Examining the Role of Homework in Engineering Curriculum: Two Project Examples

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Example #1: Improving Students' Technical Writing Skills: Abstracts in Introductory Solid Mechanics

Project Description:
The research project examines the effects of intervention on writing abstracts for Project 2 ENGR 14: Intro to Solid Mechanics between Fall 2013 and Winter 2014. The intervention involves providing students with more explicit instructions in the writing process.

Questions of Interest:
- How did the changes in the assignment worksheet affect student work in terms of clear technical writing?
- What could be added or changed about the assignment to maximize student performance?
- How will these ideas be implemented for future quarters?

Step 1: Coding
- Conducted blind coding of abstracts between researchers that resulted in 2 sets of data
- Discussion held to ensure consistency between researchers

Codes
- Statement of Problem
- Theoretical Explanations
- Assumptions Made
- FBD: Explanations

Results: Mentioning
- Results: Explaining
- Results: Clarifying
- Results: Mitigating

Step 2: Excerpt Grading
- Individually "graded" excerpts data from coding by "Low," "Medium," and "High" (Blind grading)
- Discussion held to ensure consistency in the grading process between researchers

Table 1: Explanations of requirements for each level for excerpt grading

<table>
<thead>
<tr>
<th>Level</th>
<th>Explanation</th>
</tr>
</thead>
<tbody>
<tr>
<td>High</td>
<td>Clearly state goal and attack approach.</td>
</tr>
<tr>
<td>Medium</td>
<td>Contain either goal or attack approach, not both.</td>
</tr>
<tr>
<td>Low</td>
<td>Contain neither, or not understandable.</td>
</tr>
</tbody>
</table>

Table 2: Results of t-test conducted on data set

<table>
<thead>
<tr>
<th>Codes/Categories</th>
<th>t-value</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Statement of Problem</td>
<td>2.46</td>
<td>0.04</td>
</tr>
<tr>
<td>Theoretical Explanations</td>
<td>3.16</td>
<td>0.005</td>
</tr>
<tr>
<td>Assumptions Made</td>
<td>2.15</td>
<td>0.054</td>
</tr>
<tr>
<td>FBD: Explanations</td>
<td>2.46</td>
<td>0.04</td>
</tr>
</tbody>
</table>

Results:
- The research project examined the effects of intervention on writing abstracts for Project 2 ENGR 14: Intro to Solid Mechanics between Fall 2013 and Winter 2014. The intervention involves providing students with more explicit instructions in the writing process.
- Discussion held to ensure consistency in the grading process between researchers.
- Individually "graded" excerpts data from coding by "Low," "Medium," and "High" (Blind grading).
- Discussion held to ensure consistency in the grading process between researchers.

Example #2: Using online activities to improve self-efficacy and knowledge in mechanics

Possible Future Steps
1) Introducing abstracts early to the students in the quarter
2) Abstracts peer review
3) Simplified version of instruction sheet

Confident
Moderately Confident
Slightly Confident
Not Confident

Results:
- Mechanics Self-Efficacy increased for all students, though more men than women. Interestingly, women and first-generation students started the course with greater self-efficacy than their counterparts.