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Design of Inquiry-Oriented Science Labs: Impacts on Students' Attitudes

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**Design of Inquiry-Oriented Science Labs: Impacts On Students’ Attitudes**

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### Assessment
I utilized an end-of-semester survey to assess students’ attitudes toward lab. Reliability and validity of the survey were well supported (Basey et al., 2008). In the survey students rated the following on a scale of 1–10: how much the lab helped with lecture (lecture); how exciting the lab was (exciting); how much they learned for the time they invested (time efficiency); and how easy the lab was (difficulty).

Observations in 2008 indicated TAs were not implementing PB labs as they were intended. So I utilized a questionnaire for the TAs to determine the extent that PB labs were implemented as PB and not GI.

### Results and Discussion
When labs were not changed between years (control labs), student ratings did not change for any parameter (Table 2). Thus, the validity of a study design that changes lab styles between years is supported for a sample this large.

In 2 of 3 cases, students significantly preferred the GI format to the PB format (Figure 1). For the case in which students did not show a preference (Cell Phys.), level of difficulty and time efficiency were not significantly different (Table 3). Upon review of the Cell Phys. lab, the GI version had a challenging extension question designed specifically to improve understanding of lecture material. Students rated lecture help significantly higher for the GI version (Table 3). Thus, lab style (PB vs. GI) appears to have an influence on students’ attitudes, however, other lab characteristics (i.e., time efficiency and difficulty) associated with lab style may be the cause rather than lab style itself.

When lab style (PB vs. GI) changed difficulty and/or time efficiency, students rated the version that was higher. When lab style was the same, students rated the version that was higher. This indicates that the PB version was significantly more difficult and significantly less efficient than the GI version, and level of difficulty was the factor that was the greatest change in PB vs. GI labs.

In 2 of 3 cases, students found lecture help for the GI version to be significantly greater than for the PB version. Interestingly, in all three cases, the change between a PB and GI lab did not significantly influence excitement for the students. This indicates that excitement may be more related to characteristics other than lab style.

### Literature Cited


### Table 3. Mean overall rating for labs in the GI format vs. the PB format. A t-test was used to compare mean ratings. Error bars indicate standard error.

<table>
<thead>
<tr>
<th>Lab</th>
<th>Overall</th>
<th>Lecture Help</th>
<th>Exciting</th>
<th>Time Efficient</th>
<th>Difficulty</th>
</tr>
</thead>
<tbody>
<tr>
<td>GI</td>
<td>6.70</td>
<td>3.18</td>
<td>4.02</td>
<td>7.84</td>
<td>0.134**</td>
</tr>
<tr>
<td>PB</td>
<td>6.10</td>
<td>2.94</td>
<td>3.88</td>
<td>7.68</td>
<td>0.298*</td>
</tr>
</tbody>
</table>

### Conclusions
- Lab style has an impact on students’ attitudes toward lab. However, the impact appears to be heavily influenced by how lab style alters difficulty and time efficiency.
- When level of difficulty is low, students’ attitudes are the same for PB and GI labs, but when level of difficulty is high, students’ prefer GI labs to PB labs.
- Lecture help does not appear to have a substantial influence on students’ attitudes toward lab.
- Lab style does not appear to influence students’ perceptions of lab excitement.

### Acknowledgements
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