Development and Evaluation of a Hybrid ADI/SWH Model Pre-Laboratory Curriculum

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Previous Research at UNI:

- Students value each part of the pre-lab differently, struggle to connect all of the components, and therefore fail to see the big picture.
- Students find the pre-lab moderately helpful in understanding both the concepts and mechanics of the lab, but find it less helpful at the end of the semester compared to beginning.
- The cognitive load demands of the SWH pre-lab hinders students’ ability to participate in authentic scientific inquiry.

Cognitive Load:
The amount of brain power it takes to process given information.

<table>
<thead>
<tr>
<th>Intrinsic Load</th>
<th>Extrinsic Load</th>
<th>Germane Load</th>
</tr>
</thead>
<tbody>
<tr>
<td>Complexity</td>
<td>Unnecessary information or processes</td>
<td>Diversity</td>
</tr>
<tr>
<td>Element interactivity</td>
<td>Varied skill set</td>
<td>Varied skill set</td>
</tr>
<tr>
<td>Determined by activity and experience</td>
<td>Determined by breadth of learning objectives</td>
<td>Determined by breadth of learning objectives</td>
</tr>
</tbody>
</table>

General Chemistry Lab Models

- ADI
  - Tools/Skills
  - Beginning Questions
  - Background Info
  - Procedure Proposed
- Hybrid
  - Tools/Skills
  - Beginning Questions
  - Background Info
  - Procedure Proposed
- SWH
  - Tools/Skills
  - Beginning Questions
  - Background Info
  - Procedure Proposed
  - Class Discussion

Online Interactive Assignments
- Provide effective scaffolding
- Focus on the skill

Assignment Format Goals
- Students more confident and prepared
- More focus on concepts, less on technique
- Less technique error

Consider the Following...
- Statements prompting students to put skill section in context
- Questions for students to answer

Online Quiz
- Multiple responses
- Check for understanding

Skill Tutorial
- What students do during the assignment and why they do it

Research Questions

How are the cognitive and affective expectations of students met through the use of the hybrid model compared to a general SWH model in an undergraduate general chemistry course?

In what ways are expectations of students met in the prelab portion of the lab for hybrid and SWH model types?

In a freshman general chemistry class, how does having a mixture of videos, simulations, and interactive feedback questions as prelabs in a hybrid lab compare to SWH prelabs in supporting students in lab?

Methodology (Fall 2019/Spring 2020)

- Interviews
- MLLI

Expected Results

More confidence in lab, better lab technique, better understanding of concepts.