The Effect of WebAssign in an Introductory Astronomy Course

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Question:

- How does the use of WebAssign for homework assignments compare to no graded homework?
- Previous work* shows little difference between WebAssign and paper homework

“help” in what way?

- Does WebAssign improve conceptual understanding?
- Does it improve opinion of the course?
- Does it improve test scores?
Methods

- 4 sections of introductory astronomy (for non-science majors)
- 3 different instructors
- compare test scores
- compare Astronomy Diagnostic Test (ADT) gains
- use mid-course survey
Course Details

- Traditional Lecture format
- 30 - 80 students per section
- Little focus on problems with math
- Presentation using PowerPoint
- Multiple-choice tests
# Section Details

<table>
<thead>
<tr>
<th>Section 1 - Instructor A</th>
<th>Used WebAssign for Homework</th>
</tr>
</thead>
<tbody>
<tr>
<td>Section 2 - Instructor A</td>
<td>Assigned Homework, but not graded</td>
</tr>
<tr>
<td>Section 3 - Instructor B</td>
<td>WebAssign for first half, then research paper</td>
</tr>
<tr>
<td>Section 4 - Instructor C</td>
<td>Research paper for first half, then used WebAssign</td>
</tr>
</tbody>
</table>
Homework Details

- Questions were mostly multiple-choice and multiple select
- Students were given a “score” feedback, but not item details
- Non-WebAssign sections were given the same homework (posted) but not graded
Population comparison

- Looked at:
  - ADT pre-scores
  - ADT confidence level
  - ADT science and math levels (self reported)
  - ADT expected difficulty
- No significant differences
### ADT gains (matched)

<table>
<thead>
<tr>
<th>Section</th>
<th>n</th>
<th>&lt;g&gt;</th>
</tr>
</thead>
<tbody>
<tr>
<td>Section 1 (WebAssign)</td>
<td>35</td>
<td>4.7%</td>
</tr>
<tr>
<td>Section 2 (No WebAssign)</td>
<td>50</td>
<td>8.6%</td>
</tr>
<tr>
<td>Section 3 (WebA then Paper)</td>
<td>51</td>
<td>5.4%</td>
</tr>
<tr>
<td>Section 4 (Paper then WebA)</td>
<td>27</td>
<td>14.8%</td>
</tr>
</tbody>
</table>
Comparing Test scores for Instructor A

<table>
<thead>
<tr>
<th></th>
<th>WebA avg</th>
<th>non-WebA avg</th>
<th>Z-score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Test 1</td>
<td>56.8%</td>
<td>60.1%</td>
<td>1.58</td>
</tr>
<tr>
<td>Test 2</td>
<td>60.0%</td>
<td>63.3%</td>
<td>1.31</td>
</tr>
<tr>
<td>Test 3</td>
<td>66.3%</td>
<td>63.5%</td>
<td>-1.06</td>
</tr>
<tr>
<td>Test 4</td>
<td>61.6%</td>
<td>60.9%</td>
<td>-.019</td>
</tr>
<tr>
<td>Final</td>
<td>77.1%</td>
<td>76.4%</td>
<td>-.029</td>
</tr>
</tbody>
</table>
Survey

- Mid-course survey given to Sections 3 and 4
- This is at the “switching point”
- Section 3 has been using WebAssign and Section 4 has not
How much time do you spend outside of class?

- 0-1
- 2-3
- 3-4
- 4-6
- 7-8
- more

WebAssign

non-WebAssign
How do you use the homework?

- **a** - looked up answer in text
- **b** - used it as practice
- **c** - to determine where I was confused
- **d** - I did not look at HW
What helped you the most in this course?

- a - reading the text
- b - going to class
- c - posted presentations
- d - doing the homework

<table>
<thead>
<tr>
<th></th>
<th>WebAssign</th>
<th>non-WebAssign</th>
</tr>
</thead>
<tbody>
<tr>
<td>a</td>
<td>65.0</td>
<td>32.5</td>
</tr>
<tr>
<td>b</td>
<td>48.8</td>
<td>48.8</td>
</tr>
<tr>
<td>c</td>
<td>16.3</td>
<td>0</td>
</tr>
<tr>
<td>d</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>
Limitations

- This study used:
  - non-science majors
  - mainly multiple-choice questions
  - many recall questions
  - no problem solving
  - few calculations
Conclusions

- Overall, it seems WebAssign had little change on students in Introductory Astronomy courses
- In this case, WebAssign may be similar to paper homework