Feedback and Attitude Study of Online Web-Based Learning (OWL) in First Semester General Chemistry

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Background on Homework

• Homework motivates students to interact with course material.
• Homework allows for the identification of misconceptions, which can then be addressed by the student or by the instructor.
• Online homework allows students to do their homework anytime and anywhere.
• Graders are expensive, give limited feedback, and are slow.

Background on Homework

- Type and amount of feedback important to student learning.
- Feedback consists of two types: immediate and delayed
- Individualized programs allow for each question to have different specifics, i.e. each question is different for each student.
- Number of homework programs available (OWL, Mastering Chemistry, WebCT, etc.)


Research Questions

1. Does the amount of feedback during OWL* assignments affect the performance of students on electronic configuration quizzes?

2. What is current attitude about OWL from current students?

3. What are the attitudes toward OWL after students have completed a sophomore level organic chemistry course?

*Product of Thomson Learning
Method

Large General Chemistry Lecture Class
  Topic: Electronic Configuration

Test of Logical Thinking

Group #1 - Feedback

Group #2 - No Feedback

Post Test

End of Semester Survey

Method

• Total students n=148
• Group 1 contains 79 students
• Group 2 contains 69 students
• Females are 71.62% of total population

Students are given:

• 3 tries for 6 units containing 2 questions each
• Both groups receive indication of right/wrong and answer after submission
• Group 1 receives the solution and reasoning for solution after submission
Sample OWL Questions

Sample OWL Response
Results of the Test of Logical Thinking

The maximum score on the TOLT is 10.
Groups are similar and do not have a difference in reasoning ability.

Example Post Test Question
Give the electronic configurations using both the spectroscopic and noble gas configuration for Al.

<table>
<thead>
<tr>
<th>Spectroscopic Configuration</th>
<th>Noble Gas Configuration</th>
</tr>
</thead>
</table>

Post Test Results (scores 0-12)

<table>
<thead>
<tr>
<th></th>
<th>Group 1</th>
<th>Group 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Post Test*</td>
<td>9.025 (2.311)</td>
<td>8.261 (2.794)</td>
</tr>
</tbody>
</table>

Students who received more feedback scored significantly higher.

*significantly different at p<0.05
Freshman Survey End of Semester After Full Semester of Using OWL (n=148)

<table>
<thead>
<tr>
<th>Response Rating</th>
<th>Disagree</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>Average</th>
</tr>
</thead>
<tbody>
<tr>
<td>OWL helped me learn general chemistry.</td>
<td>3 2 15</td>
<td>49</td>
<td>78</td>
<td>4.34 (0.91)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>OWL helped me be prepared for general chemistry lecture exams.</td>
<td>5 17 31</td>
<td>41</td>
<td>58</td>
<td>3.91 (1.13)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>OWL helped me be prepared for general chemistry lecture quizzes.</td>
<td>6 17 39</td>
<td>48</td>
<td>38</td>
<td>3.64 (1.10)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>OWL helped me be prepared for general chemistry laboratory quizzes.</td>
<td>91 37 14</td>
<td>2</td>
<td>4</td>
<td>1.59 (0.94)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>OWL was a good use of study time for learning general chemistry.</td>
<td>6 9 26</td>
<td>51</td>
<td>56</td>
<td>3.96 (1.08)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

End of Semester Organic Survey (n=338)

Question: Do you think that OWL helped you learn chemistry in general chemistry II?

- Majority of students perceived that OWL helped learn general chemistry.
Conclusions

• Students who received feedback scored higher than those who did not receive feedback on the covered chemistry content (electronic configuration).

• Current students believe that OWL helps them learn in general chemistry.

• Past students who are currently enrolled in second semester organic chemistry believe that OWL helps them learn in general chemistry II.

Future Work

• Repeat study to investigate if the results are consistent with other topics.
• Incorporate more students, especially males, into the study to see if the effects of feedback are for both males and females.