

Assessing the PRiME Modules: Spring 2005

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Introduction

In the summer of 2004, the PRiME project team at the University of Texas at Austin began creating resources that encourage undergraduate students to develop their analytical skills and teach them fundamental strategies for approaching professional and ethical challenges. These resources take the form of web-based educational lessons that can be broken down into discrete exercises, used as a whole, or combined with other lessons. Lessons on similar subjects are grouped into modules. The ultimate goal of PRiME is to create customizable modules that Engineering instructors can use in any Engineering course.

The first set of lessons was developed in summer-fall of 2004 and posted on the web in readiness for piloting in spring 2005.

Methodology

Six PRiME lessons were piloted and assessed at the University of Texas at Austin in the spring of 2005. The pilots were conducted by UT faculty in Engineering Communication courses and observed by research assistants in the classroom. The assessment plan had four components: a self-reported questionnaire issued to students, student focus groups, in-class observations, and internal assessment (delta question) for each lesson. The last component was up to individual instructors to assess, so we have no data on the delta question in this report.

The individual lessons assessed are shown in Table 1.

Table 1. Lessons within PRiME modules

<u>Professional Ethics</u> 1. Introduction to Professional Ethics	<u>Leadership</u> 2. Ethical Leadership
<u>Credibility of Sources</u> 3. Evaluating Web Sites 4. What to Report?	<u>Ownership of Information</u> 5. Copyright 6. Plagiarism

All engineering students who participated in PRIME pilots were invited to provide qualitative feedback through self-reported questionnaires and focus group participation. To help create a confidential environment and elicit honest feedback, a project specialist and teaching assistant administered the questionnaires and conducted the focus groups, without the presence of an instructor. The questionnaire (attached as Appendix A) focused on student learning gains as a result of lesson content and pedagogy and targeted any problems with online navigation or clarity of instructions.

IRB approval was obtained for this assessment project and students were clearly informed that their responses would be treated as anonymous and would not affect their grades in any way.

Questionnaire Results

The results for questions 1 and 2 reveal that online navigation appeared to go well, with only a few problems with broken links or difficulties with opening the initial URL.

1. Did you encounter any difficulties accessing the opening URL for this lesson? Yes: 21 **No: 368**
2. Did you encounter any problems in navigating the online portion of this lesson? Yes: 21 **No: 364**

Charts were plotted for each of the lessons on the basis of the rest of the questionnaire's questions. Appendix B shows those charts. None of the lessons scored lower than 3 in any category, and most scored between 3.2 and 4 (out of a possible 5), but some lessons were obviously more successful in certain areas than were others. The following paragraphs give a summary of the questionnaire results.

Survey questions 3 and 4 asked about perceived relevance of the lesson to "current academic goals" and to "future professional needs." The Plagiarism and Leadership lessons scored highest (3.93 and 3.62 mean, respectively, out of 5) for "academic goals." The open-ended comments on the survey reveal that many students understood the relevance of recognizing plagiarism to being successful in their academic career. For the question about relevance to "future professional needs," Plagiarism again scored very high but not quite as high as Leadership, 3.87 vs. 3.98 mean. This result may reflect students' desire to understand as well as to become the managers and leaders in their profession. And, hearteningly, they seem to realize that awareness of what constitutes plagiarism will continue to be important in their professional lives. The Copyright lesson, which scored lowest, focused on the ethics of downloading music and the larger debates over "fair use." Although the subject matter would seem to be relevant to students, this lesson had been designed purposefully for freshmen, and it was difficult to fit the lesson into the junior-level communication course.

Question 5 asked about clarity of instructions. All lessons scored between 3.5 and 3.92, so results were deemed quite acceptable. Students commented on Copyright that there was limited time available for discussion and on Evaluating Web sites that there was little time to digest the matrix.

Questions 6 and 7 asked whether the material enhanced students' understanding of "professional responsibility" (question 6) and the "social context of engineering" (question 7). For both questions, four lessons scored high: Professional Ethics, What to Report?, Plagiarism, and Leadership. These results seem consistent with the content of these lessons: the first two present professional responsibility issues explicitly by introducing students to Codes of Ethics for Engineers, and all of them introduce "social context" in ways that Evaluating Websites, for instance, does not.

Focus Groups, Observations, and Questionnaires: *Emergent Themes*

Several themes emerged from student responses, details of which are detailed below.

1. Relevance. The most significant theme to emerge throughout surveys and focus groups across virtually all PRIME modules is *Relevance*. Overall, students' approach and level of acceptance of PRIME modules related to how they perceived a topic's relation to the practice of engineering and academic requirements. "What's in it for me" underlaid the majority of responses. In several cases, students stated they needed the relevance of the lesson to academic or professional needs as well as engineering stated directly.

2. Novelty and Appropriateness of Ethics and Professional Responsibility topics in Engineering Communication courses. Virtually all responders stated the PRIME pilots were the first time they had explored engineering ethics and responsibility topics in their engineering coursework. Overall students welcomed the exposure to PRIME topics. However, a significant number of students were unclear about why or how PRIME topics aligned with course communication objectives. Some stated too much time was devoted to PRIME lessons and PRIME homework. Although students were given written and oral communication assignments throughout the PRIME lessons, students voiced concerned that PRIME topics detracted from time that could have been concentrated on writing and communication mechanics or how to communicate strictly technical information.

3. Value. Students related the value of a PRIME lesson in terms of personal interest and usefulness. When assessing PRIME topics overall, some students expressed an appreciation for the opportunity to analyze topics and perspectives with which they had no prior experience or exposure. Lessons students deemed interesting or of immediate academic benefit were the lessons they valued highly. The Introduction to professional Ethics and Leadership modules elicited the most fruitful discussions across several class sections in terms of student engagement and thoughtful analysis. In formal feedback sessions, students rated the Leadership module as most interesting and yielding the best discussion as they were able to draw on their work backgrounds and to evaluate leadership styles. Despite the quality of discussion during the Buffalo Creek module, some students at the semester's end or several weeks after the Buffalo Creek topic, evaluated the module as uninteresting and less valuable because of its historicity. In retrospect, students were unable to relate Buffalo Creek to their current or future goals and thus deemed it less valuable. Lessons that had immediate academic application, such as citing electronic sources and avoiding plagiarism also were cited as useful, although of short-term value. When assessing PRIME topics overall, some students expressed an appreciation for the opportunity to analyze topics and perspectives with which they had no prior experience or exposure.

4. Ambiguity / Bias. Students preferred topics or scenarios that were complex and ambiguous, which allowed them to formulate their unique perspective. Students were sensitive to and even offended by what they perceived as bias. The Leadership Challenge scenario about Jack and Susan's leadership styles elicited the most concerns about bias and even sexism. The Challenge, they believed, was constructed so that the only right response was to favor Susan's participatory style of leadership. Students noted that the Challenge was also sexist because it not only pitted a woman against a man but discussed the woman's physical aspects. Students also pointed out elements of bias in the Buffalo Creek lesson. First, the videos concentrated on the Buffalo Creek's residents tragic situation in an emotional fashion. Second, Pittston Coal's side was not represented.

5. Instructional Organization. As highlighted in terms of Relevance and Value, some students expressed frustration in terms of the use of PRIME modules into what they perceived as strictly a technical communications course. One focus group concentrated their feedback on course organization and their dissatisfaction with a structure that alternated between PRIME modules and non-PRIME major writing assignments and lessons. Overall, the engineering students stated they wanted a clear, consistent, and efficient structure. To this end, students provided positive feedback about the structure provided by the HPL challenge cycle although most instructors did not go through complete cycles during the pilot. Students whose course began with the Buffalo Creek module cited that it was a good opening to the course. However, some students found the reading material in Buffalo Creek - Gather Multiple Perspectives to be redundant and could not identify the unique information that each selection provided. Students also provided positive feedback on the Evaluating Web Sites lesson assignment which included a grid for them to fill out rather than open-ended questions. They liked working with a rating and ranking grid structure which efficiently structured their classroom discussion as opposed to a qualitative evaluation of lesson material.

6. Infrastructure and Media. In addition to a clear instructional structure, students value an efficient, clear educational infrastructure. Throughout the pilot students provided feedback about broken links and found the initial entry points to the PRIME website and lesson cycles difficult to access. A few students found navigating the HPL challenge cycle difficult when instructors did not follow the cycle from beginning to end. Students suggested a spell-check feature should be added to PRIME text-boxes that they use to complete assignments. One focus group discussed the audio and video media, citing the Plagiarism audio clip and Buffalo Creek videos in their appreciation of a multimedia element to classroom instruction. The Hearsay video received mixed reviews, probably because one class viewed an edited version and one viewed an unedited version. Overall students found multimedia elements engaging regardless of how they evaluated the content.

Student Assessment: Qualifying Factors

Through classroom observation and conducting student assessments, the project specialist and teaching assistant identified several factors that likely affect the assessment data. These factors should not be overlooked as the data are interpreted and as PRIME modules are created and revised.

1. Assessment Timing. Due to a delay in receiving University - IRB approval for administering the surveys and focus groups, there was a gap, perhaps as long as two months for some lessons such as Buffalo Creek, between the time the students participated in the lesson and the time the students provided feedback. Different responses may have been collected had the students taken the survey immediately after finishing the lesson.

2. Pedagogy. The pedagogy chosen for PRIME was problem based learning (PBL), which is typically lengthier and more time consuming than traditional lecture-based formats. PBL also requires more active participation from the students. Students may have had limited experience with PBL which may have then affected their expectations from the lessons, or influenced the behaviors they thought their instructors expected from them. The use of PBL might explain some

of the complaints about redundancy or too much time spent on certain lessons. PBL is not as efficient as lecture-based learning. The instructors were also new to using the HPL challenge cycle in the classroom so were not only piloting new material but also a new pedagogical approach they previously had not used.

3. Integrating PRIME Modules. The instructors worked to fit PRIME lessons into their already crowded course schedule. In some cases they were substituting this material for previous material they had used to present the same topic, or previously established was now incorporated into a PRIME module. Sometimes in an effort to pilot PRIME material, time constraints mandated instructors just use parts of the lessons.

4. Student Resistance. The students' reactions to the lessons as expressed by the survey comments frequently ranged from very negative to very positive. The more negative comments often seemed to exhibit an overall resistance to PRIME objectives. In some cases negative responders did not believe ethics and professional responsibility material should be discussed in a communication course. In the case of the Plagiarism and Evaluating Web Site material, some negative reactions focused on the students' belief they already knew the material and thus it was an inefficient use of their and classroom time. The PBL format was new to most students and may have also contributed to this resistance. Whatever the roots of the resistance of some students evidenced in highly negative feedback, these students may have prevented some students from benefiting from the learning opportunities provided by the lessons.

5. Classroom Environments. The lessons were taught in classrooms with different layouts and differing availabilities of computers. Some classes had a computer projector / screen at the front of the room where the instructor could display the actual web pages and use handouts. One class held discussion outside. Some of the classes were held in classrooms with computers, either desktops or laptops. Surfing was an issue in classes with computers. Classroom technologies and layouts affected the students' participation in the lessons which likely impacted their assessment.

6. Sample Sizes. The number of students responding for each lesson is indicated in the table of descriptive statistics (N=) at the end of Appendix B. This number can vary. For comparison, responses were normalized using percent of responses rather than the actual values. Still, the number of responses and the possible effect on error particularly for low samples sizes needs to be considered when comparing data. Lower response rates might be skewed to represent more strongly one part of the students' population such as the most satisfied or most dissatisfied students.

Observers' Suggestions for Future Lessons and Revisions

Based on classroom observation of all PRIME module pilots and student assessment evaluation, the project specialist and teaching assist make the recommendations below for PRIME module creation, revision, and incorporation in future courses.

Relevance.

- Overall, every lesson should be introduced by stressing the objectives and relevance to engineering. Again, during the discussion or summation, explicitly state the relevance. Specifically address the students' question “What's in it for me?”
- Review the NSPE Board of Ethical Review journal / website of actual ethics case studies for engineering related examples of the topic at hand and for the creation of future PRiME modules.

Problem-Based Learning.

- With PBL there should be an overall problem or task to address at the end of the Challenge step. For some Challenges there is no clearly stated task or problem for students to solve. Provide an explicitly labeled task at the end of every Challenge which focuses on the lesson's overarching problem / question to be addressed.
- PBL might need to be evaluated for appropriateness as an effective pedagogical approach for all topics, especially since it is a time-consuming pedagogy. PBL seems more appropriate for ethics and professional responsibility topics but may be less appropriate for academic processes such as analyzing the credibility of sources, evaluation websites and promoting academic integrity in research and writing.
- PBL may be a new learning format for most engine students. At the beginning of the course, students should be introduced to what PBL is and specifically what will be expected of them, for example class participation and activities versus a passive lecture mode. At the beginning of the first PRiME lesson, students could be given an opportunity to learn about the HPL challenge cycle

Structure.

- Keep lessons similarly structured within the HPL cycle so that students know what to expect. Use all steps of the cycle, even if some steps are very short. Use the online format to your advantage by assigning sections of the module as homework or even multiple-sections as self-paced homework.
- Provide more verbal structure and guidance within the lessons to make sure students follow the intended cognitive path by stressing the importance of objectives and use Go Public to guide the transfer of information.
- Provide readings that are distinctly unique without significant redundancy. If readings overlap, help students recognize unique material and relate to discern multiple perspectives from multiple treatments of the same “facts” or scenarios.
- Keep focused on connecting with students' prior knowledge by conscientiously structuring Generate Ideas questions to connect with students' prior knowledge e. Keep Test Your Mettle and Go Public assignments simple but linked to course objectives.
- Provide clear access and navigation instructions for online modules.
- Reduce the Plagiarism and Evaluating Web Sites lessons' instructional time.

Appendix A: Self-Reported Student Questionnaire

PRiME Lesson Survey – Hart 1

1. Credibility of Sources: What to Report (HART)

This survey is designed to collect your feedback on the Credibility of Sources - What to Report lesson you recently completed.

Please review the module and complete the survey below.
(<http://webdev3.engr.utexas.edu/prime/ethics/creditSources/lesson2/index.cfm>)

Thank you for completing the survey. Your responses will help improve Engineering Ethics and Professional Responsibility curriculum at the University of Texas-Austin.

1. Did you encounter any difficulties accessing the opening URL for this lesson?

Yes

No

If yes, please explain:

2. Did you encounter any problems in navigating the online portion of this lesson?

Yes

No

If yes, please explain:

3. How relevant do you consider this lesson to your current academic goals?

1 (Not Relevant At All)	2	3	4	5 (Very Relevant)
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

4. How relevant do you consider this lesson to your future professional needs?

1 (Not Relevant At All)	2	3	4	5 (Very Relevant)
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

5. How clear were the instructions for this lesson?

1 (Not Clear At All)	2	3	4	5 (Very Clear)
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

6. How much did this lesson enhance your understanding of professional responsibility?

1 (Not Enhanced At All)	2	3	4	5 (Enhanced Very Much)
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

7. How much did this lesson enhance your appreciation of the social context of engineering?

1 (Not Enhanced At All)	2	3	4	5 (Enhanced Very Much)
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

8. Please provide additional comments:

Done >>

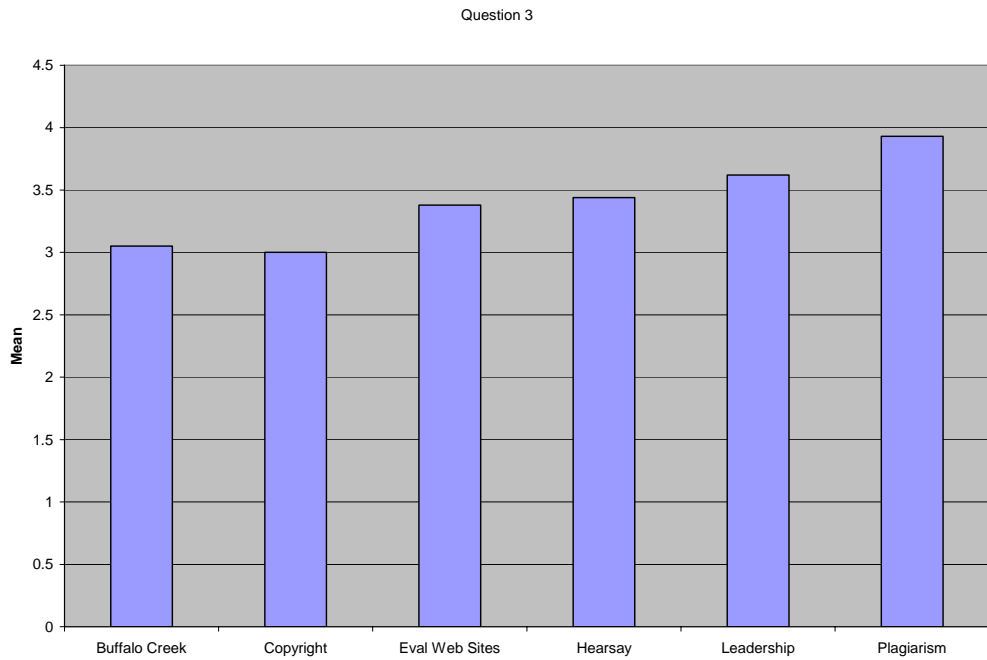
Appendix B

Questionnaire Data for all PRiME Lessons Theresa Jones, Ph.D

- 1. Did you encounter any difficulties accessing the opening URL for this lesson? Yes: 21 **No: 368**
- 2. Did you encounter any problems in navigating the online portion of this lesson? Yes: 21 **No: 364**

3. How relevant do you consider this lesson to your current academic goals?

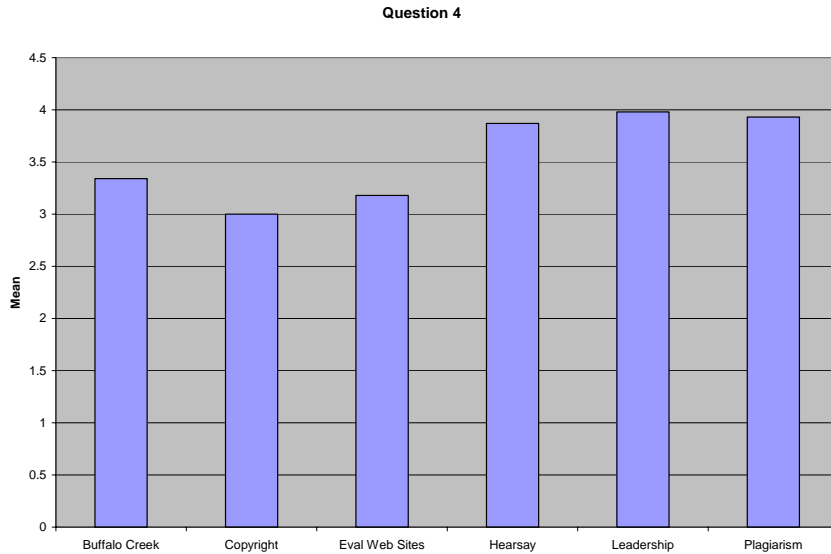
Not relevant at all 1 2 3 4 5 Very relevant



Comments: Students commented repeatedly the topic was relevant and imparted new information.

4. How relevant do you consider this lesson to your future professional needs?

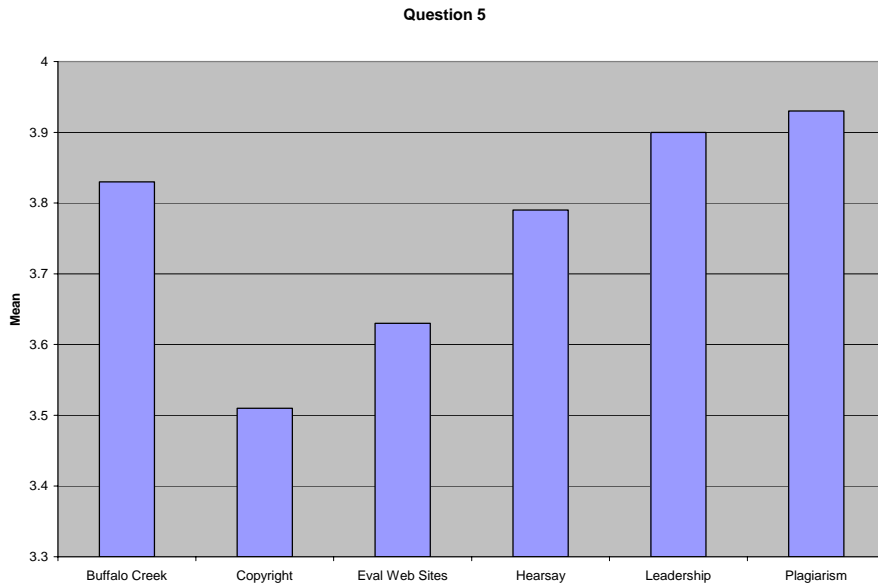
Not relevant at all 1 2 3 4 5 Very relevant



Leadership had the highest mean. Most students plan to go work in industry where they know they will have to deal with managers, and many may aspire to be managers. Plagiarism had the second highest mean, perhaps indicating that they do recognize that plagiarism does not just apply to papers they write in school and that it can influence them professionally.

5. How clear were the instructions for this lesson?

Not clear at all 1 2 3 4 5 Very clear

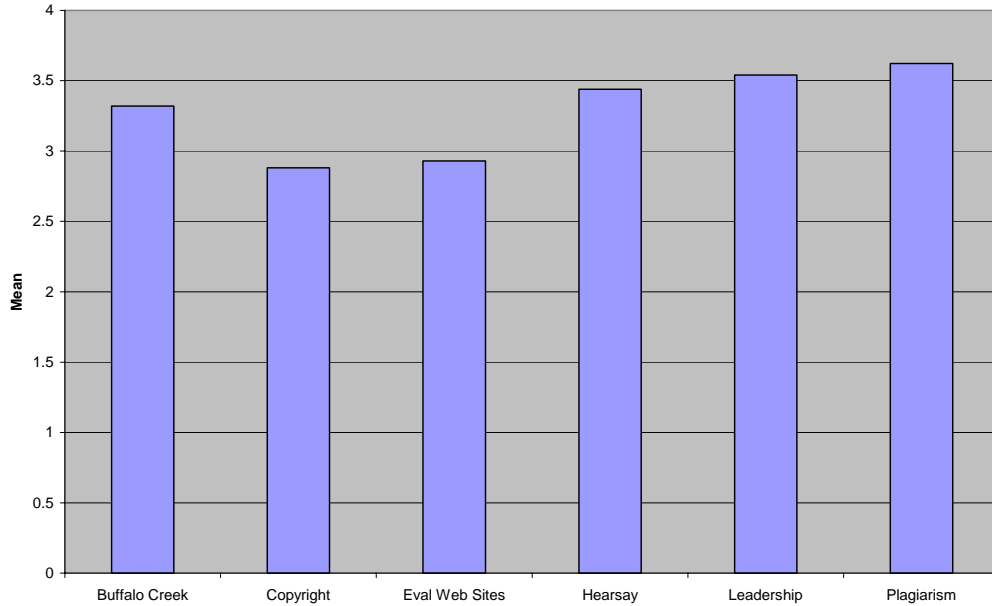


Students commented on Copyright that there was limited time available for discussion and on Evaluating Web sites that there was little time to digest the matrix.

6. How much did this lesson enhance your understanding of professional responsibility?

Not enhanced at all 1 2 3 4 5 Enhanced very much

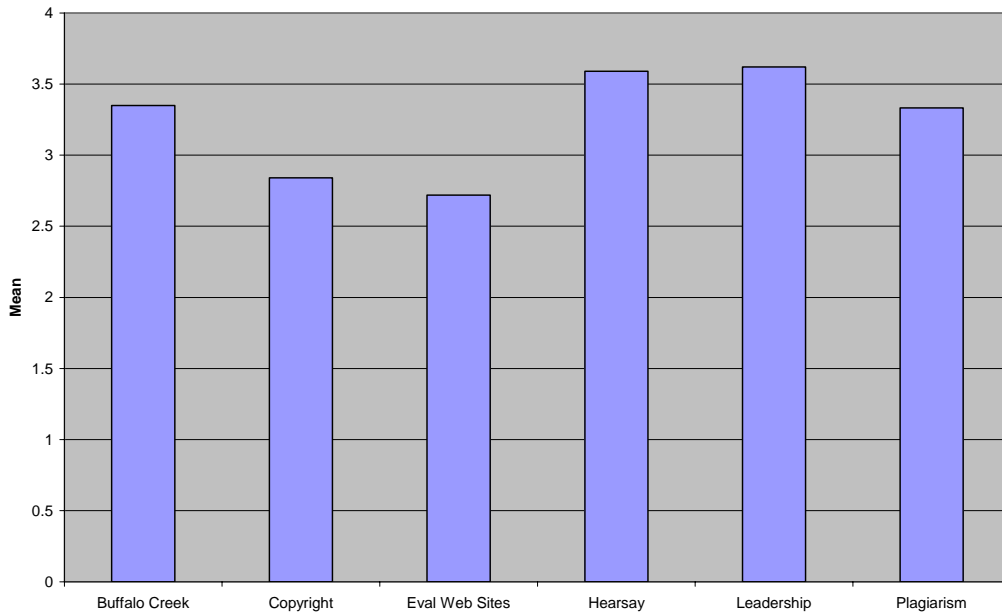
Question 6



7. How much did this lesson enhance your appreciation of the social context of engineering?

Not enhanced at all 1 2 3 4 5 Enhanced very much

Question 7



Number Responses

	Q1		Q2	
	Yes	No	Yes	No
Buffalo Creek	8	103	7	103
Copyright	3	47	4	44
Eval Web Sites	6	89	6	87
Hearsay	1	38	2	37
Leadership	1	48	1	49
Plagiarism	2	43	1	44
Total	21	368	21	364

Buffalo Creek

N=111	Q3	Q4	Q5	Q6	Q7
Mean	3.05	3.34	3.83	3.32	3.35
Std Dev	1.00	0.96	0.85	1.01	1.02
Median	3	3	4	3	3
Mode	3	4	4	4	4

Copyright and Fair Use

N=51	Q3	Q4	Q5	Q6	Q7
Mean	3	3	3.51	2.88	2.84
Std Dev	1.18	1.26	1.12	1.16	1.21
Median	3	3	4	3	3
Mode	4	3	4	3	4

Evaluating Web Sites

N=45	Q3	Q4	Q5	Q6	Q7
Mean	3.38	3.18	3.63	2.93	2.72
Std Dev	1.02	1.10	0.91	1.01	1.11
Median	3	3	4	3	3
Mode	4	4	4	3	3

Hearsay

N=39	Q3	Q4	Q5	Q6	Q7
Mean	3.44	3.87	3.79	3.44	3.59
Std Dev	1.12	1.03	1.06	1.10	1.14
Median	4	4	4	4	4
Mode	4	4	4	4	4

Leadership

N=50	Q3	Q4	Q5	Q6	Q7
Mean	3.62	3.98	3.9	3.54	3.62
Std Dev	1.09	1.02	0.79	1.13	1.28
Median	4	4	4	4	4
Mode	4	4	4	4	4

Plagiarism

N=45	Q3	Q4	Q5	Q6	Q7
Mean	3.93	3.87	3.91	3.62	3.33
Std Dev	0.96	0.87	0.91	0.91	1.09
Median	4	4	4	4	3
Mode	5	4	4	4	3