

Web Based Forms for Design Team Peer Evaluations

Elizabeth A. Eschenbach¹ and Marc A. Mesmer²
Humboldt State University

Abstract

This paper describes the use of web based forms for a peer review process used in teaching ENGR 111: Introduction to Design and is a follow up of work reported at the 1997 ASEE meeting: *Using Peer Evaluations for Design Team Effectiveness*. The paper describes the functionality of the web based software and provides examples of web based peer evaluation forms, as well a summary of the training students receive on how to write a good peer evaluation. Results from a survey of students using the peer evaluation process and a summary of how both students and instructor benefit from the peer evaluation process are described. This paper differs from the work reported in 1997 in two ways. 1) This year is the first year that web based forms were used in the peer evaluation process and this paper reports implementation of the peer review web pages. 2) The results of peer evaluation surveys were not reported in the previous paper. About 50 % of the students say that they are uncomfortable writing the evaluations, but over 90 % said that the course should continue to have peer evaluations. Some students said that they wished their other team based courses used peer evaluations. For those interested in using web based forms for peer evaluation, a copy of the code can be down loaded from <http://www.humboldt.edu/~cdc/peerrev/AboutPeerRev.html>.

Course Overview: ENGR 111, Introduction To Design

Humboldt State University has one of the oldest and largest accredited programs in environmental engineering in the country. The Environmental Resources Engineering Department was accredited in the 1970's and currently has about 270 majors. Students work in teams throughout the curriculum of the ERE major. All ERE majors are required to take ENGR 111 Introduction to Design, which has no prerequisites, and provides an introduction to the types of skills that students need to be successful in the major³. Students are introduced to the design process, by being part of a 3-5 member team that completes a 10 week design project. In addition to introducing the design process, the course develops students' computing skills and communication skills, with an emphasis on team work and writing. During the first 4 weeks of the semester, an hour a week is spent on team building skills. A description of the labs for building team work skills can be found in [2]. During the fifth week of the semester, the design project and the design teams are assigned.

Three weeks into the project, each student is required to fill out a form, evaluating the strengths and possible areas for improvement for the team and all team members (including him or herself). The student and the instructor have a 15 minute conference to review the student's team evaluation. The student and the instructor discuss ways to improve team productivity. The instructor gives the student suggestions on how to write a more professional evaluation. Many

¹ Assistant Professor, Environmental Resources Engineering

² Senior Programmer, Courseware Development Center

³ For a more complete description of the ERE program and the course, please refer to [1].

students do not know how to write constructive criticism, nor know how to describe another team member's contributions.

At the end of the semester, each team member submits a self evaluation and peer evaluation of all team members. The evaluations from all team members are combined and then split into summary evaluations, one for each team member. A summary evaluation is returned to each team member during the final period of the class. The summary evaluation only contains evaluations discussing overall team dynamics and the strengths and weaknesses of that one team member. This year web based forms were created in order to automate the process of creating the summary evaluations for each team member. Before the first use of the peer evaluation web pages at the end of the semester, the summary peer evaluations were distributed by the instructor sharing copies a file. Students would submit their evaluations in a file on a disk and the instructor would cut and paste the entries into another file. While creating the summary evaluation, the instructor would edit any comments that were not constructive. This cutting and pasting process was very time consuming.

With the web based forms, the software automatically creates the summary evaluations for the instructor. The instructor still has the ability to edit an entry if it is not constructive. This automation saves time that can be better spent on evaluating the students' comments, rather than cutting and pasting a document.

In general the students' prefer the web based software has over using a word processor. The benefits that the students mentioned were that they did not need to keep track of a file, and they access their work as long as they had a web connection. The drawbacks that the students mentioned was there is not spell check and some students do not have easy web access.

The paper has the following organization. First the software functionality will be explained. It has been designed, so that it is general enough to use in any course requiring team evaluations. The next section will explain how the software is used in ENGR 111. Lastly, a summary of the benefits of using peer evaluations will be given, including results from a student survey on the use of peer evaluations.

WWW based Peer Review Program

The Peer Review program uses an HTML form-based interface for interaction over the World Wide Web. This interface was chosen as a lowest-common-denominator for Web interaction, as most graphical web-browsers can understand this format. A full description of the program, including screen dumps of the interface can be found at the following URL <http://www.humboldt.edu/~cdc/peerrev/AboutPeerRev.html>.

The program is designed to model any number of teams or work groups with any number of members in each team. The instructor can ask any number of questions and require the answers be given in any on of three types:

- Text Field (single line entries),
- Text Area (multi-line scrollable entries), or
- Choice Boxes(drop down selections from provided alternatives).

The instructor can edit a student's review the evaluations from for a given student. further illustrate Evaluation Other visuals are AboutPeerRev URL given above).

The program first with a ord verification Figure 1. If the successfully enter information, a is presented as shown in Figure 2. The next screen is followed by an HTML form, consisting of questions and spaces for answers.

In order to make the program work, the instructor needs to compile 2 text files: one for the list of questions and one for the list of teams. The file containing the list of teams must also provide the team member names and passwords. The text file for the list of questions must state the required format for each Field, Text Area or Questions may to whether they as a whole or to members. In the question is peer evaluation the question is team member. For like "What do you how your team question that is team as a whole. like: "List the team member", is team members.

Before the due date, students these questions and on each access,



Figure 1 Peer Review Request Form

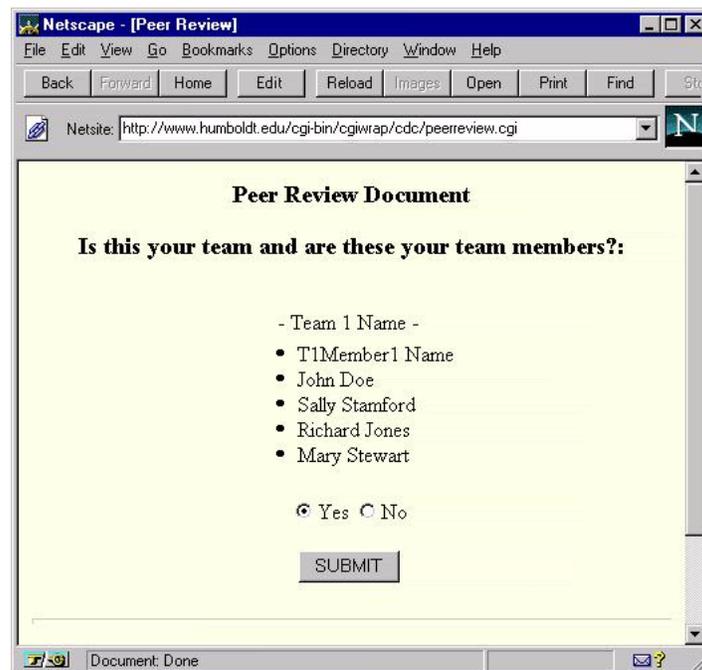


Figure 2 Peer Review Verification Screen

either review and replies, or can summary of the all team members Two figures below how the Peer Program works. available on the web page. (See

presents a user Name/Team/Passw dialog as shown in student is able to the required verification screen

question (Text Choice Box). also be specified as apply to the team individual team former case, one presented in the form. In the latter, repeated for each example a question like best about worked" is a presented to the While a question strengths of this repeated for all

instructor specified are able to access again and again, the team member

will be presented with the same questions, along with any previously input responses . Thus students are able to edit and improve their peer evaluation until the due date.

A second interface is provided for instructors, who have a birds eye view of the process, with the ability to view responses either exactly as seen by a given team member, or in a digest form, listing all members' anonymous responses relative to a given team member .

Each peer review is treated as a separate CGI (Common Gateway Interface) process, although the bulk of the program is identical. That portion which varies includes the name of a template file from which questions are extracted for presentation and an expiration date after which access (except by the instructor) is no longer possible. Any number of different peer reviews may be constructed by providing a separate set of template files for questions, and/or a separate list of teams and their members.

All information is stored on the web-server on which the program resides. The instructor has direct access to template files and the script which activates the program, as well as text-based files of team-member responses stored hierarchically by team. The bulk of the program consists of three Java classes which are activated by aforementioned script. Java was chosen as the server-side programming language due to its ease of use and its ability to model the entities of the problem domain in a practical and encapsulated manner. Although created for a particular project, these classes were constructed to provide a versatile solution to the general, as well as the specific problem, affording a degree of adaptability and code-reuse for similar situations and projects.

A general summary of how one uses the Peer Evaluation program follows:

1. The instructor creates a TEAMS.TXT file listing all members by team, a template file for questions for a review, and an activation script which calls on the above listed classes.
2. The instructor publishes the link to the activation script, and supplies each team member with an access password.
3. Each team member may access their review, filling in or altering information until the review's expiration date.
4. The instructor may monitor members' progress and input, exercising editorial control over the content.
5. Once the expiration date has been reached, or all input is in, the instructor may generate text documents listing questions and responses by the entire team, one document per member, summarizing all team members responses concerning that member.
6. The team members are presented with a copy of their review, listing all team members' input as well as their own.

The web page <http://www.humboldt.edu/~cdc/peerrev/AboutPeerRev.html> contains a description and a demo of the software. The executable and instructions that can be down loaded from the page as well.

Previous Use of Peer Evaluations to Assess Team Work Effectiveness

Though their use has not been well documented, peer evaluations have been used in engineering education as well as other disciplines. Rhinehart [3] provides a description of a junior level

chemical engineering transport course, which is team project based. He uses a group member evaluation form to assess team work. Peer evaluations are used in industry as well. Recently, Hewlett Packard in Puerto Rico has begun to use peer evaluations for promotion considerations [4].

Some other disciplines that have used peer evaluations for enhancing team work include Journalism [5], Business [6] and English [7]. Johnson [5] had a junior level advertising class work in teams to develop an extensive quantitative team evaluation form. The students listed the following categories as the most important: Attendance, Time on Project, Quality of Work, Communication with Team, Team Player, and Shows Initiative. Holter [6] develops a peer evaluation method for implementing a formal method to remove irresponsible team members from a team. Singh-Gupta and Troutt-Ervin [7] review literature on collaborative writing and discuss how peer review techniques can be used in group writing projects.

Design Team Peer Evaluation Process

There are four course components of ENGR 111 that contribute to team building and the peer evaluation process: four one hour laboratories on team work, emails of weekly team progress reports, midterm evaluations, and endterm evaluations. This paper 's focus on the midterm and endterm evaluations. The other team building components are described in [2].

Midterm Evaluation

15% of a student's final grade is dependent on the endterm peer evaluation he or she receives from his or her team mates. At midterm students perform a practice evaluation. Peer evaluations help create interdependence and accountability among team members (two key attributes needed for cooperative learning [8]). Appendix A contains a copy of the midterm evaluation questions. (Much of the content of the peer evaluation was borrowed from materials presented by Professor Gregory Deierlein in the Spring 1991 Class of ENG 600 Teaching Engineering [9].)

Each student in the class has a 15 minute conference with the instructor to review the midterm peer evaluation. The instructor and the student review the evaluation and discuss ways of improving the student's or the team's performance. In addition, the instructor indicates ways to improve the quality of the evaluation itself, by pointing out where the student could provide more specific information or more constructive information. For example: "Joe is a great team member" provides little information. While the following example provides more specific feedback. "Joe is a great team member because he always comes to meetings prepared and contributes creative ideas. He also has lots of enthusiasm for the project". When offering criticism, students are encouraged to differentiate between personality conflicts and lack of performance. Students also discuss and identify examples of constructive criticism. At midterm, students do not receive a copy of what their peers wrote about one another.

Some students feel uneasy completing peer evaluations for some of the following reasons: "It is the instructor's job to assign grades" or "I do not like saying any thing negative about my team mates". Class time is spent discussing the benefits of learning to write insightful evaluations and of receiving insightful evaluations. A tone is set in the class that every person is in the "process of becoming", meaning that everyone can continually find ways to improve his or herself.

In order to help the course and instructor continually improve, each team is required to complete a midterm evaluation of the course and the instructor. [2] contains a copy of the midterm course and instructor evaluation form. Each team is required to discuss the answers to the questions and try to reach consensus. If consensus is not reached then the team makes it clear that the answer does not reflect the entire team. Each team submits its evaluation electronically, so that the team remains anonymous. This method of requiring the team to reach consensus helps precipitate the most widely perceived positive and negative aspects of the class and the instructor. (This course evaluation method of using team consensus is similar to one used at the first year engineering course at the University of Colorado [10] and the SGID technique developed at University of Washington [11].) The instructor responds to the midterm feedback in the next classroom session. Examples of constructive criticism are highlighted and the instructor models professional responses to the constructive criticism.

Endterm Evaluation

At the end of the semester, each student is again required to complete a peer evaluation. The evaluation form is that same as the midterm evaluation found in Appendix B with the two following questions added:

1. If your team was paid \$10,000.00 for this design, how would you distribute the money among your team mates?
2. List how each of your team members (including yourself) has grown or improved, or what each of you has learned this semester.

The following is provided at the top of the final evaluation.

Please carefully consider the questions below. Your fair and honest input will influence 15% of your team members' final grades for the course. Unless you state otherwise, each team member will receive an anonymous copy of your comments along with other team members' comments.

Students submit the final evaluations on the web, so that the evaluations for one student are automatically can be extracted and collated from his or her teammate's evaluations. The instructor reads the evaluations for all team members and assigns a grade to each student using the following criteria:

- If most team members agree that a given team member contributed substantially, then the student receives a score between 90-100.
- If most team member agree that a given team member contributed, but not as much as he or she should have, then the student receives a score between 60-90.
- Students that do not put in a good effort on writing the peer evaluation lose points on the evaluation.

The course does not have a final exam, so the final period is used for the "The Final Party". At the Final Party, the students have a potluck, review all the team design reports with their customer, and receive their graded projects and the class grade. They also receive their peer evaluations. A student's peer evaluation contains each team member's comments about what worked best for the team and how the team could be improved. The evaluation also contains each team member's comments about that particular student. The instructor may add more comments on the peer evaluation as well.

Student Benefits of Peer Evaluations

At the end of the 1997 Spring semester, about 150 students had completed peer evaluations in 5 different classes of ENGR 111. A voluntary survey was given out to current and previous ENGR 111 students. The results of the survey can be found in Table 1.

Table 1 Results from Student Survey (N = 55)

Question	Yes	No
1. Did you find the summary of the evaluations of your efforts useful or rewarding?	81%	19%
2. Do you feel you learned anything more about team dynamics by completing a peer evaluation?	73%	27%
3. Did you feel uncomfortable evaluating your peers in ENGR 111?	49%	51%
4. The evaluation process is time consuming. Do you believe this time is well spent?	84%	16%
5. Should ENGR 111 continue to use peer evaluations?	93%	7%

Reading the student responses, one gets a sense of how students learned about team work.

I think that being asked to reflect, evaluate and concentrate on the way your team works together is important. It forces you to look past the little stuff that might bother you, in order to accomplish the task at hand. Also, when forced to look at the way your team works, you are able to make improvements along the way.

Even though half the students were not comfortable with the process, over 90% of the students believe evaluations should still be used. These students' responses to Question 3 "Did you feel uncomfortable evaluating your peers in ENGR 111?" reflect the students' response to this question.

Uncomfortable because sometimes it is emotionally difficult to say "unpositive" or critical comments about others. This is not the same uncomfortable in the sense of feeling it is inappropriate.

Absolutely not! I experienced both excellent group members and one horrible one. Evaluations give an opportunity to complement students who work well and motivate (or eliminate) students who don't. I feel mid-semester evaluations are very important. Students that are not working should not have the opportunity to just "go along for the ride"

Some of the student comments reflected what students had learned about themselves.

At first I took the evaluations with a grain of salt. However, I eventually looked at them closer and have been trying to work on some things. I quit stressing so much because I realized it was a waste of valuable time and energy.

It helped me make improvements as well as raise my self confidence.

I was able to use my peers suggestions. This makes it worthwhile.

The comments below are responses to Questions 4 and 5 from Table 1. Many of the students' responses reflected that they believe their team mates should be held accountable and that the instructor has little information to assess the contributions of team members.

Yes its important to take the time to recognize the importance and accomplishments of your group members and to anonymously relay the deficiencies of other group members. A lot of times it is hard for the professor to assess performance of group members and peer evaluations are a good resource for this goal

Especially if the class knows that they will be evaluated by their team members. I believe an evaluation will increase the chances of a team working together well.

All group projects should have a similar accountability process

The following list summarizes the student benefits of peer evaluations.

- Students become more aware of the team building process, as they are asked to assess the process twice during the semester. They become more aware of the responsibility they have to themselves and their team mates to maintain good team rapport.
- Some students become more motivated to contribute to their teams after the midterm evaluation. This motivation may stem from the fact that a student learns that his or her peers do not approve of his or her contributions, or that the student knows that the instructor is aware of the poor quality of his or her work.
- Before "Introduction to Design", many first year engineering students have not been asked to describe the quality of another person's work clearly and objectively. Students are encouraged to become clearer thinkers, as their midterm peer evaluations are critiqued by the instructor for clarity.
- Many students find receiving the summary of their peer evaluations at the end of the semester to be very rewarding. After an intensive team experience, it can be more rewarding to read a description of one's contributions to the project, rather than only receiving a letter grade.
- Many students will not visit a faculty member during office hours unless they are forced. This required meeting time may help some students become more comfortable visiting faculty.

Instructor Benefits of Peer Evaluations

The peer evaluation process has a number of benefits to the course instructor.

- The midterm evaluation is an assessment method for determining the quality of team functioning. The midterm evaluations provide data for early intervention when a team is malfunctioning.
- The midterm evaluation provides motivation for students that might be slow starters.
- The endterm peer evaluations provide information for assigning design team grades.

- Reading the evaluations is often enlightening, allowing the instructor to get a better understanding of the learning process and team dynamics (i.e. it is a lot of fun!).
- Saved copies of endterm evaluations can be helpful when writing recommendation letters.

Drawbacks of Peer Evaluations

Meeting with each student at midterm and preparing the evaluations at the end of the semester is very time consuming, but as seen in Table 1, Question 4, most students believe the time is well spent. About half of the students surveyed were uncomfortable with the process (Question 3 in Table 1), but over 90% believe the process is worth the discomfort (Question 5). Preparing the summary evaluations at the end of the semester is time consuming for the instructor. Using the Peer Evaluation program, which has mechanized part of this process, reduces the required instructor time.

Conclusions

Peer evaluations have worked well in ENGR 111, because students have reflected on the team process and have realized that they have learned skills in the class that will help them in their careers. The use of web pages in this process has made it easier for the instructor to review the student comments and return them to the student.

References

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Appendix A: Midterm Peer Evaluation

Please carefully consider the questions below. Be sure that all criticism is constructive. This information will only be viewed by yourself and Beth Eschenbach.

What is the best thing about how your team works?

What would you like to change about how your team works?

Team Member Evaluations (Range 0 to 4):

Each team member's contribution will be evaluated by you based on three criteria:

1. Time and Effort
2. Technical Expertise
3. Overall Contribution

In each category, a rating between 0 and 4 should be assigned, where 1 implies the lower rating and 4 the highest. Aside from the obvious, the time and effort rating should include the energy and enthusiasm with which one takes on work and the team member's reliability in terms of showing up for team meetings, etc. The technical expertise should reflect the depth of understanding of the material and the willingness to learn and grapple with new ideas. Finally, the overall contribution should be a general measure of each team member's effectiveness in "getting the job done". The overall contribution should include considerations as to how effectively each student works as a group member and helps in the organization and direction of others.

For each of your team members and yourself do the following:

1. List your team member's name (or your name)
2. List your team member's strengths (or your strengths)
3. List your team member's weaknesses (or your weaknesses)
4. Rate your team member (or yourself) in the three categories listed above

Please note any additional thoughts regarding the peer review process. Thank you for your input.

ELIZABETH A. ESCHENBACH

is an Assistant Professor of Environmental Resources Engineering at Humboldt State University. As an undergraduate, she started as a Civil Engineering major, but received a BA from University of California Santa Cruz in mathematics and psychology, with honors in mathematics. She received her MS and Ph.D. in Environmental Systems Engineering from Cornell University. She spent a year as a postdoctoral research associate at the Center for Advanced Decision Support in Water and Environmental Systems at the University of Colorado at Boulder. Her research interests are water resources, decision support systems, and developing instructional support software. She has won a number of teaching awards, including the Apprentice Faculty Grant from the ERM division of ASEE. She can be reached at ea1@axe.humboldt.edu or <http://www.humboldt.edu/~ea1>.

MARC A. MESMER

is a Special Projects Programmer and System Administrator at Humboldt State University. He works in several modes of computing including Unix, Macintosh and Windows, and has programmed in C, Pascal, C++, TCL, Perl, and Java, among others. His main work is with the Humboldt State University Foundation in research and development of World Wide Web based applications with a particular focus on integrated database interaction. He also created and administers ExamMaker, HSU's on-line testing program. He also creates specialized programs for specific educational projects as Senior Programmer for the Courseware Development Center at HSU, a center for developing on-line instructional aids and promoting distance learning and multimedia development. He is a co-founder of the Hidden Variable, a state of the art Information Technology company. He may be reached on the Web at <http://lilmud.cnrs.humboldt.edu:8080/mesmer>, or via e-mail at starc@variable.net or mesmer@hopper.humboldt.edu.