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1-30-2014

## Common Misconceptions Found in a Statics Course Through Discourse Analysis of Student Learning Logs

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### Recommended Citation

Green, Christopher, "Common Misconceptions Found in a Statics Course Through Discourse Analysis of Student Learning Logs" (2014). Research On Capitol Hill 2014. *Research on the Hill (Salt Lake City)*. Paper 15.

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# Common Misconceptions Found in a Statics Course Through Discourse Analysis of Student Learning Logs

## I. Introduction

Statics is a gateway engineering course for many engineering majors. As a result, many students use their performance in a statics course to evaluate and judge their desire to continue within an engineering field.

Students' performance can be adversely impacted by misconceptions they may have regarding class content. Feedback from instructors can help students navigate through their misconceptions. It is critical that this feedback be concise and timely to prevent a slip in self-efficacy, or an increase in their frustration. Both factors can negatively impact a student's desire to persist in engineering.

This study is designed to explore misconceptions exhibited through learning logs, or discussions about the course material, written by 85 students in the Fall 2013 statics course at Utah State University during the unit involving trusses. A "discourse analysis" technique called "coding" was used to categorize their statements, find misconceptions, and discover student's trouble areas in the course.

Study conducted with funding from the USU Engineering Undergraduate Research Project Grant from the College of Engineering and administered through the Department of Engineering Education.

## II. Methods

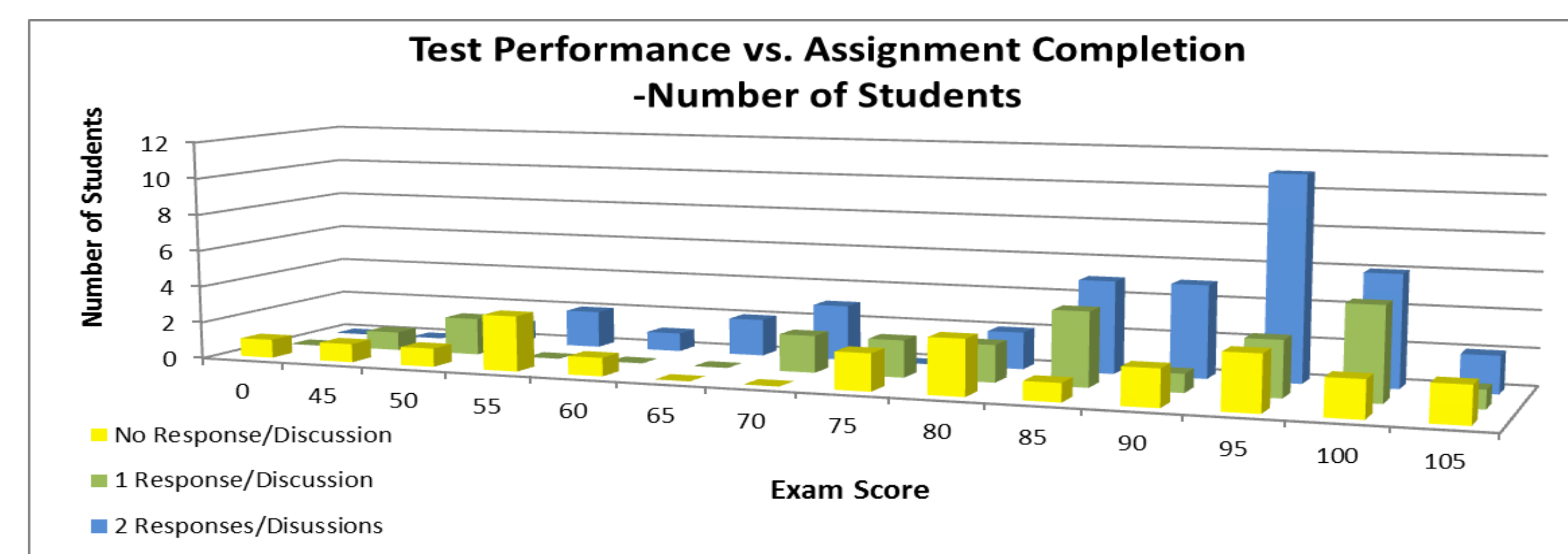
Discourse analysis is the study of written or spoken communication, especially how the communication is structured. Coding is the process by which messages are broken down into smaller parts and sorted by categories.

The categories used in this study were:

- Definition of a concept
- Discussion of a topic the student is having difficulty with
- Discussion of an equation or approach to solving a problem
- Discussion of a real-world application

Their responses were then compared to performance on the unit exam.

"This homework just keeps getting difficult. The idea of analysing each joint gets confusing and bit hard to follow. Finding the moments have become easier."  
-Low Performer Learning Log, Scored 45



**Figure 2** – Student test performance relative to assignment completion as proportions to the number of students per test score.

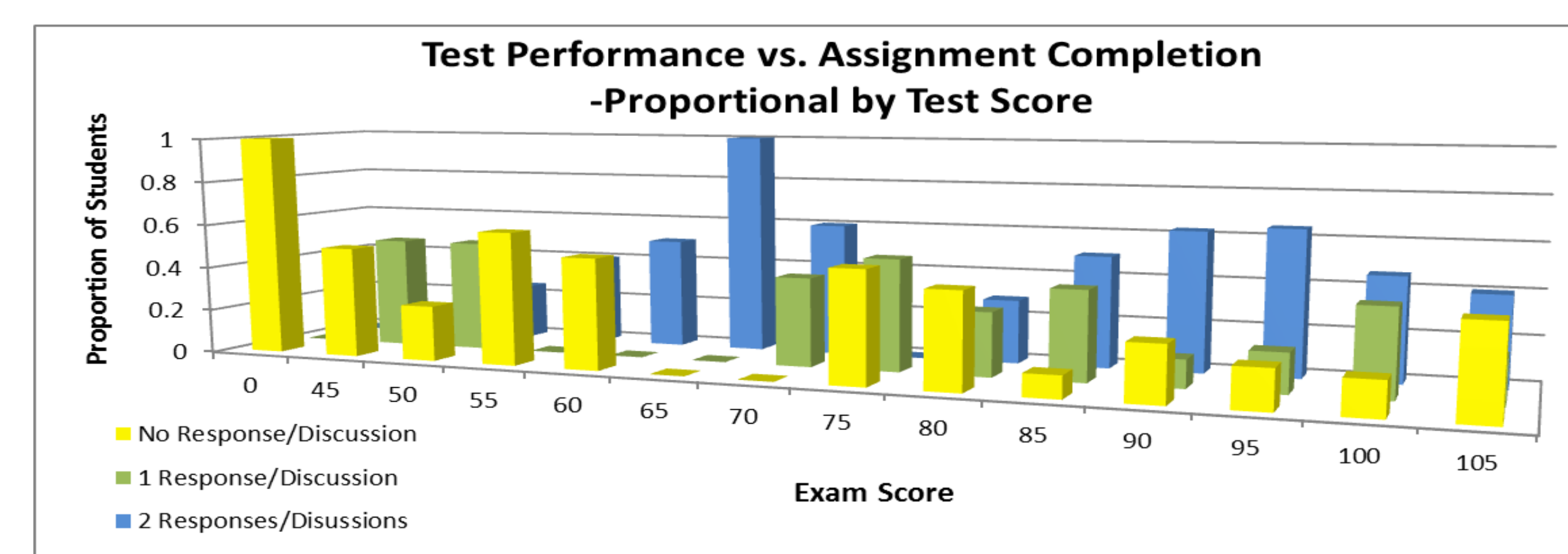
## III. Results

While the results were not as anticipated, they were still insightful in identifying not just misconceptions, but struggles and other barriers to learning.

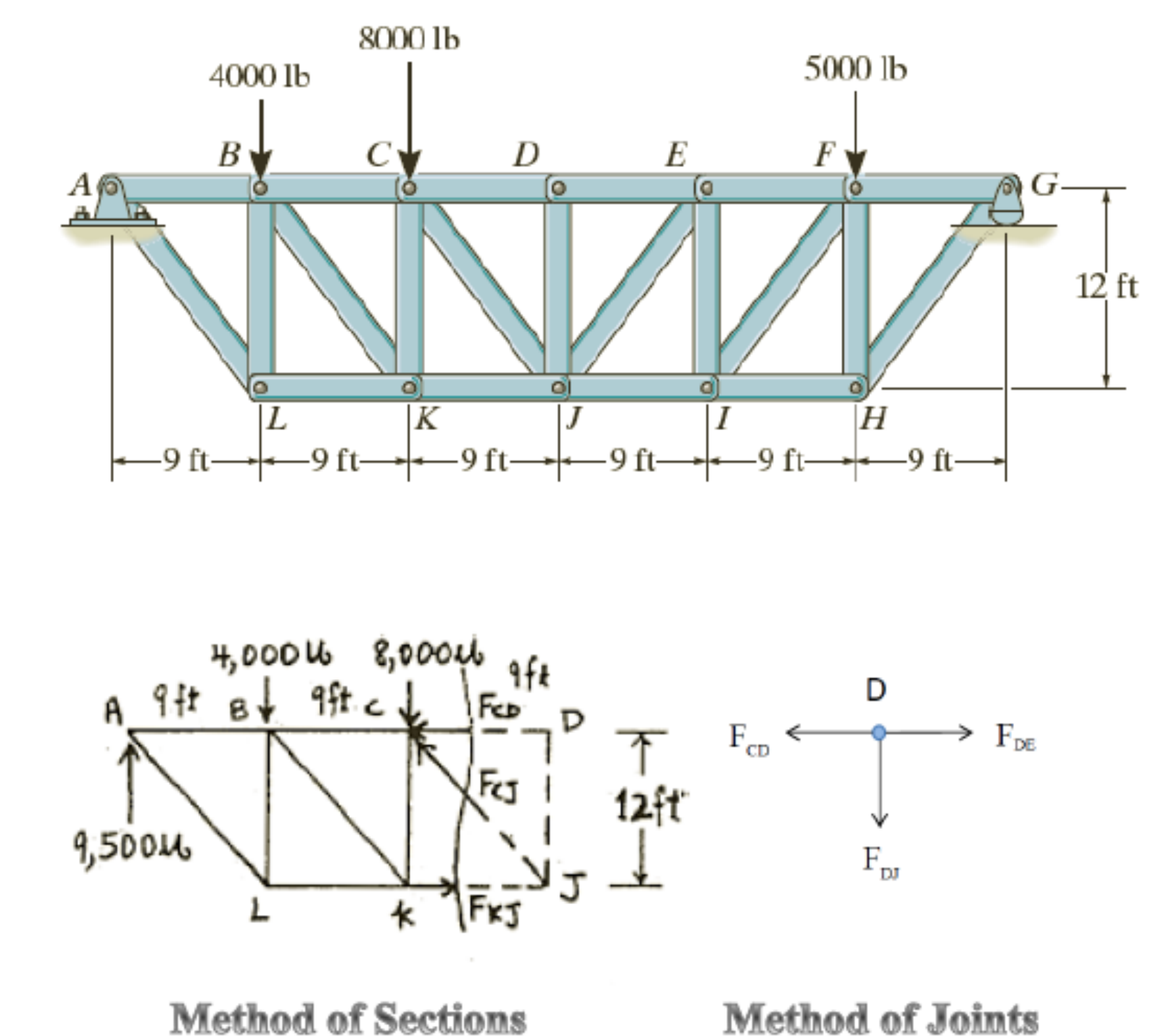
The distribution of test scores was weighted toward the higher scores. There were a number of students who didn't turn in both learning logs for the unit, or who didn't write a discussion that could contain statements of truth or misconception. By comparing the number of completed assignments with the test scores, a correlation was seen where a greater portion of those who scored low on the exam didn't turn in both learning logs.

"This week was interesting looking at reactionary forces. I like that we were able to look at the different connections and how they reacted made sense to me. The only one that wasn't too clear were journal bearings and thrust bearings, but later in class I feel like you addressed it and explained them really well. Journal bearings don't allow for moments, but allow for the shaft to slide through. Thrust bearings don't allow for translation along the shaft."  
-High Performer Learning Log, Scored 105

**Figure 1** – Student test performance relative to assignment completion in terms of number of students.



**Figure 3** – Example of Course Material



## IV. Conclusions

The main areas in which students had misconceptions were:

1. The sign convention used in determining tension and compression.
2. Reactionary forces and moments.
3. How forces and moments oppose each other at every point.

Furthermore, students who performed less than average were more likely to not turn in the assignments or not say anything that could be incorrect than to say a misconception. They were more open to express struggles as well than to make an incorrect statement.



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