An Exploration of Engineering Student Effort: Correlations to Exam Performance

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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
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

Pre-Survey → Exam + SE Questions → 45 minutes in Survey → Exam + SE Questions → Post-Survey → 20 Minute Wait → Post-Survey

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

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.

$r = 0.208$

$p = 0.3922$
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
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