



## Brief Evaluation Report on Pilot of Dr. Frame Software

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### BACKGROUND

This report summarizes an evaluation of a pilot version of an innovative course software package, called "Dr. Frame." Used in engineering classes, the software is designed to provide hands-on experience to students with the characteristics of certain structures. In Fall of 2005, the software was used for an in-class assignment in a UW engineering class: Civil and Environmental Engineering 379: Civil Engineering. As part of the assignment students completed a pre-survey and post-survey. Both instruments contained the same three questions aimed at assessing changes in their understanding relevant concepts. The post-survey contained a set of evaluative questions to assess students' satisfaction with the software and the extent to which they found it useful.

The surveys were presented as online questionnaires at the beginning and the end of the exercise. Within the assignment, an introduction to the evaluation project was presented along with a link to the survey itself. Students' participation was voluntary, although to receive credit for the assignment, they had to at least answer whether they consented to participate in the surveys. A total of 30 students completed a pre-survey, 32 completed a post-survey, and 28 completed both a pre- and post-survey.

### RESULTS

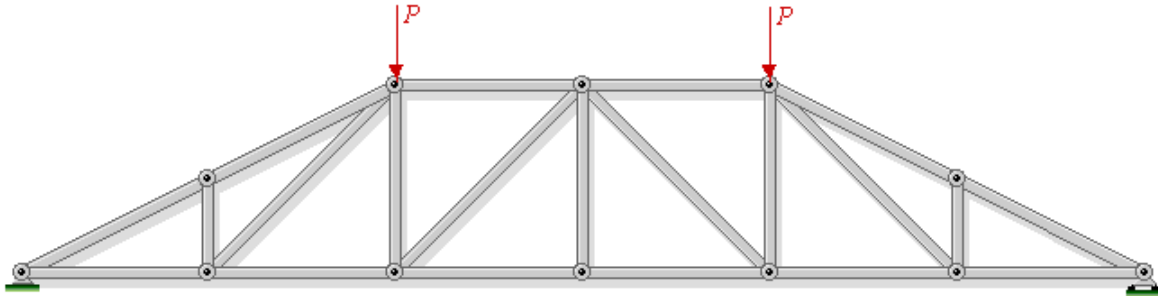
The descriptive results presented below are separated according to a pre- and post-comparison of the content-related questions and an analysis of the evaluative items presented only on the post-survey. Each section concludes with brief, interpretive comments from the evaluator.

#### Pre-Post Comparisons: Conceptual Questions

There were three conceptual questions presented on both the pre- and post-surveys:

- Question 1: The joints in a real truss are rarely true pin joints, which you are likely to have noticed when looking at normal bridge or roof trusses. For a typical truss, what kind of error would you expect for axial force values computed using a pinned-joint assumption (i.e., the standard truss model) versus a restrained-end assumption (i.e., rigid joints)?

- Question 2: Following on from question #2, which of the following factors has the biggest influence on the difference between pinned versus restrained end axial force values for a truss?
- Question 3: Without doing any calculation, how many zero-force members are there in the truss loaded as shown below?



Figures 1 through 3 show the percentage of respondents provided each answer for the pre- and post- conceptual survey questions, presented below:

Figure 1. Percentage of individuals providing each response to Question 1 on the pre- and post-survey. A (\*) indicates the best answer, with (\*\*) representing an acceptable answer

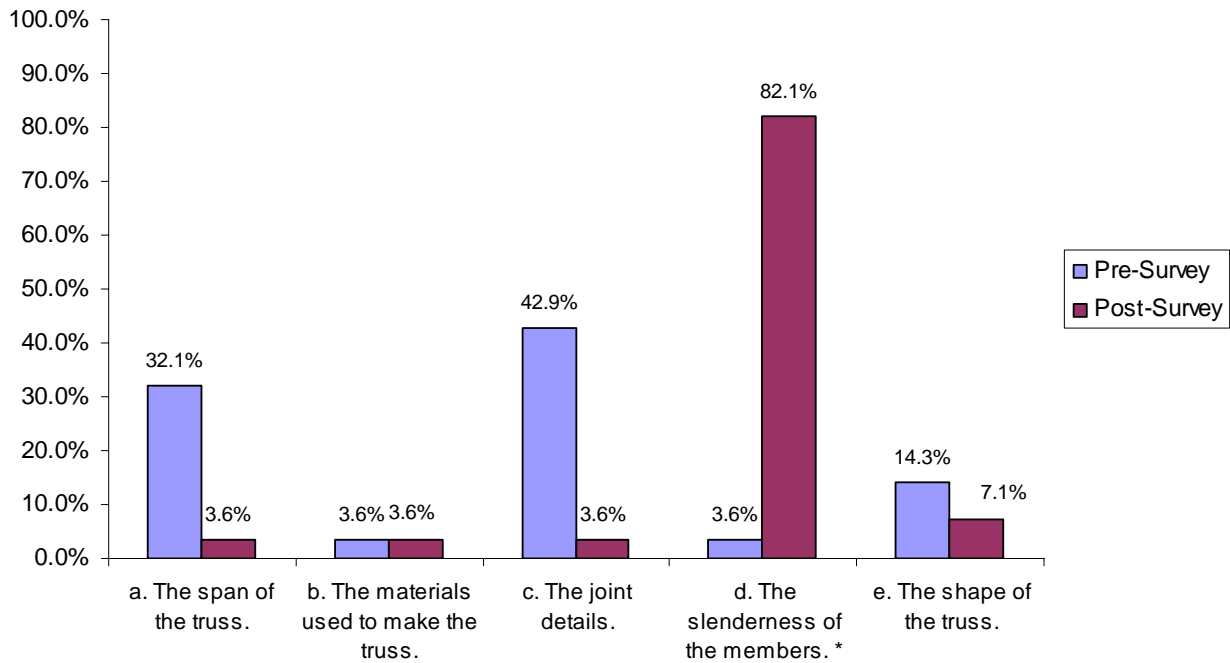


Figure 2. Percentage of individuals providing each response to Question 2 on the pre- and post-survey. A (\*) indicates the best answer.

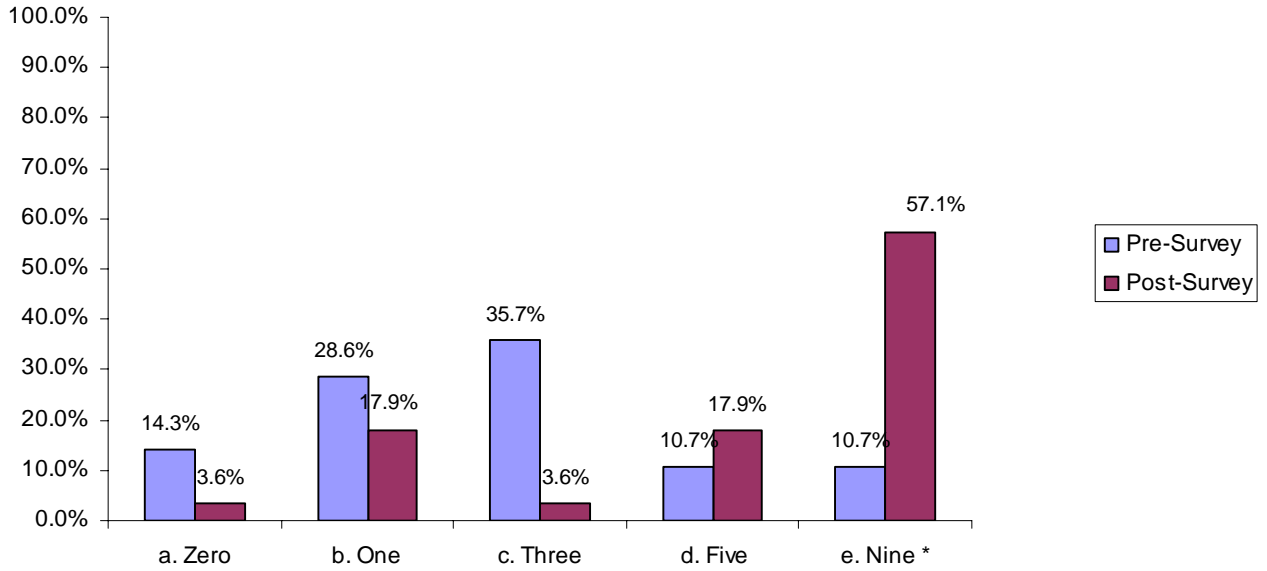


Figure 3. Percentage of individuals providing each response to Question 3 on the pre- and post-survey. A (\*) indicates the best answer.

Participants were also asked to rate their level of confidence in the responses they provided on the conceptual questions on both the pre-survey and post-survey, from a scale of 1 “Not at all confident” to 6 “Completely confident.” Mean confidence ratings for each question, both pre- and post- are presented in Figure 4.

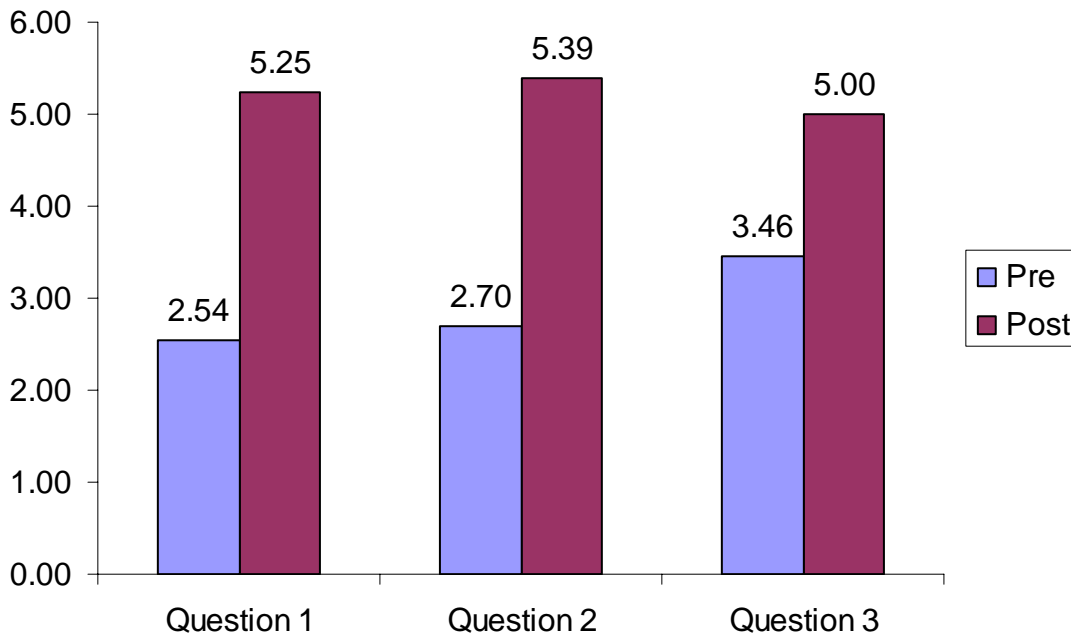


Figure 4. Mean confidence ratings (on a scale of 1: Not at all confident to 6: Completely confident) provided by participants about their responses to three conceptual questions on the pre- and post-surveys.

**Evaluator’s comments:** Participants did make conceptual gains before and after going through the Dr. Frame software. For each of the conceptual questions, students were most likely to provide an incorrect answer, with percentage of correct responses increasing significant on the post-survey. Participants also demonstrated more confidence in their responses on the post-survey as compared to the pre-survey, with ratings for all three ratings increasing significantly (according to matched-pairs t-tests,  $p < .001$ ).

## Post-Survey: Evaluative Questions

### Ratings

The evaluative questions on the post-survey began with a set of six statements; participants were asked to indicate the extent to which they agreed or disagreed with the statements. Table 1 shows the frequency, mean and standard deviation of their responses.

Table 1: Descriptive statistics for six evaluative statements.

	Strongly Disagree 1	Disagree 2	Neutral 3	Agree 4	Strongly Agree 5	Mean	SD
This activity enhanced my understanding the behavior of trusses.	0 (0.0%)	0 (0.0%)	2 (6.1%)	19 (57.6%)	12 (36.4%)	4.30	.585
The software was easy to use.	0 (0.0%)	0 (0.0%)	0 (0.0%)	17 (51.5%)	15 (45.5%)	4.36	.783
I enjoyed this activity.	0 (0.0%)	2 (6.1%)	1 (3.0%)	17 (51.5%)	13 (39.4%)	4.24	.792
This activity was a good use of my time.	0 (0.0%)	1 (3.0%)	3 (9.1%)	15 (45.5%)	14 (42.4%)	4.27	.761
Now that I've completed this assignment, I will probably have to study less for the final exam.	10 (30.3%)	10 (30.3%)	6 (18.2%)	6 (18.2%)	1 (3.0%)	2.33	1.190
If given the opportunity, I would like to return to this activity as a study resource.	0 (0.0%)	3 (9.1%)	5 (15.2%)	14 (42.4%)	11 (33.3%)	4.00	.935

As a visual presentation of these data, Figure 5 shows the mean ratings for each item.

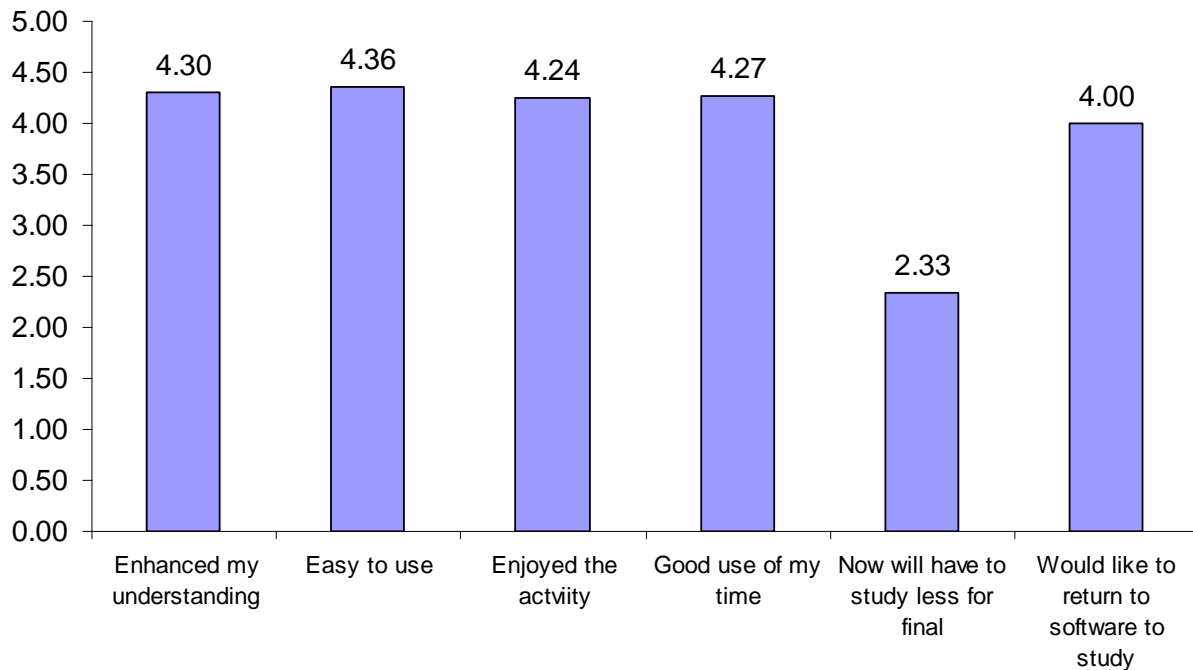


Figure 5. Mean ratings for each of the rated evaluation items on the pre-survey.

### *Open-Ended Responses*

Below is a complete list of all responses from students to each of the four open-ended evaluative questions at the end of the survey.

#### What, if anything, did you find particularly valuable about this activity?

- It's fun to be able to see things first hand and play around with them. I don't learn very much out of books.
- Cool software and a visual aid
- This excellent, you can see results in real time. It solves thousands of problems in few seconds... it is just great. I wonder what Eiffel would have done if he had a computer!!
- Interactivity and playback review.
- it was easy to use
- It is help full it is just like being in the lab.
- It showed me how to use Dr Frame.
- Being able to see how frames react under different loadings.
- It is a lot more efficient and not so handy to turn in.
- How the user could interact and manipulate the truss and see what the affects are.
- I find out that the interial members forces can all be zero depend on the act of the axial load

- seeing the shape of the trusses physically change how the forces are distributed, and seeing the string example to get a better visualization
- I liked that the activity had a clear and pointed objective in what it was teaching us.
- Interactive, like I could ask questions easily without having to put the idea in to words.
- The interactiveness.
- I have learned more about how difference between pinned and restrained end axial force values for a truss in different conditions such as: the span of the truss, the materials used to make the truss, the joint details, the slenderness of the members, and the shape of the truss.
- The fact that it used interactive visual aids to explain everything and provided simple, real-world analogies.
- the interaction between computer program and instructions
- Without this activity, I might never try to use Dr. Frame for helping my assignment. Moreover, it helps me a lot in understanding the behaviour of trusses system.

Did you have any technical problems with the software? If so, please describe these in detail below

- No problems (8 responses)
- It crashed a few times.
- Since it is my second time, I have some not much difficulties.
- Getting both windows to appear without having to scroll in any one was near impossible so it detracted from the efficiency but not overly.
- The software is really neat and useful, but I have not try to monkeyed around with it much so I don't know yet.
- just accidentally clicking things like the force vector and messing it up a little...
- "Going back from step 10 to step 9, it shows
- "cmd\_ArrowTool"
- I found it a little annoying to find Dr Frame on the lab machines. That is all, though.
- i didn't know what "unpacking" meant, so i got a bit frustrated getting started
- A little but maybe after using it more often I will be able to use it more properly

How, if at all, do you think this activity could have been improved?

- Nothing to improve or "don't know" (3)
- It should be given as lab part of the class.
- We should be allowed to take it multiple times like the matlab

- Have better graphics for the frames
- A lot I think, it is available if we expand as what we do in the CEE 392
- The window interaction may have been better.
- This activity is great
- maybe a little less wordy
- liked it as it is. Maybe letting more experimentation happen. When using the program, after answering I think q3, the solution always posted and didn't allow further tweaking to see it yourself (don't know if all solutions like this or not).
- Expand it to cover other concepts.

Any additional comments about the activities?

- No comments (3 responses)
- you should do an activity like this once a week like the matlab quizzes to increase our understanding of the material
- Well, I dont have any additional comment so far.
- I thought this activity was well worth my time and the material was conveyed here better than if I were to read it or be lectured on it.
- it was pretty cool after all!
- Could we have another activities such as about Fram, Beam like this one,please?
- Gained more knowledge on shapes of structures and their characteristics
- Good

**Evaluator's comments:** For the most part, responses to the Dr. Frame software were overwhelmingly positive. Almost all students agreed that they enjoyed using it, that it helped enhanced their understanding of certain concepts, it was easy to use, and was a good use of their time. There was some indication that students did not necessarily recognize the activity as a replacement for studying. Students provided a number of suggestions for how the activity might be improved and it appears there were only a few minor glitches in using the software, but nothing that stood out as frustrating for all students; rather they were idiosyncrasies of the individuals' knowledge or the computer they were using.