

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

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# Overview



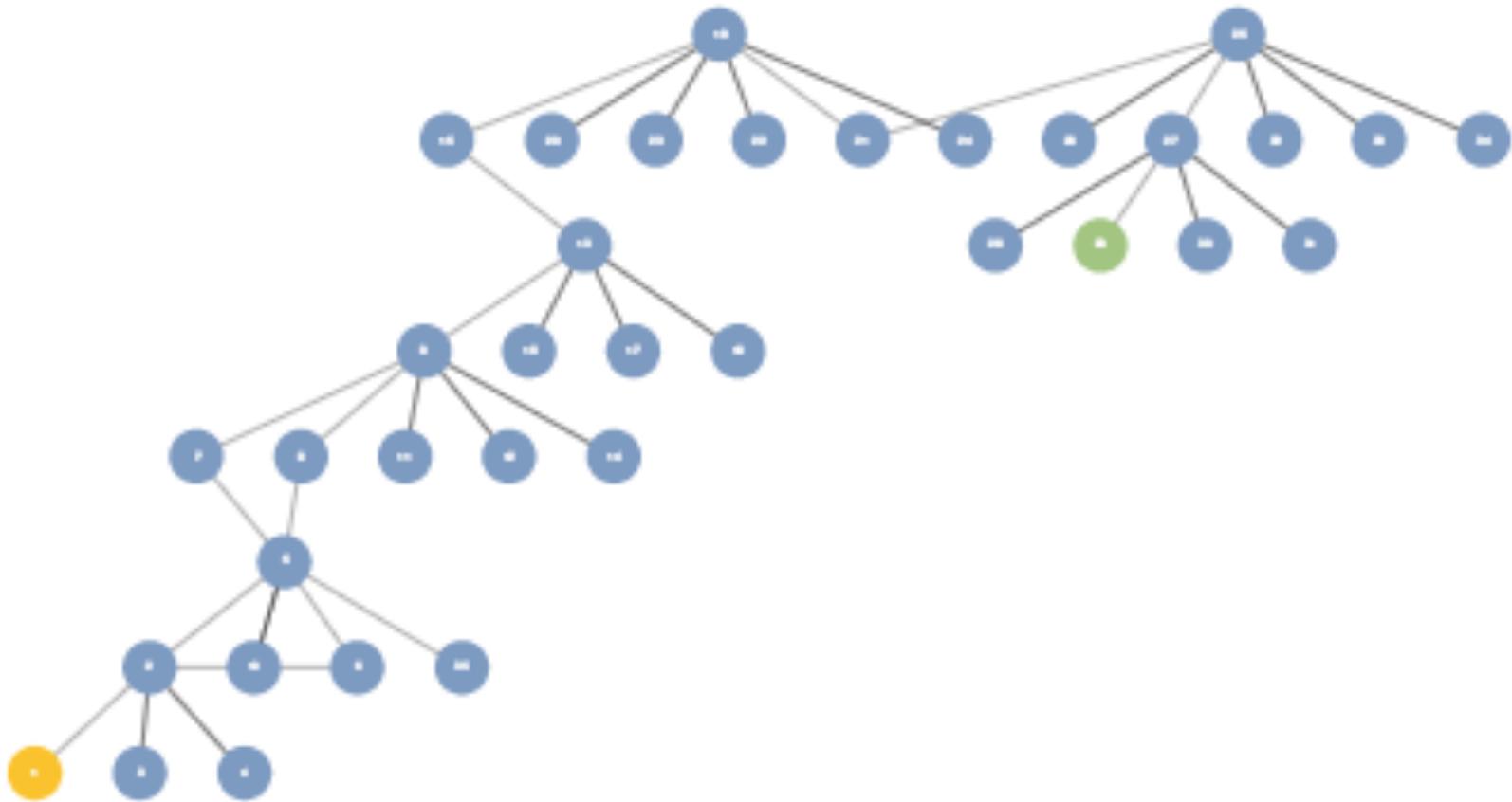
- University courses emphasize the importance of decision-making skills, yet not many opportunities exist for students to apply these skills
- Feedback is useful for students to determine what areas of the course they need to spend more time learning
- This project is an evaluation on the pilot phase 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)

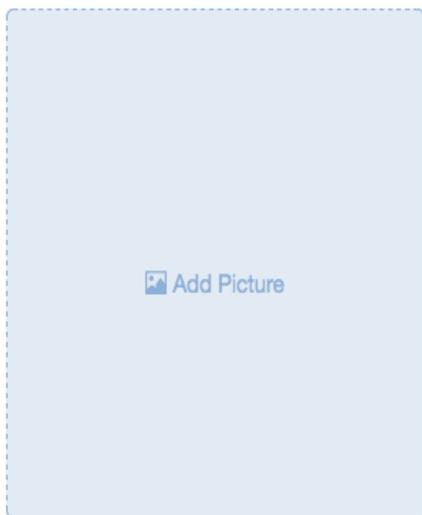


# Alchemy (Individual Question)



5

+ New Node



Title

Choice C

Body

Correct. What is the correct assumption?

Node Type:  Regular  Goal

Failure

Requires Justification:

7 A)  $[Ag^+] \ll 0.30 \text{ M}$  (because  $K_{sp}$  is small)



8 B)  $[Ag^+] \ll [Br^-]$  (because  $K_{sp}$  is small)



CHEM211 Playground

Equilibrium review (Test 1, Q4)

Choice C

Correct. What is the assumption?

A)  $[Ag^+] \ll 0.30 \text{ M}$  ( $K_{sp}$  is small)

B)  $[Ag^+] \ll [Br^-]$  ( $K_{sp}$  is small)

C) No assumption possible

D)  $[Br^-] \ll [Ag^+]$  ( $K_{sp}$  is small)

# Reporting View - Class

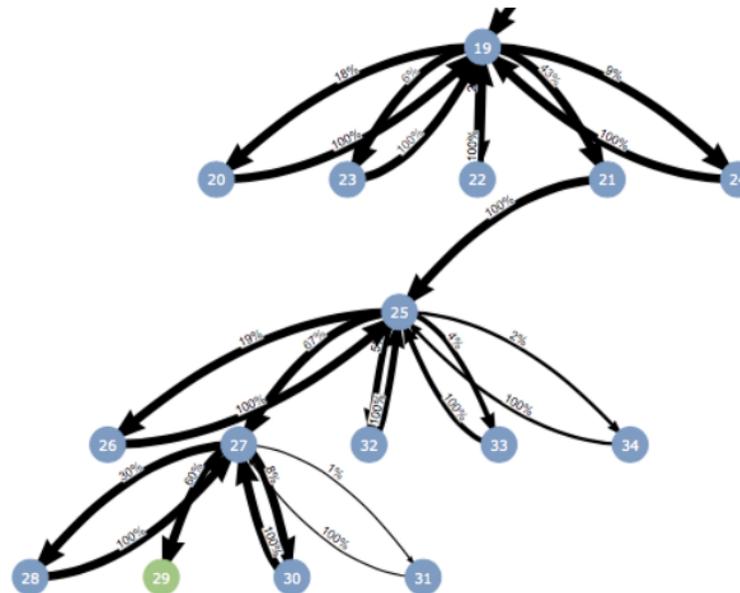
## Reporting > Equilibrium review (Test 1, Q4)

### - Courses

- CHEM 3311
- CHEM211 Playground
  - 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

Summary By Student

### Class Decision Overview (Wider edges are more traveled)



Average No. Failures

0 / 100

Completion Status

Completed 92 Expired 46

# Reporting View - Student

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

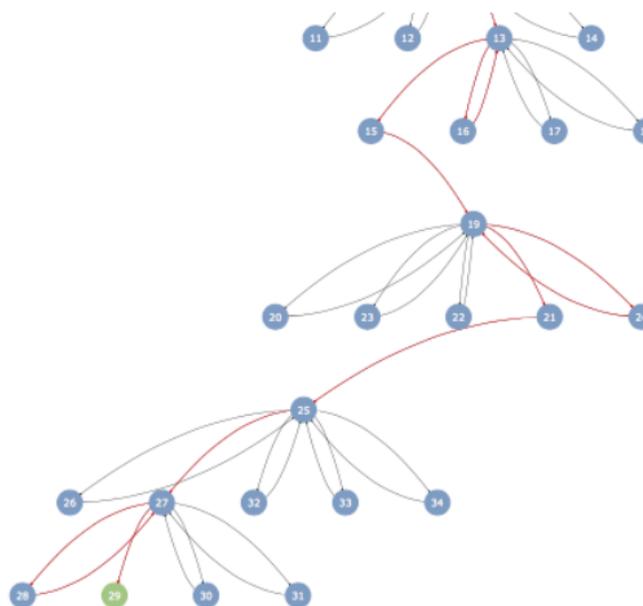
▢ UV-visible worksheet

▢ Mixture of strong and weak acid

Summary

By Student

## alchemist's Decision Overview (Wider edges are more traveled)

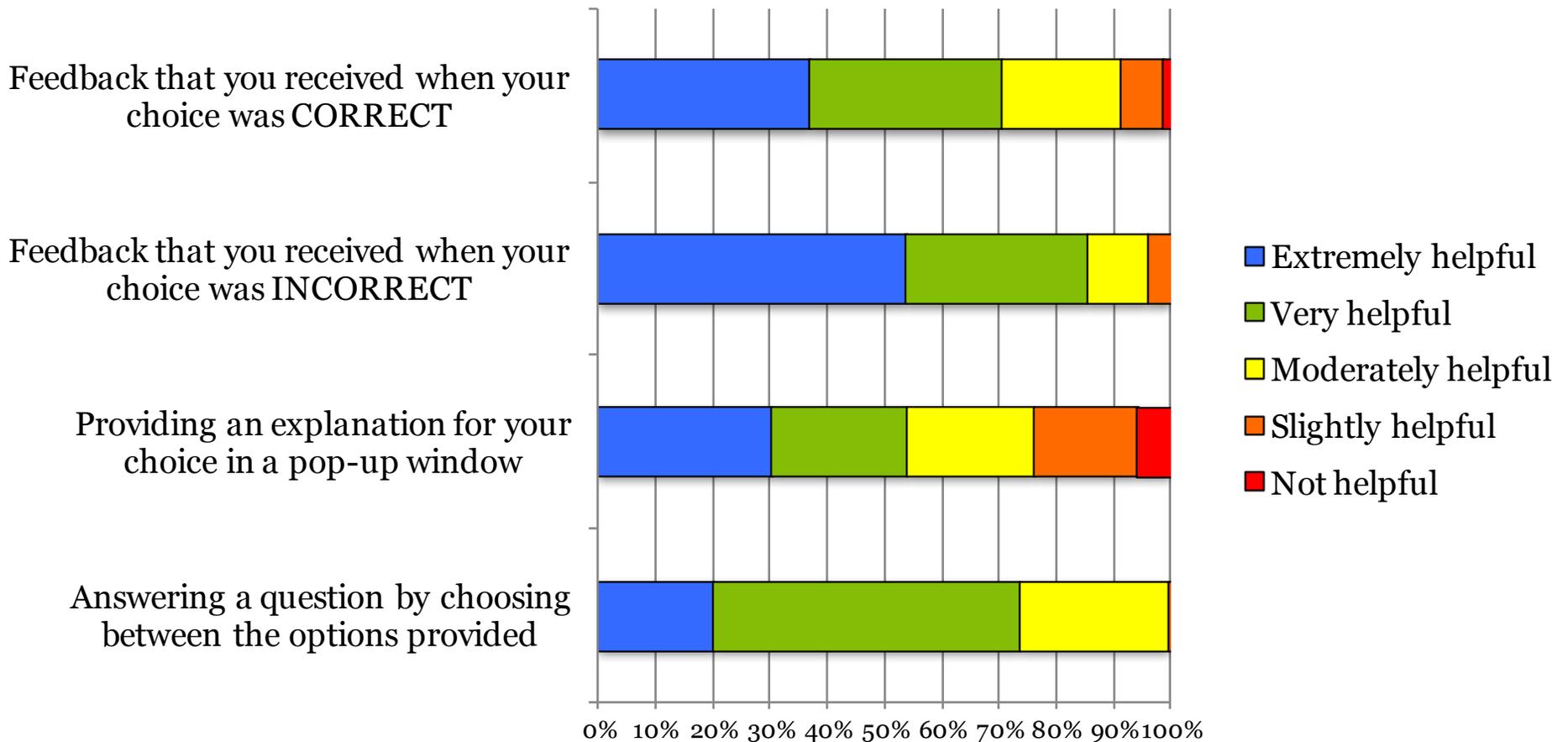


Student ID	Username	Number Failures	Status
43	alchemist	0	completed
154	scanlin	0	completed

# Results: Survey (91% response rate)



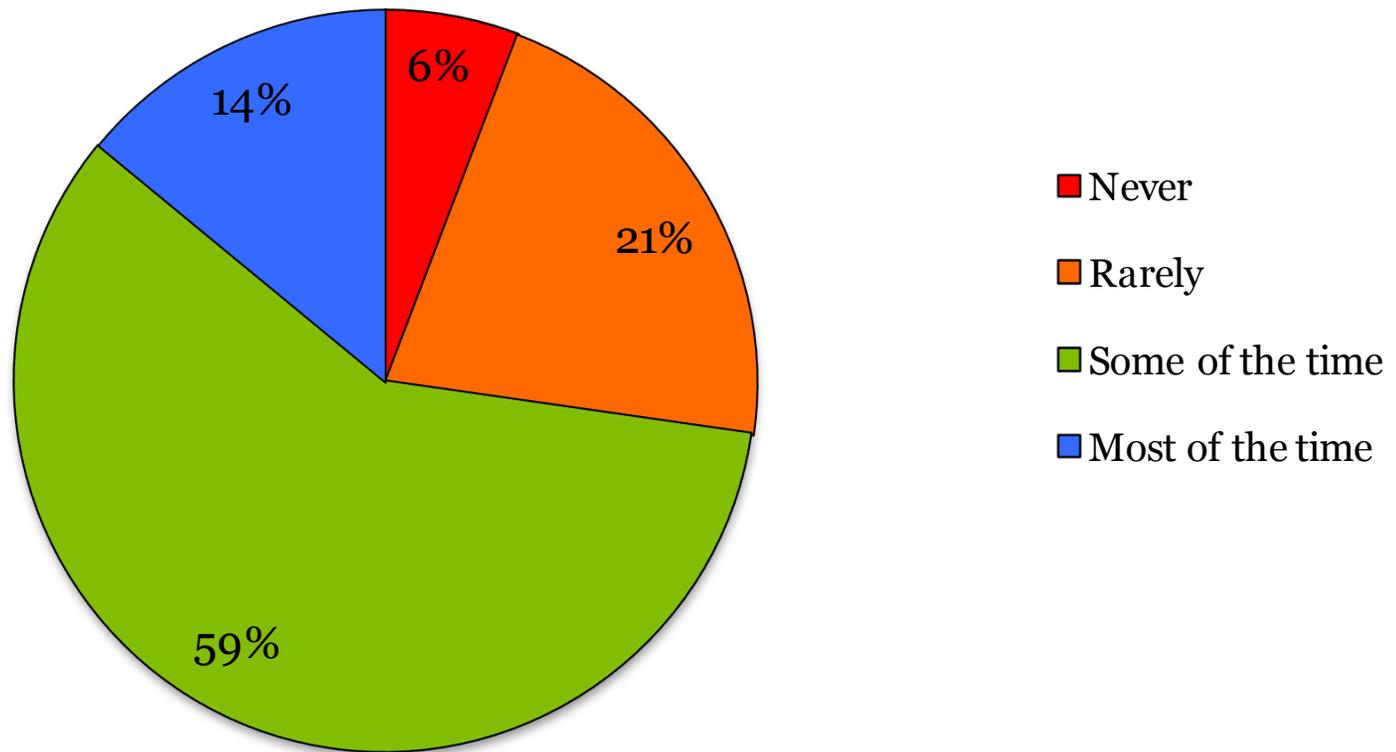
**Figure 1. Helpfulness of Tasks and Feedback**



# Results: Guessing Frequency



**Figure 2. Guessing Frequency**



# 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?

# Acknowledgements



- Dr. Jane Maxwell
- Dr. Russ Algar
- UBC Computer Science (CS 319) students who built the Alchemy software
- CHEM 211 students who participated in interviews and survey