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.

Davis, H.Z., Hwang, L., Shoaf, V., *J. of Acc. Ed.*, **2001**, *19*, 19-210.
Bonham, S.W., Deardorff, D.L., Beichner, R.J., *J Research Science Teaching*, **2003**, *40*, *1050-1071*
Cole, R.S., Todd, J.B., *J. Chem. Educ.* **2003**, *11*, 1338-1343.

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.)

Bonham, S.W., Deardorff, D.L., Beichner, R.J., *J Research Science Teaching*, **2003**, *40*, *1050-1071*
Cole, R.S., Todd, J.B., *J. Chem. Educ.* **2003**, *11*, 1338-1343.
Brooks, D.W., Schraw, G., Crippen, K.J., *J. Chem. Educ*. **2004**, *82*, 641-644.

? Research Questions ?

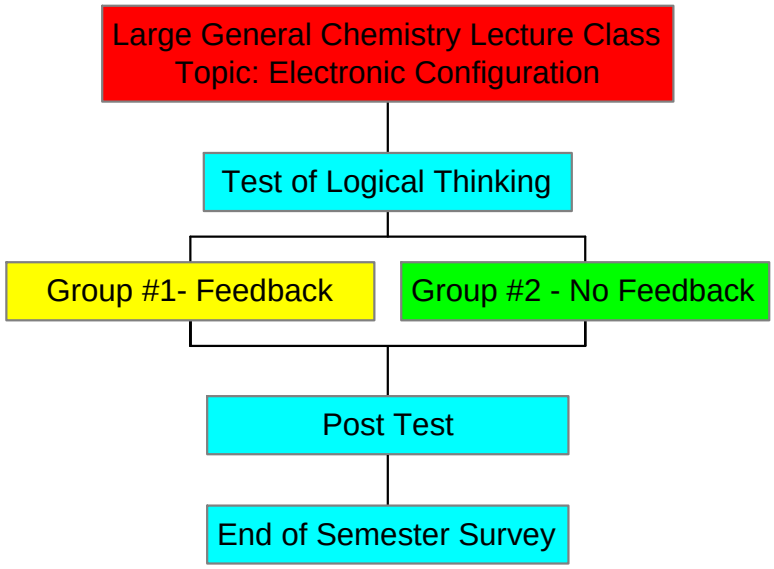
1. **Does the amount of feedback during OWL* assignments affect the performance of students on electronic configuration quizzes?**

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



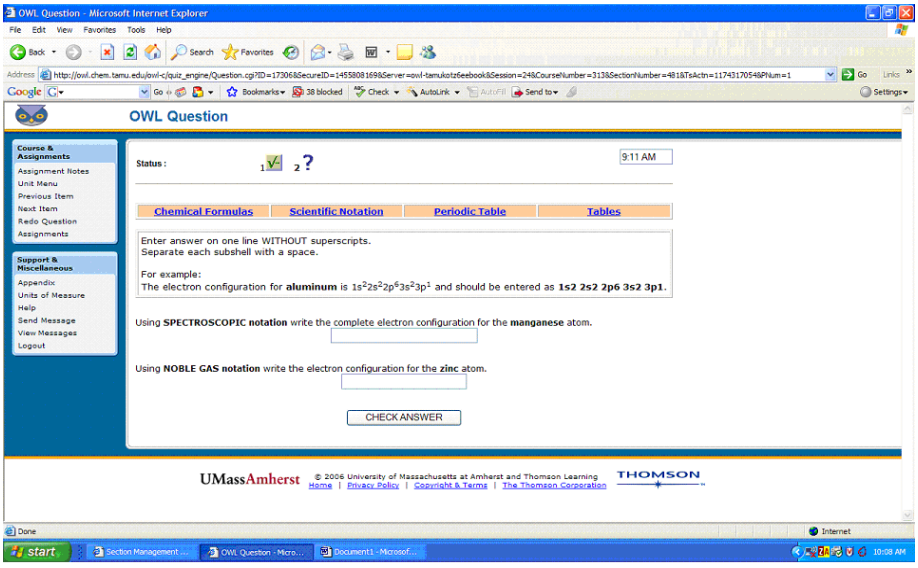
Method

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

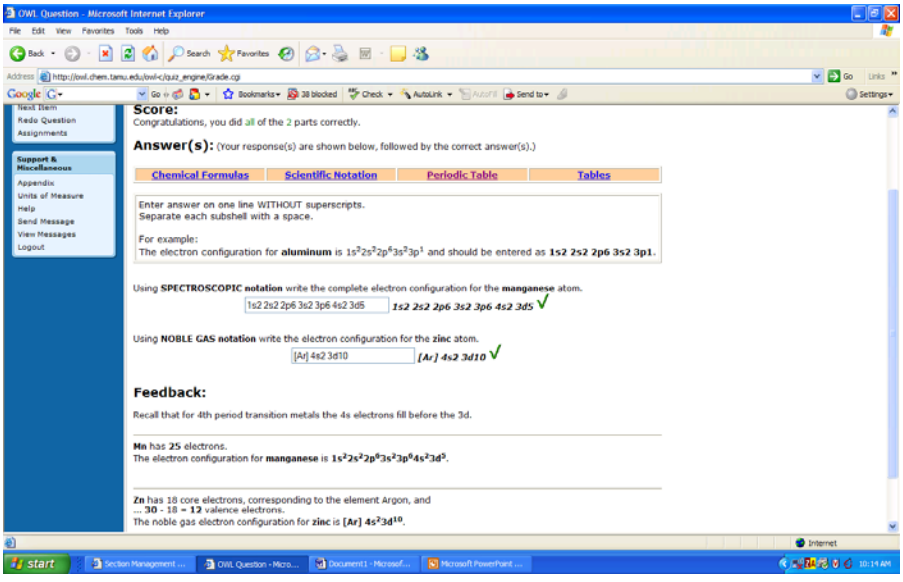
Students are given:

- **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**

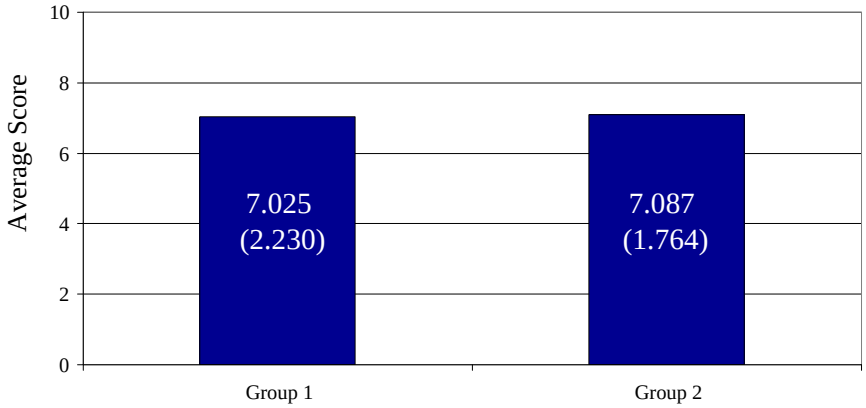
Sample OWL Questions



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 spectrosopic and noble gas configuration for **Al**.

Spectroscopic Configuration	Noble Gas Configuration

Post Test Results (scores 0-12)

	Group 1	Group 2
Post Test*	9.025 (2.311)	8.261 (2.794)

Students who received more feedback scored significantly higher.

*significantly different at $p<0.05$

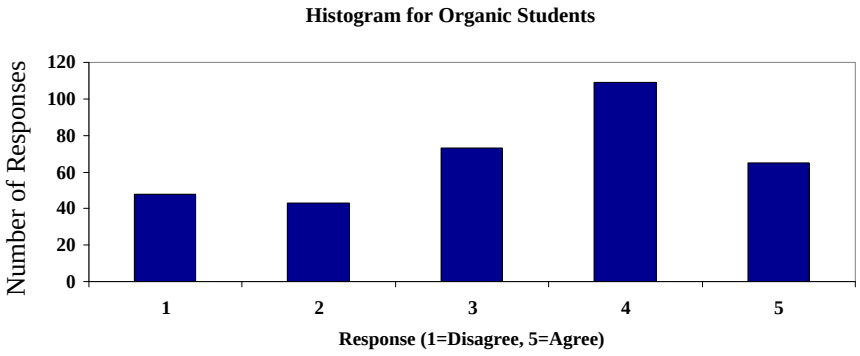
Freshman Survey End of Semester After Full Semester of Using OWL (n=148)

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

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.