Pilot implementation of an online homework system for practice and feedback on decision-making skills

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Overview

- University courses emphasize the importance of decision-making skills, yet not many opportunities exist for students to apply these skills.

- Feedback is useful for students to determine what areas of the course they need to spend more time learning.

- This project is an evaluation on the pilot phase of Alchemy, an online homework software with a focus on immediate feedback and the ability to reattempt problems.
Experimental Method

- Developed “scenarios” (multiple-choice problems sets) for different topics of CHEM 211 (Strong and Weak Acid, UV-Visible, Equilibrium)

- Scenarios were similar in style to Choose Your Own Adventure

- Included immediate feedback for both correct and incorrect responses and reattempts

- Obtained student feedback via “Think Aloud” interviews and user-experience survey
Alchemy (Complete Scenario)
Alchemy (Individual Question)

Equilibrium review (Test 1, Q4)

Choice C

Correct. What is the assumption?

A) [Ag+] << 0.30 M (K_sp is small)

B) [Ag+] << [Br^-] (K_sp is small)

C) No assumption possible

D) [Br^-] << [Ag+] (K_sp is small)
Reporting View - Class

Reporting ➔ Equilibrium review (Test 1, Q4)

- Courses
  - CHEM 3311
  - CHEM211 Playground
    - Mixture of strong and weak acid
    - UV-visible worksheet
    - Equilibrium review (Test 1, Q4)
    - UV-visible worksheet
  - CHEM 211.288 2016
    - Equilibrium review (Test 1, Q)
      - UV-visible worksheet
      - RLE testing
      - UV-visible worksheet
      - Mixture of strong and weak acid

Class Decision Overview (Wider edges are more traveled)

Average No. Failures
0 / 100

Completion Status
Completed 92 Expired 48
Reporting View - Student

Courses:
- CHEM 3311
- CHEM211 Playground
  - Mixture of strong and weak acid
  - UV-visible worksheet
  - Equilibrium review (Test 1, Q4)
  - UV-visible worksheet
- CHEM 211 288 2016
- Equilibrium review (Test 1, Q4)
  - UV-visible worksheet
  - RLE testing
  - UV-visible worksheet
  - Mixture of strong and weak acid

Alchemy's Decision Overview (Wider edges are more traveled)

<table>
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<th>Username</th>
<th>Number Failures</th>
<th>Status</th>
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<td>154</td>
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</table>
Results: Survey (91% response rate)

Figure 1. Helpfulness of Tasks and Feedback

- Feedback that you received when your choice was CORRECT
- Feedback that you received when your choice was INCORRECT
- Providing an explanation for your choice in a pop-up window
- Answering a question by choosing between the options provided

- Extremely helpful
- Very helpful
- Moderately helpful
- Slightly helpful
- Not helpful
Results: Guessing Frequency

**Figure 2. Guessing Frequency**

- **59%**: Some of the time
- **21%**: Most of the time
- **14%**: Occasionally
- **6%**: Never

Legend:
- Red: Never
- Orange: Rarely
- Green: Some of the time
- Blue: Most of the time
Summary

- Immediate feedback for both correct and incorrect responses was helpful for students.

- Most students found Alchemy to be a useful tool for conceptual understanding and exam preparation.

- Correlation between mixed consensus on use of justification box and guessing frequency.
Future Research Questions

• What types of feedback are most beneficial to student learning?

• Does requiring students to justify their choices increase learning benefits?

• Can regular use of the Alchemy software increase students’ reasoning ability?
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