What's in it for me? Engineering Educators Respond to Criteria-Based Evaluation Methods

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Abstract

This study describes the response of two undergraduate engineering professors at different universities to a new criteria-based system of evaluation for their written lab reports. Both professors have worked with the same writing consultant in designing the criteria for evaluation in each assignment, and after only one semester, both have noted both negative and positive effects of using such a system.

There were three primary goals in this research applied to criteria-based evaluation:

- to reduce subjectivity associated with traditional holistic methods of assessment in engineering classes
- to decrease the amount of time the engineering professors actually spend in evaluation
- to assist in promoting student/professor interaction in discussing evaluation problems

The pilot audience for this research consisted of two undergraduate civil engineering courses at different universities: a senior-level fluids course (*n=52*) and a sophomore-level computation course (*n=38*). Results were collected through triangulated measurement devices, and initial results indicate that at the semester mid-point, two of the three goals have been reached.

Preliminary findings report that students have also reported distinct advantages with this method of assessment: they know what to expect, they have access to the criteria before and during preparation of the assignment, and the system seems fair.

Mid-semester disadvantages include increased time for both instructors in renovating, customizing, and designing the evaluation criteria for the assignments, but both professors attribute this excess to a "learning curve" associated with the new system, and both expect the advantages of the system to outweigh short-term complaints. In addition, both professors plan to extend this system of assessment to other Civil Engineering courses in both universities.

Introduction

In the fall semester of 2000, two undergraduate civil engineering instructors in different universities pilot tested a form of criteria-based assessment for their lab assignments with three primary goals:

- ❖ to reduce subjectivity associated with traditional holistic methods of assessment
- ❖ to decrease the amount of time spent on the assessment process
- ❖ to promote student/instructor interaction when discussing assessment issues

Both instructors worked in collaboration with the same writing consultant to redesign and customize assignments for their respective courses, and after only one semester, both engineering instructors have noted significant changes in their views and practices regarding assessment duties.

Background

ABET 2000's call for engineering graduates with sound technical skills complemented by strong communication skills has resulted in increased focus on the evaluation of such skills[1]. As writing instructors have known for years, assessment and evaluation of written documents differs from the more quantitative assessment practices associated with discrete theoretical concepts, and many engineering educators express frank confusion regarding evaluation of writing. While they agree about the degree of confusion, potential solutions are limitless. Most recently, Pappas and Hendricks[2] suggested a "holistic" type of approach to evaluating writing that focuses on assigning one letter grade as a representation of the work in general, and while there are distinct advantages associated with this approach, it was not feasible for our study because one of our goals included an increased sense of student/instructor interaction. In addition, Miller et al.[3] found that engineering students respond well to a combination of a numerical score plus qualitative teacher-generated comments as opposed to previous findings which suggested that students in general composition classes who do not prefer or respond to qualitative comments.

The second phase involved reviewing some of the more recent curricular modifications in engineering education, and in general, research data supported that idea that successful modifications include a variety of approaches designed to work together and reflect the individual learning styles of the students. Randolph's[4] recent review of Kolb's[5] and Bloom's[6] work regarding individual learning styles suggests that engineering educators should design curricular methodologies that are more student-centered and less teacher-centered. At the same time, Randolph[4] proposes that writing can be used as a powerful tool for learning by incorporating more psychologically active writing activities to promote transfer from content knowledge to application of content. Suggestions include asking students to write in professional formats for potential engineering clients instead of the more tradition write-to-the-teacher format, and Randolph[4] also suggests designing group-based writing activities to allow for increased transfer of content knowledge to engineering applications.

In designing our research plan, we reviewed current literature regarding prevalent methods of assessing writing in engineering writing, and we targeted specific areas in response to this research. By combining this literature with current cognitive psychological theories regarding individual learning styles, we designed a pilot research plan to emphasize criteria-based writing assignments customized around the content requirements of two independent engineering courses.

Methodology

The pilot audience for this research consisted of two undergraduate Civil Engineering courses at different universities: a required senior Fluids course (*n=52*) at The University of Kentucky and a required sophomore computation course (*n=17*) at The University of Memphis. The writing instructor worked with both engineering instructors on the first day of their respective courses to introduce the concept of a criteria-based assessment system to the students, and students were strongly encouraged to provide feedback to either the engineering instructor or the writing instructor at any point during the semester. Specifically, an online email account was created for the students at The University of Kentucky to communicate with the writing instructor about these things; because the writing instructor is based at the other university, students were free to interact with her either in person or by email.

Figure 1. Original error analysis assignment (excerpt).

ANALYSIS AND DATA PRESENTATION

A. A table is needed to document the necessary computations to determine the velocity for each test condition. Note that the barge is *6 inches* in length. With the velocity, weight and impact force, graph F vs. V on a scatter plot. The use of several regression programs determines the relation between the force and velocity.

B. The form of the equation relating impact force to weight and velocity is

$$F = CV^{a}W^{b}$$

where *F* is the impact force, *V* is the velocity of the barge, *W* is weight of the barge and contents and *C*, *a*, and *b* are coefficients. Plot the Impact Force as a function of the velocity. Is there a trend? Confirm the hypothesis that *C=0.8*, *a=1.3* and *b=-0.07*.

C. For this type of calibration effort, it is important to understand the relative error introduced into the experiment by the various measurements. Details of linear error analysis will be discussed in the lab. You will provide a detailed error analysis derivation as part of the computations. Assume for this experiment that the precision of the length was *+/- 0.05in*, the measurement of weight was *+/- 0.02 lbs*, the time was *+/- 0.0003 seconds* and the impact force was *+/- 0.0095lbf*. After performing the error analysis, compute how individual measurement errors translate into an error in the impact force for each data point. Which measurement is most likely to have an adverse effect on the experimental results? Is the variation in the impact force observed in the experimental data explainable on the basis of limited precision in the measurements (hint: include error bars on your *F* vs V graph)? Which measurement techniques would have to be improved, and what would be the required resolution, in order to improve the accuracy of the calibration? How does the error in F_{calc} relate to the error in F_{exp}?

D. Present your results in a concise one-page summary utilizing the graphs, error analysis and all computations as supporting documentation. Your audience is the primary issue (See audience profile discussion). The one page summary will be divided into three sections: background and motivation, results and discussion, and recommendations. Make sure you address all questions raised in this handout!

Designing the Authentic and Criteria-Based Assignment

The first part of integrating criteria-based assessment into established courses with existing assignments is customizing the assignments to reflect the changes and explaining these changes to students. To do this, we provided the students with an assignment in the same format as previous years (Figure 1); then, we distributed the same assignment reworked to include a more authentic engineering situation (Figure 2) with a criteria-based system (Table 1). By explicitly

noting the differences between the two types of assignments, students were able to discover one of the primary advantages to criteria-based systems: there's no mystery about what the instructor is looking for in the assignment because the criteria are provided initially.

Designing/Presenting the Assessment Instrument/Table

The second part of criteria-based assessment involved designing an assessment instrument or assessment table for evaluation. Importantly, this assessment must be explicitly linked to the goals of the assignment, and this assessment device should be presented to students along with the initial assignment. While both engineering instructors previously evaluated assignments in two major areas of content itself and the presentation and technical writing of the assignment, neither instructor had ever explicitly attributed specific points to certain criteria in advance of assessment. For these reasons, designing the first few assessment tables took time, attention, and much revision, but in the end, Table 1 was designed as the assessment table for the assignment presented in Figure 2. From our experience in designing assessment tables that worked well with the assignments, we recommend that instructors actually sketch limited expectations of what findings they expect in the final document and go from there. Once the expectations are stated, more specific guidelines may or may not be required, but explicitly stating these expectations for the students greatly reduced both our own subjectivity in evaluation and reduced the students' frustration in losing points for something they had not realized was important. In addition, we were able to explicitly link the stated criteria on the assignment to expected parts of the written document and the oral presentation, thus taking the mystery out of the evaluation process as well.

Using the Assessment Instrument/Table

It is important to note that commitment to a criteria-based system requires carrying through with the process, and that includes evaluating the assignment completely on the stated criteria. In working with the first few assignments, both of the engineering instructors realized they had assigned too much weight in some areas and not enough in others, but the integrity of any criteria-based system requires no deviations from the table at the time of assessment. A remedy is to include handwritten comments along with the quantitative feedback and then revise the table appropriately or as needed for the next assignment. Table 2 shows how the criteria assessment table changed due to student and instructor feedback.

Assessing the Assessment Changes - Student Feedback

In order to obtain student feedback about these changes in assessment practices, surveys were designed by all three instructors to measure students' reactions pre-semester, in-semester, and post-semester. Copies of the CE441 surveys are available in the appendices. Through ongoing feedback, we collected students' perceptions about the evaluation process and their overall satisfaction with the course. We used this, coupled with instructors' perceptions, to update the criteria evaluation. At the end of the semester, we asked the students to rate their degrees of confidence in previous evaluation methods as compared to the criteria-based systems. Highlights of the feedback process are outlined in the following text.

Pre-semester findings (Appendix A): A pre-semester survey was conducted on the pilot section of a senior-level Fluids Mechanics (CE441) at The University of Kentucky in the fall semester of 2000 to assess the students' expectations of the course and instructors on the first day of class. When asked for specific expectations of their course instructors, *36* of *52* students stated expectations concerning course instructional methods. Selected excerpts from this section are quoted below

Figure 2. Modified (from Figure 1) Authentically-based assignment (excerpt).

ANALYSIS AND DATA PRESENTATION

A. Concept: The form of the equation relating impact force to weight and velocity is

$$F = CV^{a}W^{b}$$

where *F* is the impact force (lbf), *V* is the velocity of the barge (ft/sec), *W* is weight (lb) of the barge, *C*, *a*, and *b* are coefficients. The precision of the length was *+/- 0.05in*, the measurement of weight was *+/- 0.02 lbs*, the time was *+/- 0.0003 seconds* and the impact force was *+/- 0.0095lbf*.

Application: Design a table to document the following computations. Note that the barge is *6 inches* in length.

- Plot the Impact Force as a function of the independent variables V and W.
- Is there a trend?
- Using multiple-linear regression with the linearized form of the equation, determine values of a, b, and C?

B. Concept: In any calibration effort, it is important to understand the relative error introduced into the experiment by the various measurements and their effect on the overall validity of the data. The error analysis documents how individual measurement errors translate into the total error in the impact force.

Application: Perform a linear error analysis to answer the following questions:

- Which measurement is most likely to have the greatest adverse effect on the experimental results?
- Is the variation in the impact force observed in the experimental data explainable on the basis of limited precision in the measurements (hint: include error bars on your F_{obs} vs V and W)?
- How does the error in F_{calc} relate to the error in F_{obs}?
- Is improvement in the experimental technique necessary so that the combined error in the measured independent variables (L, W, and t) are bound by the error in the measured impact force (F_{obs})?

WRITING ASSIGNMENT

The situation:

Practicing engineers often have to present complicated technical data to non-technical audiences, and for this report, your audience is Juanita Seagraves, Vice-President of Prefabricated Piers. Her company believes that prefabricated piers can be used instead of cast-in-place piers. However, to do this, they need to come up with an improved method of quantification of the impact forces on piers. Ms. Seagraves' company can avoid costly over-design expenses by developing a more robust impact theory and corresponding equation(s) to quantify the impact force on piers, while using greater quality control in the prefabrication process. Prefabricated Piers is planning some field tests and extensive laboratory work on scale models and would like feedback on the validity of their equation, as well as on the accuracy of collecting laboratory data.

The link to real-life engineering practice:

Your lab group functions as a consulting engineering firm, and the members of your group have received the attached memo from Ms. Seagraves requesting your assistance. Your group will work together to write a one-page memo with attachments reporting to Ms. Seagraves the results of your work. Your report should include three main sections: a brief background and motivation section, a results and discussion section, and your recommendations section. Present the information in language geared toward a non-technical reader, using your graphs, error analysis, and computations as supporting information. Finally, your group will organize, design, and present a 7-minute presentation to your client via videotape on _____.

***Note:** The language of the memo is dense, wordy, and difficult, but this serves as an authentic example of what you would receive as professional engineers. While you can't change this, you CAN and SHOULD make your own report clear, brief and easy to follow.

Figure 2 con't. Modified (from Figure 1) authentically-based assignment (cover memo).

MEMORANDUM

TO: <your group name>

FROM: Juanita Seagraves, Vice President Development, Prefabricated Piers

RE: Notice to proceed on the analysis of the impact force equation and associated experimental data.

As per our conversations and meetings during the week of August 28, 2000, please proceed with analyzing the data and our associated barge impact equation. As you know, my company believes that prefabricated piers can be used instead of cast-in-place piers. As we discussed, my company wants to come up with a better way of determining the impact forces on piers. I have given you the latest results from our internal studies, which includes the impact force equation as a function of barge velocity and weight. With this equation, coupled with the quality control available in the prefabrication process, we hope to avoid costly over-design. Based on the preliminary information that you will provide us, Prefabricated Piers will decide whether to start full scale testing. The testing will include some field studies on bridges scheduled for replacement, plus extensive laboratory work on scale models. We would like your analysis and feedback on the validity of the impact equation and experimental procedure used to collect the data. Besides determining the coefficients to calibrate the equation, we would like you to quantify

- whether the difference between the observed impact force (using experimental data) and the calculated one (using the equation) is explainable on the basis of limited precision in the measurement techniques.
- how the error in the calculated force relates to the error in observed force.

If there is a significant amount of error in the lab data, please comment on the necessary improvement in the experimental technique(s) so that the combined error in the measured data is bound by the error in the measured impact force. Also, please comment if there is something fundamentally wrong with how the data is being collected.

Since I will be out of town for two weeks, if you have any questions or comments please feel free to contact my quality control representative Scott A. Yost at (859) 257-4816 or email at yostsa@engr.uky.edu. I look forward to your report and presentation.

Cc: Scott A. Yost

Table 1. Original Criteria-Based Evaluation Table.

CRITERIA FOR EVALUATION
Group name: _____
Group members: _____, _____, _____, _____

Audience Analysis

20 points/___	Minimal (0-1 pts)	Adequate (2-3 pts)	Excellent(4+ pts)
Memo format			
Proper recipient			
Audience awareness			
Explanation of terms in plain language			

Content Analysis

30 points/___	Minimal (0-3 pts)	Adequate (4-7 pts)	Excellent(8+ pts)
Background/motivation			
Results/discussion			
Recommendation			

Presentation of Data

30 points/___	Minimal (0-3 pts)	Adequate (4-7 pts)	Excellent(8+ pts)
Use of graphs/charts			
Error analysis			
Computations			

Technical Writing Proficiency

20 points/___	Minimal (0-1 pts)	Adequate (2-3 pts)	Excellent(4+ pts)
Clarity of writing			
Organization			
Grammar/punctuation			
Correct spelling			

Oral Presentation Analysis

50 points/___	Minimal (0-1 pt)	Adequate (2-3 pts)	Excellent(4+ pts)
Appearance			
Introduction/participation of all members			
Connectives/ transitions			
Organization/ quality			
Extemporaneous delivery			
Language/voice			
Non-verbals			
Visual aids			
Conclusions/recommendations			
Time (+/- 15sec intervals)			

Comments:

Table 2. Updated Criteria-Based Evaluation Table.

CRITERIA FOR EVALUATION

Group name: _____Group
Members:_____

Content Analysis: 60 points/___	Possible	Score
Introduction/problem statement	10	
Rise in water elevation	5	
Extend of effects upstream	5	
Explanation of the basic procedure	10	
Appendix: Sample calculations, verification	10	
Appendix: explanation of the program procedure, theory, and consistency	10	
Recommendations/Conclusion/link between contract and your company	10	

Presentation of Data: 20 points/___	Possible	Score
Graph of channel location	5	
Graph of surface location	5	
Graph of normal and critical depths	5	
Accuracy of computations	10	

Technical Writing Proficiency 20 points/___	Possible	Score
Audience Analysis—"client-friendly focus"	4	
Document Design	4	
Readability: grammar/punctuation/spelling	4	
Clarity of the writing	4	
Link between document and appendices	4	

Oral Presentation Analysis: 50 points/____	Possible	Score
Time limit 5min (6 min max)	5	
Motivation: Outline of Project - overview of issues	10	
Customization of content to general engineering (non-water resources) audience	10	
Anticipation of client's future needs	5	
Level of interest/enthusiasm	5	
Professional appearance	5	
Quality/use of visuals	10	

TOTALS: Report: 100 points/___ Presentation: 50 points/___

Comments:

Table 3. Post Assignment Survey results.

Question	True/Yes	False/No
1. I believe that this lab assignment includes the type of writing, analysis, and presentation skills I'll be required to have as a practicing engineer	50	2
2. I believe my group worked together well to complete this assignment	50	2
3. My group asked either Dr. Yost or Ms. Phillips for assistance/comments at the draft stage	39	13
4. In general, I believe that this assignment reflected my knowledge about error	43	19

analysis		

- *To turn technical knowledge and experience over to the students in an easy-to-understand format.*
- *To provide us with the information we need to understand this course.*
- *To provide extra assistance to students extra assistance to students when there is confusion/difficulty with the material.*
- *Present material in an effective manner that is understandable…to be readily available to answer any questions.*

With regard to grades, we were very surprised to find that none of the *52* students stated specific expectations concerning specific course grades. Rather, they stated their expectations of evaluation in more general terms:

- *to be good and fair*
- *to be fair and straightforward*
- *to be fair and understanding*
- *to present in-depth descriptions of what is required…*
- *teach us so that it works with the exams*

The survey also asked students to write suggestions regarding their own learning styles as applied to the course. We found a close connection between learning techniques/methodology and expectations of fairness in design and evaluation of work. Examples here include group discussions, use of example problems from authentic engineering situations, and direct application of their new content skills to the work they will do as engineers.

These findings were important to us and revealed on the first day of class that our CE441 students had clear expectations of both what they needed to learn and how they wanted to learn. This information was very useful to use in designing the instructional methodology and assignments throughout the course. Interestingly, *46* of *52* students replied YES to the following question: "Do you believe that your previous Engineering courses have been linked to what you will be expected to do as a practicing engineer?" As engineering educators, these findings pleased us.

Mid-semester findings (Appendix B): A survey was administered at the completion of the first major group assignment. Students were asked to use the same criteria-table as the instructors and assign a grade to their assignment before turning it in (this part of the survey was not included). In addition, the survey also included 4 specific questions regarding the first assignment and any problems, comments, or feedback about the process of completing the assignment. Table 3 presents the results of this survey. It is interesting to note that *50* (out of *52*) students reported "I believe that this lab assignment includes the type of writing, analysis, and presentation skills I'll be required to have as a practicing engineer" since we were trying to present the material in a more authentic situation. Most valuable were the qualitative comments submitted by the students, and here are some representative excerpts:

- *Felt it was a new and good learning experience for me. Challenged me.*
- *We believe that we grasped the concept of error analysis…I feel that we presented the material in the write-up in a clear, but concise manner….*

- *I liked the group format, and I think we worked well to get the assignment done.*

Table 4. Select Post Semester Survey results.

Question	Results
13. I liked the criteria-based system of grading (the table) used for the written labs better than the traditional system of assigning a specific number with no comments/breakdown.	4.10
14. I believe the evaluation of the lab assignments was fair and accurate.	3.36
15. I believe the evaluation of the tests was fair and accurate.	3.88
16. I believe the evaluation of the homework assignments was fair and accurate	3.88

Post-semester findings (Appendix C): The last survey was administered on the last day of regular classes. Results from the grading and evaluation section are given in Table 4. Overwhelmingly the students liked the criteria based system compare to the previous experiences.

Instructor Feedback

Because all three researchers were active participants as instructors in this research, feedback was collected through multiple informal meetings and supplemented with an online journal where comments were shared about the system. While both engineering instructors were using the criteria-based system of assessment for the first time, the writing instructor has used similar systems for assessing writing and engineering writing for over five years, so her feedback on this process was mainly consultant-based. At mid-semester, both engineering instructors reported increases in time spent renovating, customizing, and creating lab assignments and the criteria-based assessment tables to accompany them, yet they also reported decreased time spent in evaluation of the writing assignments. One instructor described this as time saved by "streamlining"—meaning that because he knew exactly what he was looking for, he was able to focus on the presence or absence of specific criteria, and he found that this process saved time.

Results/Discussions

While all three researchers readily admit that their criteria-based system of assessment evolve as their assignments change, and that these changes increased attention to detail when envisioning assignments, each also believes that the criteria-based system's advantages significantly outweigh the disadvantages. And while it is difficult to establish credibility or usability with a professorial sample of two, we believe that the significantly positive response we have had from the CE441 students in the pilot section verifies our suspicions. In essence, we were able to meet two of our original three goals in this research: we believe we reduced subjectivity levels in evaluation of engineering writing, and we believe we promoted student/teacher interaction and communication through our instructional modifications. We were not able to meet the goal of significantly decreasing the amount of time we spent on the evaluation process, but given that the process is still being refined, it seems logical that speed will also improve with practice.

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Appendix A. Pre-Semester Survey.

Introduction: Welcome to CE 441. Because this class is part of an educational research project regarding innovative teaching methodologies in engineering education, your responses to the following questions are important. All answers and information obtained from this survey and subsequent research is confidential, and participation in the research is voluntary. Dr. Yost and Ms. Phillips are available today and throughout the semester to answer any questions about this survey or the intended research, and may be contacted at (859) 257-4816 or ukce441@aol.com.

Name:_____ **Age:** ____ **Gender**: ___

What is your field of study within Civil Engineering (i.e. structures, environmental, etc…)? _____

Do you believe that your previous Engineering courses have been linked to what you will be expected to do as a practicing engineer? __Yes __No

How many lab classes have you had?_____

How would you rate your learning experience in previous lab classes? (check one)

☐ Lab improved learning substantially ☐ Lab improved learning somewhat ☐ Lab did not effect learning
☐ Lab decreased learning ☐ Lab decreased learning substantially ☐ Other _____

Do you expect that CE441 Lab will enhance your learning of Fluids II? ___Yes ___No

Do you expect that CE441 will be a writing-intensive class? ___Yes ___No

Do you expect that CE 441 will be a programming-intensive class? __Yes ___ No

Do you expect that CE 441 will be a computation-intensive class? ___Yes ___No

Which of the following skills appeals to you most? (check one)

☐ technical writing skills ☐ computer programming skills
☐ computation skills ☐ other. Please describe _____

Which of the following skills appeals to you least? (check one)

☐ technical writing skills ☐ computer programming skills
☐ computation skills ☐ other. Please describe _____

In your opinion, how useful are technical writing skills to engineering students?

☐ very useful ☐ not useful
☐ somewhat useful ☐ other. Please describe _____

What are your expectations of your CE 441 instructor/s?

If you could make one suggestion to enhance your opportunity to learn concepts and content in this course, what would you suggest?

What kind of skills do you expect to learn in CE441 that you will use in your professional work as an engineer?

Appendix B. Post-Assignment Survey.

Please answer the following questions about Lab Assignment 1:

1. I believe that this lab assignment includes the type of writing, analysis, and presentation skills I'll be required to have as a practicing engineer. ____True ____False

2. I believe my group worked together well to complete this assignment. ____True ____False

3. My group asked either Dr. Yost or Ms. Phillips for assistance/comments at the draft stage. ___Yes ___No

4. In general, I believe that this assignment reflected my knowledge about error analysis. ___Yes ___No

Suggestions/comments about Lab Assignment 1:

Appendix C. Post-Semester Survey.

Post Semester Survey

Please indicate your response by circling the following number. (1 is strongly disagree, 5 is strongly agree)

Overall					
1. I believe my grade will be a fair assessment of how much material you learned.	1	2	3	4	5
2. My time spent in this class was productive in developing my general engineering/professional skills.	1	2	3	4	5
3. My time spent in this class was productive in developing my technical water resources skills.	1	2	3	4	5
4. Compared to all other civil engineering classes, this class was the most valuable for my profession.	1	2	3	4	5
5. I performed up to my potential in this class.	1	2	3	4	5
Communications Component					
6. I believe my written, oral, and presentation design skills were increased in this class.	1	2	3	4	5
7. I believe the presentations will assist me in my professional employment.	1	2	3	4	5
8. I believe the writing assignments for this course reflected the kind of writing I will do as an engineer.	1	2	3	4	5
Feedback					
9. I believe the online journal contributed to my opportunity to learn in this class.	1	2	3	4	5
10. I would recommend the use of this type of journal for student-professor feedback in other courses	1	2	3	4	5
* One thing I liked about the journal was:					
* One thing I disliked about the journal was:					
Teamwork/Group Work	1	2	3	4	5
11. I had an overall positive experience working with my group.	1	2	3	4	5
12. I would have preferred to do all assignments individually.					
* The best thing about my group was:					
* The worst thing about my group was:					
Grading/Evaluation	1	2	3	4	5
13. I liked the criteria-based system of grading (the table) used for the written labs better than the traditional system of assigning a specific number with no comments/breakdown.	1	2	3	4	5
14. I believe the evaluation of the lab assignments was fair and accurate.	1	2	3	4	5
15. I believe the evaluation of the tests was fair and accurate.	1	2	3	4	5
16. I believe the evaluation of the homework assignments was fair and accurate.					
* Suggestions about grading in this class:					
Team-Teaching Approach	1	2	3	4	5
17. I believe the team-teaching approach (Yost & Phillips) improved my learning opportunities in this class.	1	2	3	4	5
18. I believe the team-teaching approach (Yost & Phillips) took time away from content issues that I needed/wanted to learn.	1	2	3	4	5
19. I'd recommend a team-teaching approach similar to the CE 441 approach by Yost & Phillips in other engineering courses.					
*Comments about the team teaching approach:					

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