the most beneficial and cause the least friction if freshman students were introduced to it from their first engineering course. After visiting with students in ECE 186B (senior design course) – who are in the second semester of use of the new rubric – it was clear that the SLO system was an unwelcome addition to their final semester. Many students commented that it presented an extremely steep learning curve and drew their focus away from learning and completing assignments. A student said that it feels as though the engineering knowledge is being lost while they are trying to achieve outcomes to save their grades. If this system was introduced early on, I believe that students would feel more comfortable and have a better understanding of what they need to accomplish and learn by the end of the course.

Another issue that needs to addressed is the subjectivity introduced by the SLO system. The majority of students mentioned that it is often unclear how points are given and how they are deducted. While subjectivity will always be an issue, transparency can be increased by creating a rubric or set of rubrics that can be used throughout a program. If a professor fails to use the rubric in a way similar to

his/her colleagues, it will be difficult for students. I think it will also be beneficial to give students a few examples of how assignments/quizzes/exams will be graded.

During the student forum, there was discussion of what courses fit most naturally into the SLO system. There was disagreement among students of different disciplines – some preferred design/lab courses, while others preferred traditional courses. Among ECE students, there was agreement that the rubric based system was best in a lab setting. I believe that the rubric could be adapted to fit any course if the course material was also adjusted accordingly.

When these issues are addressed, the SLO system will benefit students greatly. This system goes beyond the traditional point grading system and adds a dimension that I feel is vital for students' success. This system gets into the core of engineering – beyond the application of math and physics. It separates the engineers from the mathematicians and physicists.

CM Student: Steve Field

Classes Reviewed: CM162 & CM164

The rubric was applied to Brad Hyatt's CM162 class in the fall and his CM164 class in the spring. I had the luxury to be in both those classes. The change to the rubric style of grading was very difficult at first. Not only did it require a change in how students approached the problems presented but it also required a drastic change in how the professor taught and presented the problems. Professor Hyatt did an incredible job listening to student comments and adjusting accordingly. This rubric would not have been as successful if the class did not have a professor willing to listen and change. In the fall CM162 class, students were strongly against the rubric and in a survey very few would give praise to the rubric style of grading. However, that all changed in the spring CM164 class. Construction Management students are required to take three consecutive classes being CM162, CM164, and CM166. Most of the students in the CM164 class participated in the fall CM162 class. There were a handful of students though that was in the CM164 class that did not participate in the class in the fall. The students that were not in the fall CM162 showed similar patterns of frustration. They did not have the chance to learn and adjust to the rubric grading. However, many of the students that came from the Fall 162 class had a change in opinion. In a survey to the class, of which 33 students came, four out of the seven surveys that had comments preferred the rubric style of grading and wished that the rest of their classes had that style of grading. These four students are students that have been known to excel and put forth a lot of effort into their classes. They tend to get "A"s and "B"s in their classes. The students that spoke poorly of the rubric are students that tend to not put much effort into their classes and they could be found riding other students' shoulders bumming answers from them.

Traditional methods of grading only truly looked at the final answer. If some work was presented than when the answer was wrong, the grader could find reasons to where the issue resulted. By grading the different elements of the problems, the rubric becomes conducive to more creative

answers. No longer is the grader grading the final answer, which is only 1/3 of the points. Students are able to look at the problem and find different approaches to solve it. This would train us to better as engineers. No longer is it important to know the formula because now students are expected to know more. They have to know how to apply that formula in different situations. This allows students to be graded on questions that typical to real world situations. Professor Hyatt did a great job in finding questions and situations that owners in the construction industry would present. These questions are going to better train CM students and teach them how to approach any situation.

There is a lot of potential with the learning outcomes rubric. My recommendations are to implement the rubric earlier and to continue to use it. A lot of frustration was from learning how to use the rubric and this can be eliminated if students are exposed to it in a basic class. This rubric grades the learning outcomes very well and does a better job of grading the overall preparedness of the students. Below are the results of the survey handed out in CM164.

CM164 Rubric Survey						
	Strongly Disagree		Neutral		Very Satisfied	Total
	1	2	3	4	5	
a. Course syllabus described fully pre-requisites, content, objectives, assessment rubrics, grade and grade distribution		1	4	10	17	32
b. Course related activities (assignment, quiz, exam) were sufficient and appropriately distributed	1	3	3	13	13	33
c. Quizzes and exams were reflective of course content and outcomes	5	6	7	9	6	33
d. Assessment rubrics were direct and effective (i.e., reflective of course outcomes)	2	4	4	15	7	32
e. Use of assessment rubrics provided an opportunity to enhance learning	4	5	10	8	6	33
f. The course grading was not based on non-instructional measurements, such as attendance, bonus credits, curve, etc.		2	8	9	14	33
g. The course increased my knowledge and interest in this area of study		1	8	12	12	33
h. The course enhanced my critical thinking and problem solving skills	1	1	6	14	11	33
i. Class size was not too large and format	3		6	17	7	33
j. Fellow students were academically prepared for the course	2	10	12	9		33

ME SLO Review

CM Student: Ronald Flautz

Classes Reviewed: ME 159

With the second semester and further analysis of the rubric grading system, an apparent theme has arisen. The theme is that of subjectivity. This subjectivity creates stress on teachers, graders, and even students. Mechanical engineering students have expressed their concern with the subjectivity of the system. With the old system, each step on a problem may have been graded with a pre-determined score, which if missed, those points were surrendered. With the rubric grading system two separate students can miss the same step but for different outcomes and receive different deductions. This subjectivity is not just a hindrance for students. This dilemma also causes problems for instructors.

To make this rubric system work a complete rewrite is needed for assigned problems. Current text book problems are not easily applicable to the system. The problems in current text books are not written for learning outcomes. To streamline the system a new problem pool would need to be created. With a better set of problems oriented around the system, the system could be implemented without as much subjectivity and time investment from the instructor.

The overall time investment required for grading with the rubric is increased in comparison to previous rubrics. This occurs in the shear amount of time required to properly balance between fair and unfair with the increased subjectivity. The system that was implemented as a SLO assessment based grading, but needs a lot of streamlining to be an effective tool.

The main target of this system seems to be the joining of assessment and grading. Assessment based grading seems unfair as a grade is not always representative of a student. If a student has a bad week or family emergency and fails a test, is this a fair assessment of his or her overall knowledge

learned? To properly assess a student, the student's growth or progress needs to be analyzed. A teacher can give everyone an A or F, but that does not mean that the student is a success or failure. To use assessment grading is unfair to the individual students.

The SLO assessment based grading system shows a lot of promise. As far as combining assessment into the grade itself, there is a lot of potential for system. For most students, the system does well to show the student the area most needed for improvement. However; the system in its current form does not properly address areas of subjectivity. Subjectivity may be a large area of concern. It is at the very least, important to the students.

GME SLO Review

GME Student: Mark Barry

Classes Reviewed: GME 143

The proposed rubric system does seem to add a greater degree of visibility into how students are performing and in which areas they ought to be focusing on to improve. In that respect, it is pretty well received, provided the rubric sections are well defined and questions which have multiple rubric sections leave little "grey" area. It helps remove a degree of subjectivity, though it certainly cannot eliminate it.

Areas of concern are how to weight rubrics both within a question and in exams or homework with multiple questions, and how that affects the transparency/subjectivity issue.

In a multiple questions homework or exam, not all rubrics will necessarily appear in every question. So the question then is should each question be first averaged by its individual rubric scores and then averaged across the exam, or should the individual rubric sections be averaged first? In this respect the transparency/subjectivity issue is less clear, unless it is very carefully addressed.

If a single question contains two or more rubric sections, should each section be equally weighted? For instance, where before a rubric system was implemented, in a hypothetical example the mathematical setup portion was considered less important and accounted for 20% of the problem, and the remaining 80% was for the applied engineering principles. Either the questions with multi-part rubric categories must be revised so each category is equally represented within the problem OR the categories must again be individually weighted problem to problem. If the latter is the case, it's

difficult to imagine how the transparency/subjectivity issue is to benefit whatsoever. In the former case, though the transparency/subjectivity issue is okay, I retain some concern over whether it is necessarily a good idea at all to force a question to fit a grading/evaluation system at all over testing what the instructors deem to be a question best representing the subject matter.

In short, the rubric system seems to show promise, but only if and when certain concerns can be properly addressed in a reasonable and appropriate manner.

CE SLO Review

CE Student: David Ponce-Dick

Classes Reviewed: CE 130

The implementation of the new rubric has caused some interesting reactions from both the students and teachers/graders. The first issue was that many students did not realize there had been a change in the rubric at all. Dr. Choo, whose CE classes were the ones that were evaluated using the new rubric, gave an extensive presentation on the new rubric and what it meant for the students and despite that, many still did not notice nor did they take advantage of the tools the rubric offered. Many students stated that they simply looked at the grade they received and moved on, not noticing how it was broken down by category or how it more easily allowed them to see their shortcomings. Without students using the tools, the rubric itself becomes irrelevant.

As far as graders and teachers go, this rubric actually makes their job more difficult. The rubric makes it so that instead of simply grading as a point break down of correct steps in the problem, the grader must judge the student in the categories being graded and reward them points accordingly. This often results in a large collection of students in the C and low B range because while it is difficult to receive full credit, it is also quite easy to achieve a passing grade by simply playing to the rubric. In the case of the CE classes, there is a category that is worth a quarter of the points and is simply math operations, which if the student makes no mistakes, can still get a 25% on an assignment they did not understand at all. Furthermore, the rubric introduces a fairly heavy amount of subjectiveness into the grading process. This was noticed by both students and graders and is something that will be very difficult to overcome in this sort of grading system. Engineering is a subject that is generally looked at as having right or wrong answers, not opinions about the work, and this causes students and graders alike to have issues with the rubric as it is currently implemented.

The rubric itself has some significant advantages that, if approached correctly, could help students better understand their standing in the courses as well as how to learn more effectively. By breaking down the subject in to learning outcomes and showing the student where they are excelling and falling behind, the student can better tailor their studying habits to what needs to be addressed. The main problem is that the current version of the rubric does not achieve this. In order to assist this, students themselves need to begin to use the tools presented to them, which can only happen through teachers promoting it and showing how they can help their grades through this system. Also, homework and test questions that have been effective before must now be tailored to the rubric. This often makes it difficult for students to use their textbooks for studying, as many of the test, and even homework, problems will be different.

The focus on learning outcomes within the rubric shows some significant advantages, but there are some changes that need to be made in order to make it fully effective. Currently, students do not fully understand the use of it and would need to be educated on how it can be helpful. Also, the rubric itself needs to be made less subjective and more objective from both a grader and student perspective. Finally, all questions that are graded with this rubric must be tailored to the rubric itself.

Mid-Term Course Student Survey
CE 130 – Theory of Structures (Spring 2012)

DATE:_____

1. Classification (*circle one*): Freshman / Sophomore / Junior / Senior / Graduate Student/Other
2. Engineering Major (*circle one*): Civil / Other
3. Course (*circle one*): Required / Elective / Free Elective / Other
4. Please rate the following aspects (**a** through **j**) of the course (*blacken one*):

	Strongly Disagree		Neutral		Strongly Agree
a. Course syllabus described fully pre-requisites, content, objectives, assessment rubrics, grades and grade distribution					
b. Course related activities (assignment, quiz, exam) were sufficient and appropriately distributed					
c. Quizzes and exams were reflective of course content and outcomes					
d. Assessment rubrics were direct and effective (i.e., reflective of course outcomes)					
e. Use of assessment rubrics provided an opportunity to enhance learning					
f. The course grading was not based on non-instructional measurements, such as attendance, bonus credits, curve, etc.					
g. The course increased my knowledge and interest in this area of study					
h. The course enhanced my critical thinking and problem solving skills					
i. Class size was not too large for the subject and format					
j. Fellow students were academically prepared for the course					

Please use the back page for additional comments/suggestions

Mid-Term Course Student Survey Results

A total of 26 students took the survey.

Question	Average	Standard Deviation
a. Course syllabus described fully pre-requisites, content, objectives, assessment rubrics, grades and grade distribution	4.41	0.63
b. Course related activities (assignment, quiz, exam) were sufficient and appropriately distributed	3.93	0.92
c. Quizzes and exams were reflective of course content and outcomes	3.72	0.84
d. Assessment rubrics were direct and effective (i.e., reflective of course outcomes)	3.76	1.02
e. Use of assessment rubrics provided an opportunity to enhance learning	3.52	1.09
f. The course grading was not based on non-instructional measurements, such as attendance, bonus credits, curve, etc.	3.90	1.08
g. The course increased my knowledge and interest in this area of study	4.17	0.89
h. The course enhanced my critical thinking and problem solving skills	4.17	0.71
i. Class size was not too large for the subject and format	3.93	0.92
j. Fellow students were academically prepared for the course	3.24	0.87