

# An Exploration of Engineering Student Effort: Correlations to Exam Performance

Darcie Christensen<sup>1</sup>, M.Eng.

Cynthia Rigby<sup>1</sup>

Idalis Villanueva<sup>1</sup>, Ph.D.

Jenefer Husman<sup>2</sup>, Ph.D.

<sup>1</sup>Utah State University, Department of Engineering Education

<sup>2</sup>University of Oregon, Education Studies Department



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# Outline

**Background & Purpose**  
**Research Methodology**  
**Results & Discussion**  
**Conclusions**



# Background

- ❑ **Classroom effort is important for students' academic performance and success** (Douglas & Alemanne, 2007)
  - ❑ **Measured by attendance, number of discussion posts, course click count, etc.**

**Purpose**

**Exam  
Effort  
t**

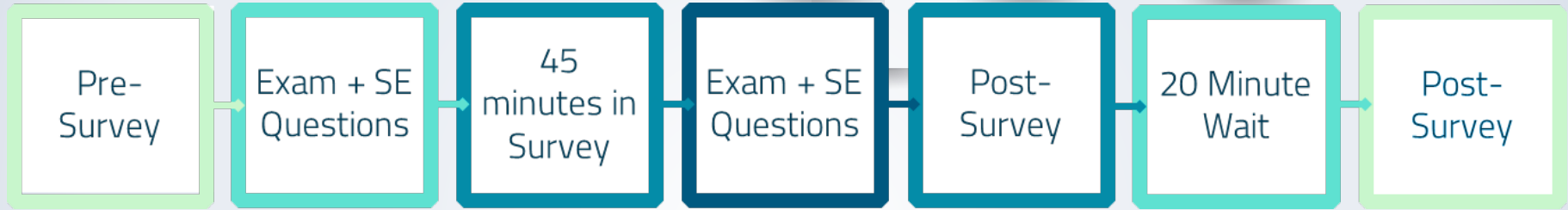


**Academic  
Performanc  
e**

# Participants

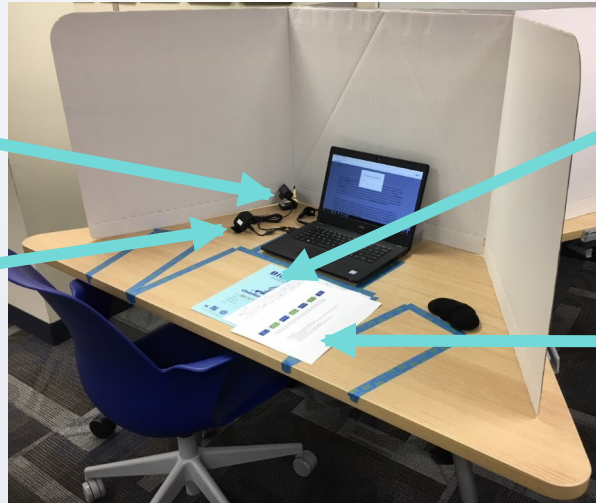
- ☐ **Engineering Statics Practice Exam**
- ☐ **Statics is first required ENGR course students take - most students in first or second year**
- ☐ **Second practice exam at week 8 of 16**
  - ☐ **One week before actual exam**
  - ☐ **Similar content and structure**
    - ☐ **20 Multiple Choice Questions - Analytical/Problem Solving**
  - ☐ **Questions provided by instructor**
- ☐ **2.5% extra credit given + \$5 gift card**
- ☐ **19 students included in this specific analysis**
  - ☐ **Pre-screened for metabolic disorders, medical conditions, dietary habits, and medication**

# Experimental Setup



**Logitech  
Webcam**

**EDA Sensor  
- Empatica  
E4**



**Work  
Booklets**

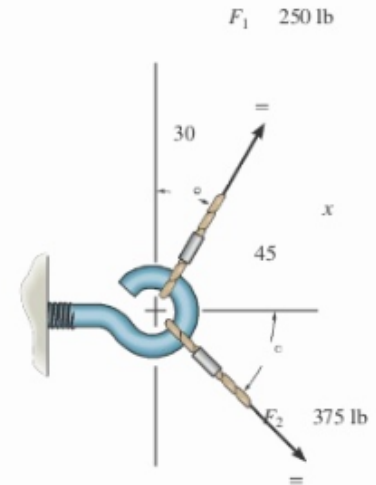
**Equation  
Sheet &  
Study  
Timeline**

# Ecological Validity

- ☐ Provide same equation sheet given for actual exam
- ☐ Standard exam workbooks similar to what is offered in regular exam
- ☐ Electronic subset of practice test questions provided by the instructor, which paralleled actual exam structure and content
- ☐ Same amount of time given for exam with extra time allotted for surveys and saliva
- ☐ Real exam also requires computer

2-3.

Determine the magnitude of the resultant force  $F_R = F_1 + F_2$  and its direction, measured counterclockwise from the positive  $x$  axis.



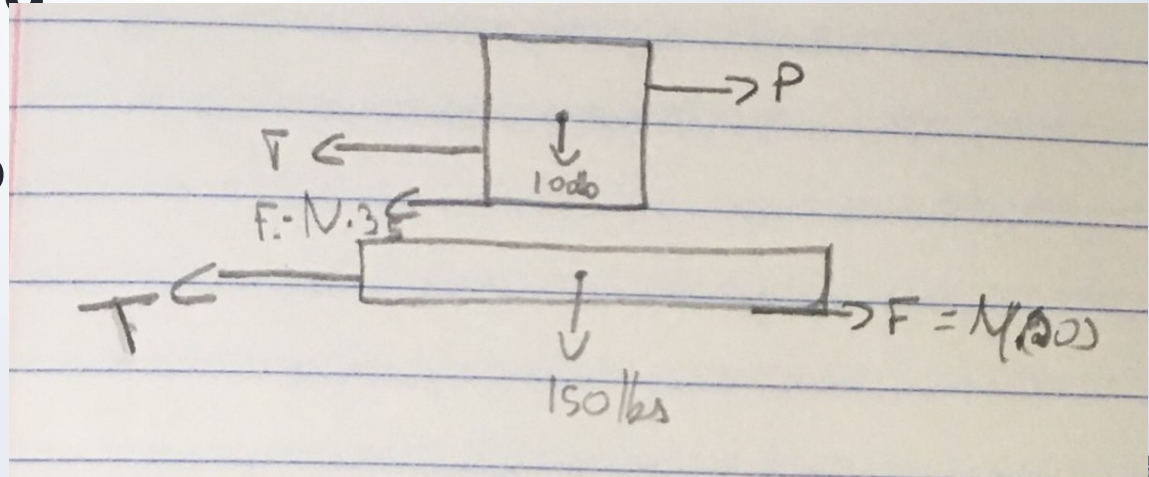
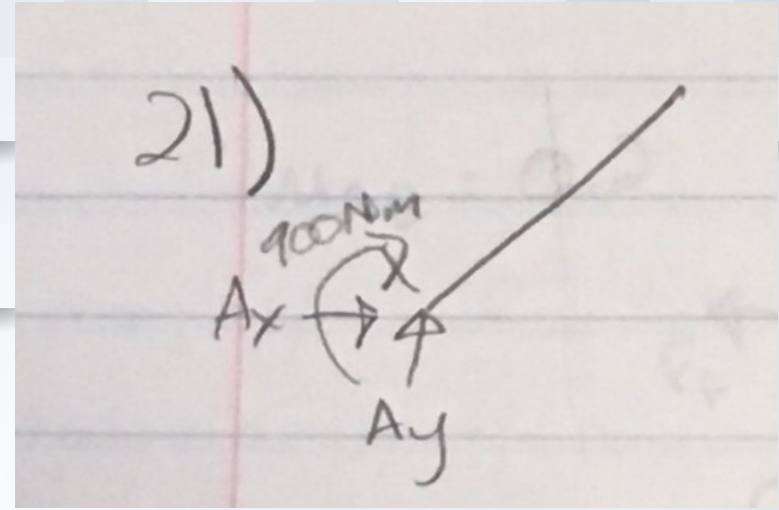
From Engineering Mechanics  
Statics 14<sup>th</sup> Edition (Hibbeler,  
2015)

# Analysis

- ☐ Identified questions as correct/incorrect
- ☐ Codebook created
- ☐ Each question analyzed on scale from zero to two
  - ☐ Zero = Nothing written in testing booklet
  - ☐ One = Something written in test booklet, but incoherent and possibly only meaningful to participant
  - ☐ Two = Adequate work shown and can easily be followed through to final answer
- ☐ Performance data and coded effort compared

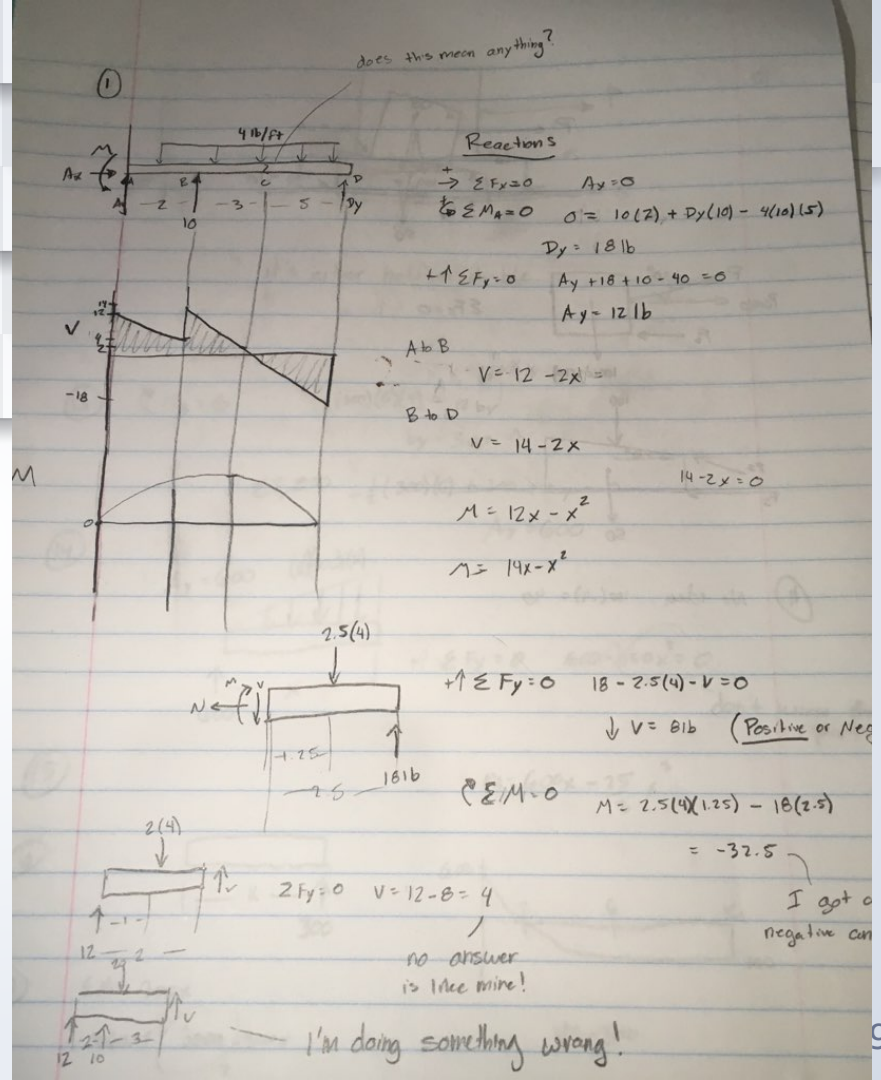
# Analysis

- One = Something written in test booklet, but incoherent and possibly only meaningful to participant



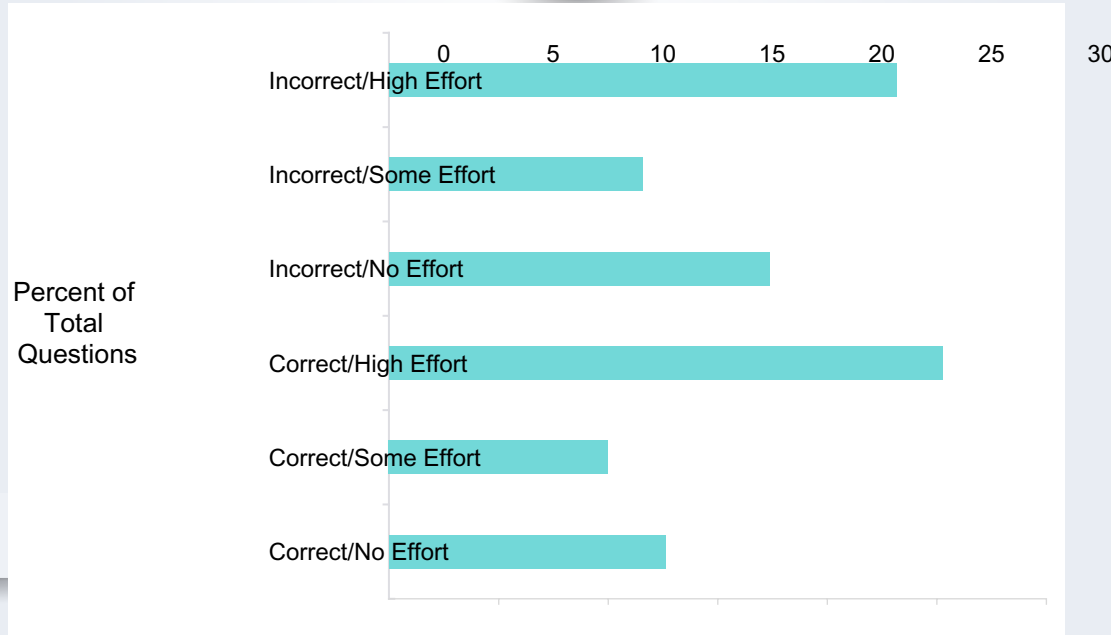
# Analysis

- **Two = Adequate work shown and can easily be followed through to final answer**



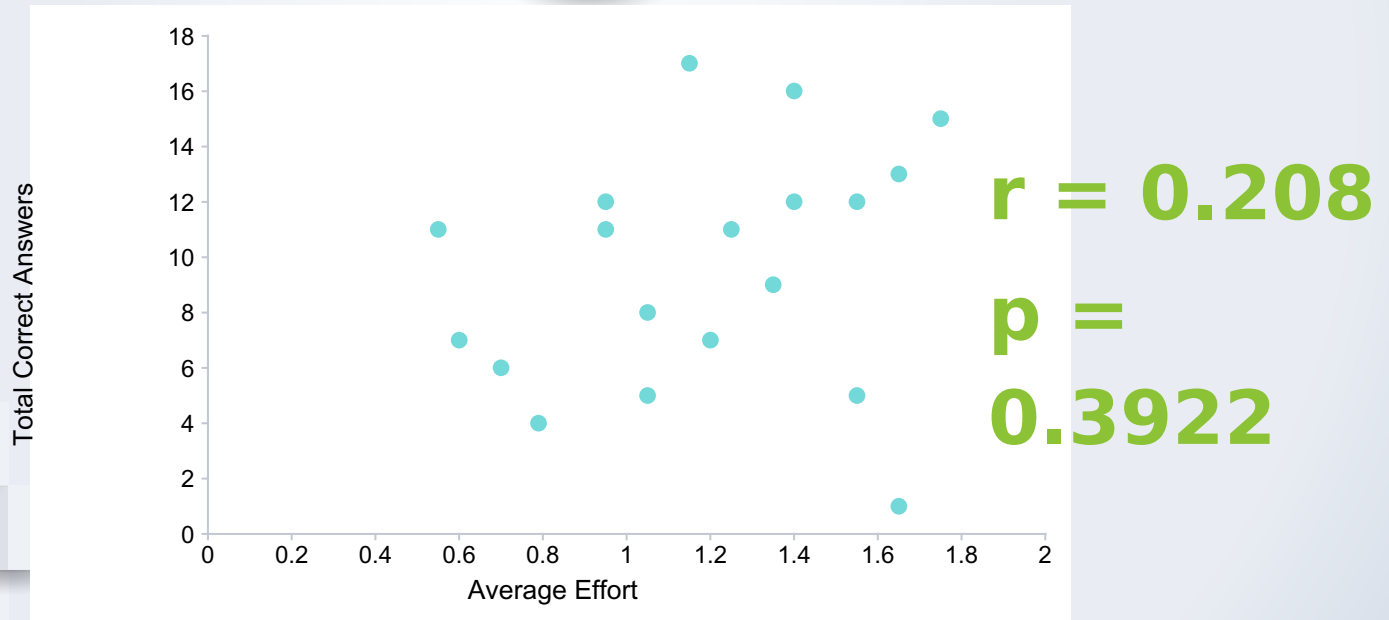
# Results

- All 19 participants answered all 20 exam questions  
= 380 total questions answered and coded



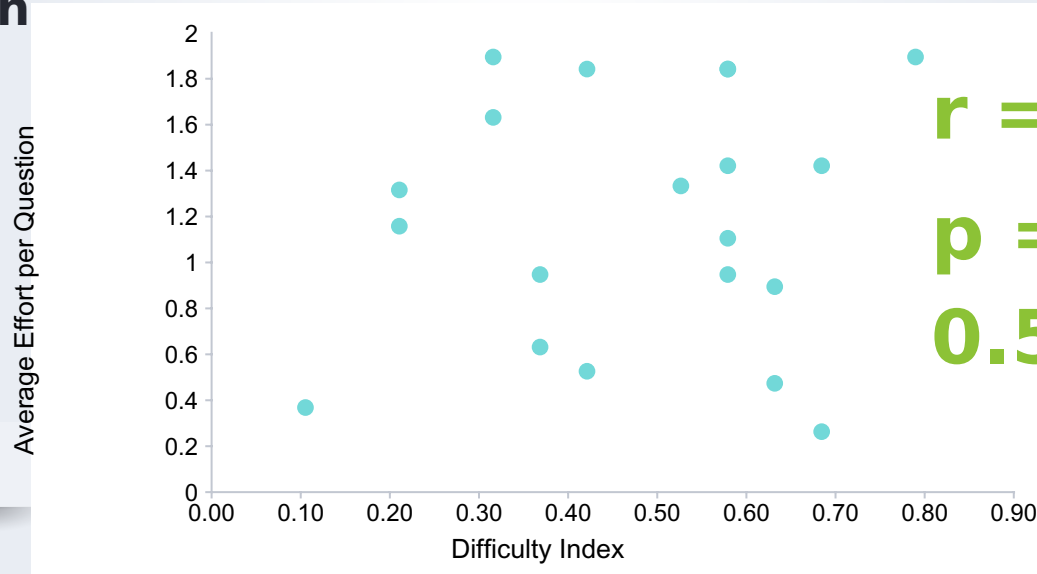
# Effort versus Performance

- Each participant's effort was averaged across the 20 questions and a linear regression was performed



# Difficulty Index Comparisons

- **Difficulty Index = Number of correct answers divided by the total number of responses**
- **Difficulty Index compared to the average effort per question**



$r = 0.126$

$p = 0.5953$

# Conclusions

- **Increase in average effort suggests weak but positive trends with amount of problems answered correctly on an engineering statics exam**
- **Increase in difficulty index suggests weak but positive trends with the average effort expended on a problem**

# Limitations

- ☐ **Small sample size means limited statistical power**
- ☐ **Practice exam one week before actual exam**
- ☐ **Laboratory environment**
  - ☐ **While ecologically valid, is not representative of high-stakes exam**

# Acknowledgements

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