PEER ASSESSMENT (JURY) OF EXPERIENTIAL LEARNING

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Abstract

The use of a student's work experience involving the investigation, inspection, collection, and analysis of data for the rating of park service bridges in the United States, is presented as a Senior Capstone Project for Civil Engineering students. This work experience while initially independent of the academic program was recognized as an excellent opportunity to incorporate on the job experience, with an academic program. The investigation, analysis, and rating of a bridge in the Park Service were used as the basis for a student's senior "Cap Stone Design" project. This project was completed in cooperation with the University Faculty, Dr. Ahmet Zeytinci and the student's supervisors at the Federal Highway Administration. This paper will describe the project and how it was used as a learning experience in the academic program and the final assessment of the experience through the use of a "Jury" of faculty and peers.

Introduction

At the University of the District of Columbia (UDC) our engineering program is relatively small, about 200 students with half in Electrical Engineering and the remaining 50% split 1/3rd in Civil Engineering and the remaining in Mechanical Engineering. The nature of our student body is that virtually all of our students are employed. As a result, our instructional program is offered primarily in the evenings and on Saturdays. Of necessity our senior year capstone design courses have been offered on Saturdays due to the ability of the students to attend. Over the years the demand for Civil Engineering skills in the Washington Metro area has made it possible for most of our students to be employed in Civil Engineering or ancillary Civil Engineering activities.

In the academic year 2006-2007, we had a Civil Engineering student, Nathaniel Jensen, who was working in the bridge inspection unit of the Federal Highway Administration (FHWA). Capstone design instructor, Ahmet Zeytinci, in conversation with Nathaniel about his work experience came upon the idea that his experience in bridge inspection might prove to be a very worthwhile capstone design project. This initiated formal discussion with Nathaniel's supervisor at FHWA and the development of an academic work plan that would utilize Nathaniel's work experience at FHWA as his senior capstone design project.

The Project

The August 1, 2007 collapse of the eight-lane, 1907 foot span, steel truss bridge that carried Interstate I-35W across the Mississippi River in Minneapolis brought into focus the importance of the safety of the nation's bridges. While this was a calamity experience because of the magnitude of the failure, there are many more bridges of smaller size but no less important to keep safe. Two Civil Engineering senior students, Nathaniel Jensen and Kemal Demircioglu, engaged in a Senior Capstone Design project that utilized the work experience of Mr. Jensen, as a Civil Engineering technician at the Federal Highway Administration (FHWA). Nathaniel was a field inspector for

small bridges under the jurisdiction of the US Park Service. Many of these bridges are of relatively short span usually constructed of steel or wood or a combination of these.

A new bridge, “Point of Rocks” (see photo 1 & 2) on the C&O Canal National Historic Trail, and an existing bridge, “The Old Toms Creek Bridge” in the Delaware Water gap National Recreational Area, were selected to serve as the senior capstone design project. Nathaniel and Kemal, using the bridge inspection procedures applicable to these bridges and the field inspection data collected by Nathaniel prepared a report illustrating how bridges of these types are inspected. A number of factors influence the choice of the rating method to be used. If plans of the bridge are available, or if it is feasible to measure structural components, then an Analytical Load Rating (ALR) may be calculated (see Figure 1). When this is not possible, a Proof Load Test (PLT) must be performed. The Analytical Load Rating Method produces maximum carrying capacity of the structure while the Proof Load testing Method essentially determines if a structure will carry State Legal Loads. The safe load, for the Points of Rocks Bridge was determined by the Analytical Method and for the Old Toms Creek Bridge the safe load was determined by the Proof Load Testing Method.

A brief overview of the **load rating** includes the following two elements:

(1) An inventory rating which establishes the vehicular loads that may occur continuously on the bridge
(2) An operating rating which establishes the permitted occasional load on the bridge

The final objective of the senior capstone design project was the presentation of both analyses to a peer assessment jury.

C&O Canal National Historic Trail
Point of Rocks Bridge (NEW)

Looking South

West (Upstream) Side

Photos 1 & 2

U.S. DEPARTMENT OF TRANSPORTATION
FEDERAL HIGHWAY ADMINISTRATION

MADE BY Nathanael Jansen & Kemal Demircioglu DATE 11/17/06 BRIDGE NAME Point of Rocks
CHECKED BY _____ DATE 11/21/06 STRUCTURE NO 3100-003P

BRIDGE LOAD RATING CALCULATION

1. Objective

This is to analyze a single span girder bridge load rating (H, HS, and Type 3, Type 3S2 & Type 3S3 conventional trucks) by using LF(Load Factor) rating method.

2. Assumption

1. The rating is based on AASHTO Standard Specifications for Highway Bridges, 16th Edition.
2. Superstructure was replaced in 2005
3. The curb load will be taken by main girders only

3. References

1. AASHTO Standard Specifications for Highway Bridges, 16th Edition.
2. Manual for Condition Evaluation of Bridges, 1994.
3. Timber Bridges Design, Construction, Inspection, and Maintenance Manual, June 1990
4. AISC Steel Construction Manual, Ninth Edition

4. Structure Geometries

Main girder span (W10x112):	
Length	$L_{main} := 36ft$
Weight	$B_w := 112lb$
Plastic Modulus	$Z_x := 147in^3$
Overhang Channel (C10x30)	
Length	$L_{Ovr} := 36ft$
Weight	$O_w := 30lb$
Diaphragm Bracing (C6x10.5):	
Length	$L_{Diap} := 3ft$
Weight	$C_{wd} := 10.5lb$
Spacing	$S_{s.} := 5ft$
Timber Nail Laminated Deck:	
Thickness:	$D_t := 6in$
Panel With:	$D_{pw} := 36in$
Effective Deck Area: $(b_d t)$	$A_d := 126in^2$
Effective Deck Section Modulus: $\frac{b_d \cdot t^2}{6}$	$S_y := 126in^3$
Effective Deck Moment of Inertia: $\frac{b_d t^3}{12}$	$I_y := 378in^4$

C:\Documents and Settings\njansen\Desktop\Drives N Files\School\Senior Project\Load Rateing.xmcd 1

Figure 1 DOT FHWA Rating Form

Assessment

The evaluation of student performance has always been an essential part of engineering education. In recent years a new concept for evaluation has emerged. Traditionally evaluation involved only the grading of the students' work effort. Now in addition to evaluation, must be corrective action for the improvement of both the students' performance and the effectiveness of

the instructional program. This is currently referred to as "assessment". For example, in the past students would take a quiz in any course, let's say Mechanics-I (Statics) and quizzes and exams would be graded and returned to the student with only a numeric score. This is considered evaluation. On the other hand, assessment requires that there not only be evaluation scores (numerical) but also a critique of the manner in which the problems were solved with the objective of correcting the student's pedagogy. Additionally, this new concept of assessment also requires corrective action on the part of instructor. For example the failure of a large number of students in a class to "grasp" a concept might very well be the result of a poor or inadequate instructional strategy. The instructor would correct or modify his/her strategy and this is an essential part of assessment.

Our colleagues in Architecture, from time immemorial, have used a "jury" system for the evaluation of architectural students' projects. It is only in recent years that engineering disciplines have incorporated a jury system for engineering projects. The composition of juries may vary significantly. They may consist of faculty only, external professionals only, students (peers) only, or combination of these individuals. Often times the composition of the jury is determined by the availability of the persons to participate. It is the authors' opinion that the ideal composition includes people from all three categories. This kind of evaluation has always included some, more or less corrective (suggestions) action for the student being evaluated. The new "twist" to the assessment by Peers or jury at UDC is the formal structured assessment process for our senior capstone design course. Essentially this formalizes the procedure for the presentation of corrective action for the students and assists the faculty in identifying and implementing corrective measures for future offerings of the course.

The assessment for the student includes two distinct components, *covert* and *overt* corrective measures. Overt corrective measures are those that are made publicly at the jury and are of such a nature that they are of benefit to all present. On the other hand covert corrective measures (suggestions) are made to the individual participants in private; they are primarily of benefit to the individual and may be of such a nature that public disclosure would be inappropriate.

Suggested Guidelines for Peer Assessment

As a result of this experience the authors suggest the following as a guide for Peer Assessment of Experiential Learning, particularly in the Capstone Senior Design courses. There are many textbooks and online references that deal with oral and written presentations. In many schools students are introduced to this material in one of their English courses but this is not true for all institutions. A complete digest of presentation skills is beyond the scope of any single Engineering course. The authors have selected a potpourri of what they feel are essential features that every student should know. The following peer assessment guide is a compendium that would be appropriate for inclusion for a Capstone Design Courses.

Content

The most essential part of the Capstone Design Course presentation is the content. The content should be monitored from the beginning of the course right up to the final presentation. This is an iterative process in which the instructor continuously reviews the students' work and provides direction toward the final presentation. This is the most important part of the content assessment, continuous evaluation with corrective actions at every step. It is important for the instructor to recognize that the corrective actions should not be merely instructing the student how something should have been done, but rather "nudging" the student in the proper direction to keep him/her on track. Often corrective action may best be couched in the form of questions. It is the authors'

belief that more is usually learned from an understanding of where our thinking went astray than from occurrences that are perfect.

Oral Presentation

For the Capstone Design Course the students should be briefed on oral presentation techniques early in the course. Waiting till the end does not provide sufficient time for evaluation and corrective action. Students should be provided the opportunity to present brief oral synopses at each class meeting (if the class is too large, at every other meeting). This routine will develop confidence and experience in public speaking. A major problem in oral presentation is the frequent foible of the speaker inserting the sound "um", which is very distracting. This is usually due to the speaker's unconscious apprehension of having silence when he/she is formulating his/her next word or phrases. A means to correct this is to call this action to the attention of the speaker at a practice session and to have them reach an understanding that no one really notices when no words are being spoken and therefore no need to utter a sound to fill a perceived void. It takes only a few instances for the person to concentrate on remaining silent as they formulate what they wish to say to virtually eliminate this bad habit. As professors we must realize that it is our responsibility to make corrections in areas that most people would feel uncomfortable such as a student's speech pattern.

Visual Presentation

Visual presentation techniques should also be covered throughout the course. As with the oral presentation skills, students should be required to present at least one visual (graphic) presentation using software such as Power Point with each oral presentation. As a rule of thumb, the visual presentations should be brief and as simple as possible. Bullet format is preferred, type fonts such as Times New Roman, Arial or Verdana are encouraged and the font size is dependent on the size of the classroom (72 points = 1 inch).

Overall Assessment

The overall assessment involves an evaluation or critique of the students' total presentation including their demeanor, posture, and dress. An important aspect of the overall evaluation is to take care to provide the necessary **overt** feedback for those aspects of corrective actions that will be beneficial to everyone at the presentation without needless adverse criticism of the presenter. Those aspects of a student's performance that are judged to best presented in private with the individual are part of the **covert** assessment. This is very difficult since it requires careful judgment on the part of the evaluator and must *always* include suggested corrective actions.

Ancillary Comment

The success of our students is based on competence in subject matter but that in it is not sufficient. The ability to clearly and succinctly communicate technical information is the key to a successful career as an engineer. Unfortunately as engineering faculty, we have not instilled in our students the true value of knowledge gained from a liberal education. Because of this important factor we engineers do not play significant leadership roles in our society.

Guide for assessment of Senior Capstone Design Project Presentation
(Evaluation with Suggested Corrective Actions)

Grading of Technical Content

The students' technical content should be reviewed to ensure that there are no errors in theory. Technical accuracy of the project is one of the most important issues. It is an embarrassment for both the student and the faculty when there are technical content errors in a presentation.

Review Outline of Presentation

The following aspects of the presentation should be reviewed prior to formal presentation.

- Outline of the talk
- Introduction
- Body of the presentation
- Conclusions

Ensure that the length of the talk is appropriate to allocated time. Usually 20 minutes with at least 5 minutes reserved for Questions/Answers.

Power Point Presentations

It is important to keep in mind that the purpose of a PP presentation is to present information *not* overwhelm the audience with a demonstration of all the software bells and whistles. The following are some simple rules about PP presentations:

- Number of slides should not exceed one slide per minute
- Background color should be light
- Font color should be dark enough to form contrast
- Font size is dependent on the size of the room. As a rule, letters should be large enough to be easily read from the farthest corner of the room. (18-24 points).
- Two font families is a good rule of thumb. (Authors prefer Verdana and Arial.)
- No more than one graphic image or chart per slide.
- The knowledge conveyed on each slide should be clear and concise.
- Complicated equations should be avoided.
- Preferably one concept and graphics per slide
- Maximum five-six lines of text per slide is ideal
- The slides should be reviewed prior to presentation for conformity to this guide.
- The presenter should not read the slides
- Presenter should keep eye contact with his/her audience
- Referring or pointing at the slide is acceptable when highlighting a feature.
- If the presentation is not committed to memory and/or there are facts that need to be exact, the presenter should have note cards to look at rather than looking at the slides.
- There should be a run-through of the material prior to the formal presentation.
- The dry run should be evaluated as if it were the final presentation with extensive critical corrective suggestions made to the presenter.
- From the beginning it should be made very clear that this critique is solely for the benefit of the student.

- While most corrective actions will be made openly in front of the group, as stated in the text, good judgment should be exercised in making some corrections or suggestions in private to the presenter.

Formal Presentation Guide

The authors suggest a three point "Likert" type scale for the formal assessment of the actual presentation. If a greater degree of refinement is desired a 5 or 7-point scale may be used. The following three categories are used at UDC.

(1) Failed to meet minimum expectations
(2) Met expectations
(3) Exceeded expectations

PRESENTATION GRADING FORM

	ITEM	1	2	3	Notes for corrective comments
1	Technical Content				
2	Voice Articulation				
3	Logical Order				
4	Content Communicated				
5	Presenter's Attire				
6	Interaction with Audience				
7	Posture				
8	Quality of Slides				
9	Presentation Appropriate for Audience				
10	Questions / Answers				

Conclusions

The final assessment of the presentation through the use of a "Jury" of faculty and peers for the Senior Capstone Design Project is work in progress. Suggestions and the perspective of others on this topic are encouraged and will be appreciated. See contact information for the Faculty authors in their Bio sketches.

References

[1] *Creating a Presentation in PowerPoint*, Tom Negrino, Peachpit Press (2004)

[2] *Making Power Point Presentations,* John A. Cagle, johnca@csufresno.edu

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