What I Learned From My First SoTL Project

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OUTLINE

- Steps to IRB:
  - Title
  - Research Design
  - Assessment: Data Collection

- Data Analysis
  - Other Lessons Learned
What Led to This Research?

- Curriculum Design Academy (CDA)/ POGIL
- Curiosity
- Improve Understanding of Logarithms
The Effects of Discovery Learning Activities on Student Learning and Student Attitudes Toward Mathematics in College Algebra
What is Discovery Learning?

Students work in groups of 3 – 4.

Guided worksheets; instructor available.

Critical thinking questions.
RESEARCH DESIGN: 4 COLLEGE ALGEBRA CLASSES: SPRING 2016
ASSESSMENT

ATTITUDE:
PRE AND POST SURVEY OF ATTITUDES TOWARD MATHEMATICS

LEARNING:
QUIZ, TEST, FINAL EXAM QUESTIONS
RESEARCH DESIGN

Step 1
Pre-Survey
• First week of the semester

Step 2
Discovery Learning Activities
• Activity 1
  • Quiz
  • Test
• Activity 2
  • Quiz
  • Test
• Activity 3
  • Quiz
  • Test

Step 3
Final Exam
• Three questions from the three activities included.

Step 4
Post-Survey
• Last week of classes
SURVEY: Attitudes Toward Mathematics Inventory

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40 Questions: 1 – 5 Likert Scale
61 respondents

ATTITUDES:

CONFIDENCE (15)
MATH IS FUN (10)
MOTIVATION (5)
VALUE (10)
NO INSTANCES of Traditional Student ATM’s significantly increase more than Discovery Student ATM’s.

DISCOVERY LEARNING did not hurt student attitudes toward mathematics and in some cases it improved attitudes.
Biggest Differences in Attitudes: MOTIVATION and ENJOYMENT.

**VALUE** - Overall no significant change (10 questions)
- Pre scores 2.8 – 4.2
- Post scores 3.0 - 4.2

Scores were already pretty high – students already valued mathematics.
CONFIDENCE – some change (15 questions)

‘Mathematics does not scare me at all.’

<table>
<thead>
<tr>
<th></th>
<th>PRE</th>
<th>POST</th>
<th>CHANGE</th>
</tr>
</thead>
<tbody>
<tr>
<td>DISCOVERY</td>
<td>2.65</td>
<td>3.23</td>
<td>+.58</td>
</tr>
<tr>
<td>TRADITIONAL</td>
<td>2.78</td>
<td>2.96</td>
<td>+.18</td>
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</table>
**MOTIVATION** - (5 questions)

‘*I would like to avoid using mathematics in college.*’

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<thead>
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</thead>
<tbody>
<tr>
<td>DISCOVERY</td>
<td>2.96</td>
<td>2.90</td>
<td>-.06</td>
</tr>
<tr>
<td>TRADITIONAL</td>
<td>2.77</td>
<td>3.28</td>
<td>+.49</td>
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</table>
‘I am happier in a math class than in any other class.’

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<tr>
<td>DISCOVERY</td>
<td>2.23</td>
<td>2.76</td>
<td>+.53</td>
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<tr>
<td>TRADITIONAL</td>
<td>2.59</td>
<td>2.40</td>
<td>-.19</td>
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</table>

‘I am comfortable expressing my own ideas on how to look for solutions to a difficult problem in math.’

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</thead>
<tbody>
<tr>
<td>DISCOVERY</td>
<td>3.27</td>
<td>3.57</td>
<td>+.30</td>
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<tr>
<td>TRADITIONAL</td>
<td>3.11</td>
<td>2.80</td>
<td>-.31</td>
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### Quiz/Test/Final Exam Grade Comparison

**Discovery vs. Traditional**

<table>
<thead>
<tr>
<th>Topic</th>
<th>Quiz</th>
<th>Test</th>
<th>Final Exam</th>
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<tbody>
<tr>
<td><strong>Inequalities</strong></td>
<td><strong>Discovery</strong></td>
<td><strong>Traditional</strong></td>
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<tr>
<td>Quiz</td>
<td>1.63</td>
<td>1.61</td>
<td></td>
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<tr>
<td>Test</td>
<td>1.72</td>
<td><strong>1.77</strong></td>
<td></td>
</tr>
<tr>
<td>Final Exam</td>
<td><strong>1.59</strong></td>
<td>1.58</td>
<td></td>
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</table>

<table>
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<th>Final Exam</th>
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<tr>
<td><strong>Transformations</strong></td>
<td><strong>Discovery</strong></td>
<td><strong>Traditional</strong></td>
<td></td>
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<tr>
<td>Quiz</td>
<td><strong>1.5</strong></td>
<td>1.44</td>
<td></td>
</tr>
<tr>
<td>Test</td>
<td><strong>1.59</strong></td>
<td>1.48</td>
<td></td>
</tr>
<tr>
<td>Final Exam</td>
<td><strong>1.3</strong></td>
<td>1.26</td>
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</table>

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<th>Topic</th>
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<th>Test</th>
<th>Final Exam</th>
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<td><strong>Discovery</strong></td>
<td><strong>Traditional</strong></td>
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<tr>
<td>Quiz</td>
<td>1.46</td>
<td><strong>1.48</strong></td>
<td></td>
</tr>
<tr>
<td>Test</td>
<td><strong>1.5</strong></td>
<td><strong>1.71</strong></td>
<td></td>
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<tr>
<td>Final Exam</td>
<td><strong>1.56</strong></td>
<td>1.55</td>
<td></td>
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</tbody>
</table>

**Grading Scale:**

0 = Incorrect; 1 = Partially Correct; 2 = Correct
QUIZ/ TEST/ FINAL EXAM RETENTION - TRADITIONAL

TRADITIONAL

- Inequalities: Quiz 1.61, Test 1.58, Final Exam 1.77
- Transformations: Quiz 1.44, Test 1.48, Final Exam 1.26
- Logarithms: Quiz 1.48, Test 1.71, Final Exam 1.55
QUIZ/ TEST/ FINAL EXAM RETENTION - DISCOVERY

Discovery

- Inequalities:
  - Quiz: 1.63
  - Test: 1.72
  - Final Exam: 1.59

- Transformations:
  - Quiz: 1.5
  - Test: 1.59
  - Final Exam: 1.3

- Logarithms:
  - Quiz: 1.46
  - Test: 1.5
  - Final Exam: 1.56
After Discovery Learning Activity Survey Information (average of 25 responses from 2 classes)

<table>
<thead>
<tr>
<th>Question</th>
<th>Yes</th>
<th>No</th>
<th>Indifferent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Was the group activity enjoyable?</td>
<td>77.6%</td>
<td>3.9%</td>
<td>18.4%</td>
</tr>
<tr>
<td>Do you understand linear inequalities/transformations?</td>
<td>75%</td>
<td>1.3%</td>
<td>23.7%</td>
</tr>
<tr>
<td>Did your group work well together?</td>
<td>92.1%</td>
<td>7.9%</td>
<td>0%</td>
</tr>
</tbody>
</table>
LESSONS LEARNED

For better data analysis:
• larger sample size - fall semester
• more discovery learning activities

Students enjoy Discovery Learning activities – more comfortable.

Attitudes impact each other – more enjoyment, more motivation.
LESSONS LEARNED

Discovery Learning doesn’t hurt learning or attitudes – can improve

Positive impact to have a change of pace for instructors and students

It is fun and refreshing to try something new