



Implementing an Online Homework Program in a Large Organic Chemistry Lecture Course

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Online Homework

- Online homework has been heavily studied and developed¹
 - Number of attempts²
 - Feed back³
 - Tutorials⁴
 - Chat rooms, collaborative learning^{5, 6}

1. Thoennessen, M.; Harrison, J. *Computers Educ.* **1996**, *27*, 141. 4. Donovan, W. J.; Nakhleh, M. B. *J. Chem. Educ.* **2001**, *78*, 975
2. Chamala, R. R. et. Al *J. Chem. Educ.* **2006**, *83*, 164. 5. Glaser, R. E.; Poole, M. J. *J. Chem. Educ.* **1999**, *76*, 699.
3. Penn, J. H. *J. Chem. Educ.* **2000**, *77*, 227. 6. Kortemeyer, G. *Am. J. Phys.* **2006**, *74*, 526.



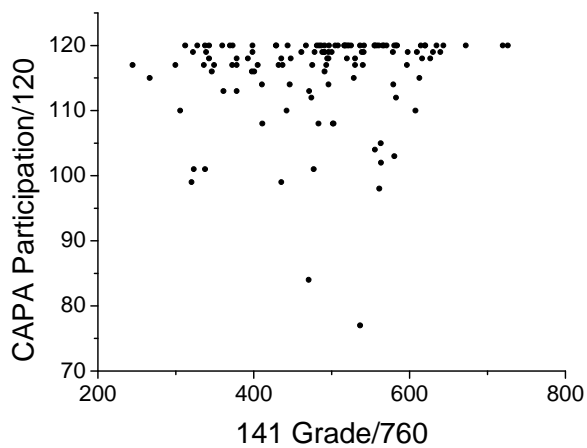
General Chemistry Homework

- CAPA homework system
- Ten attempts per problem
- Chat-room feature to communicate with classmates
- Overall, student opinion is that it is not useful at learning material, but “saves their grade”

Thoennessen, M.; Harrison, J. *Computers Educ.* **1996**, *27*, 141.



General Chemistry Homework





Organic Chemistry Homework

- Large Lecture Course
 - 340 Students
 - Pre-professional Students
- OWL homework system-Thomson Learning
 - Online Web-based Learning
- Key changes
 - Less attempts (typically 3)
 - No chat room
 - No feedback after incorrect answers, tutorials available



Organic Chemistry Homework

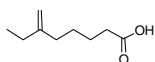
- 90 assignments with an average of 3.5 questions per assignment
- Average of 40 hours total throughout the semester
- Students attempted 80% of assignments



Exam 1-Oxidative Cleavage

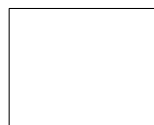
Homework Questions

- Compound **A** gives the product(s) below on oxidative cleavage with KMnO_4 in acidic solution. Propose a structure for **A**.



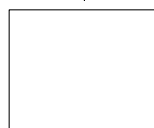
- Compound **A**, $\text{C}_{10}\text{H}_{16}$ reacts with 1 molar equivalent(s) of hydrogen on catalytic hydrogenation. **A** undergoes reaction with ozone, followed by Zn treatment, to give a symmetrical diketone, $\text{C}_{10}\text{H}_{16}\text{O}_2$. Propose a structure for **A**.

Exam 1 Question

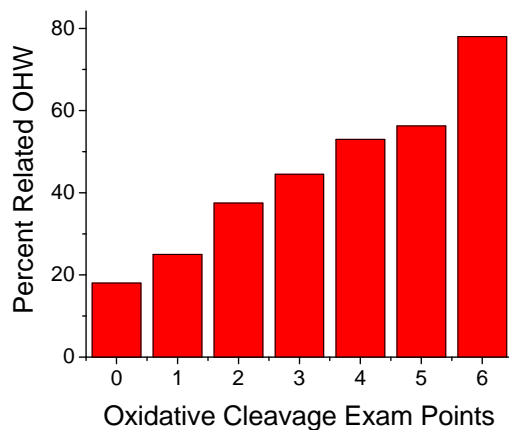


an alkene

1) O_3
2) $\text{Xn}, \text{H}_3\text{O}^+$

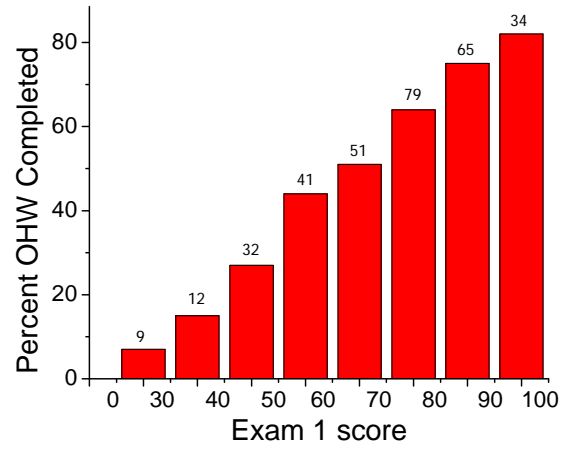


Exam 1-Oxidative Cleavage



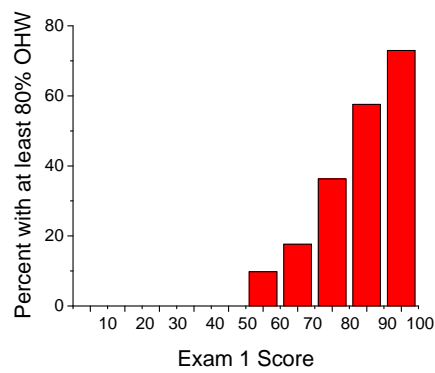


Exam 1

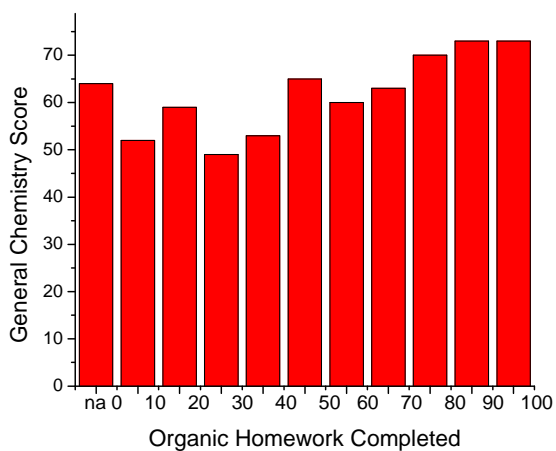


Exam 1

Students were advised to completed at least 80% of online homework in order to prepare of quizzes/exams

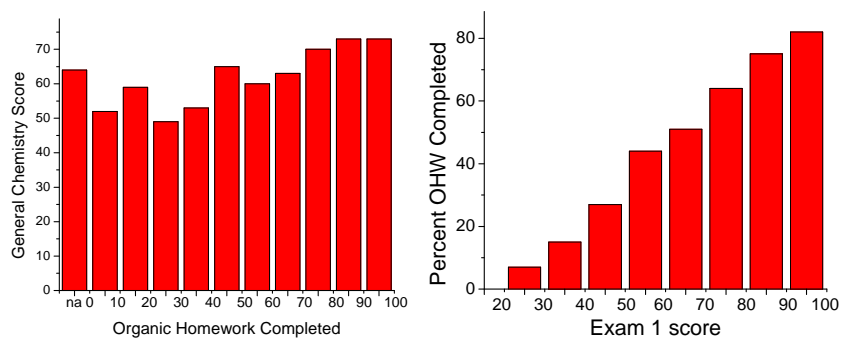


Type of Students



Type of Students

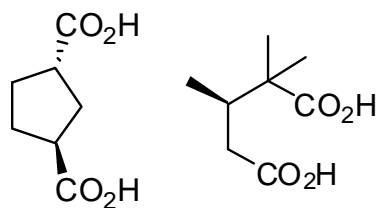
General chemistry score used as a measure of the type of student



Exam 2-Stereochemistry

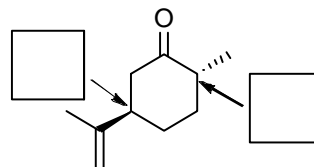
OHW

Identify the stereochemistry in each of the following compounds as **R** or **S**.



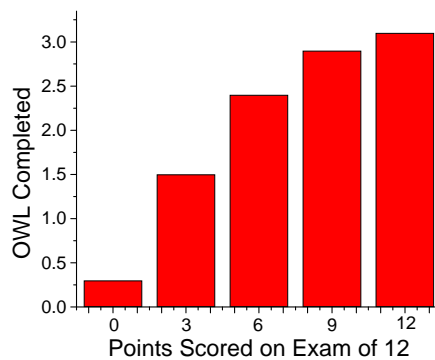
Exam 2

Assign R or S configurations to each indicated center of chirality in the molecules below.



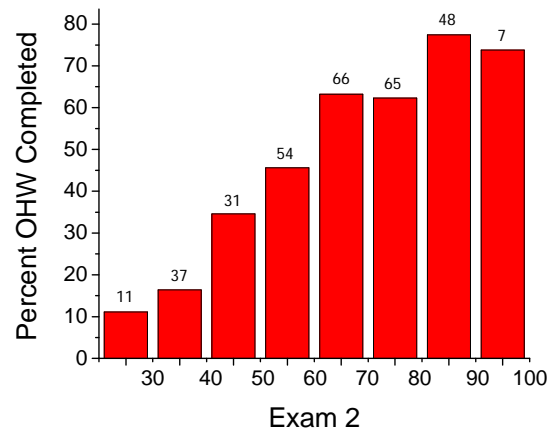
Exam 2

Stereochemistry exam vs. OWL completed

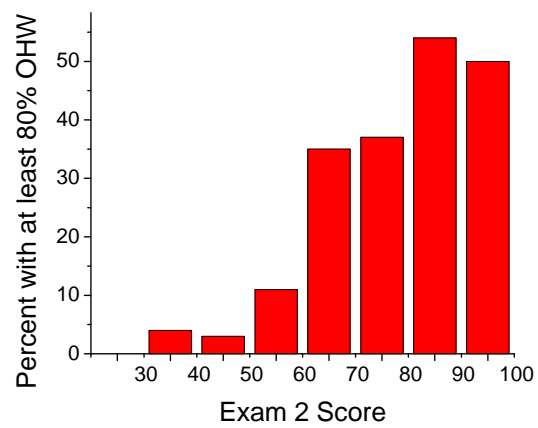




Exam 2



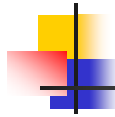
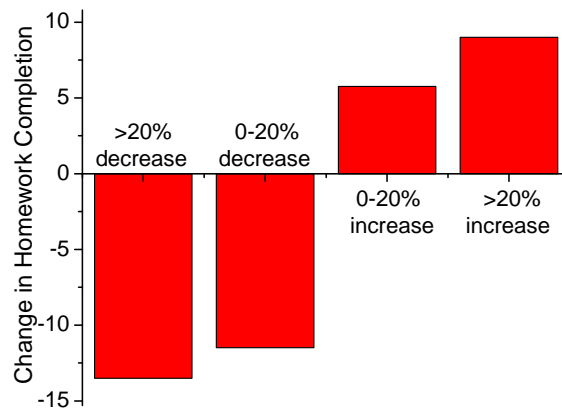
Exam 2-80% Completion



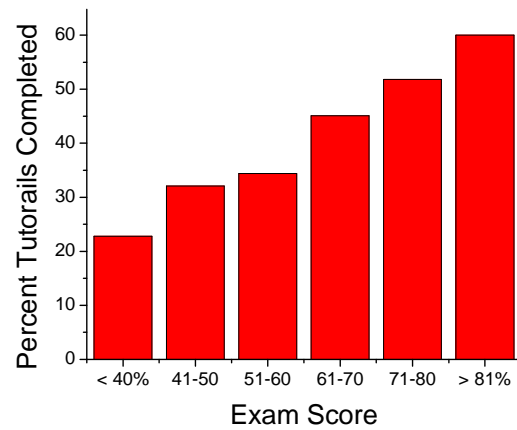


OWL Improvement

Exam 1 to Exam 2 Scores

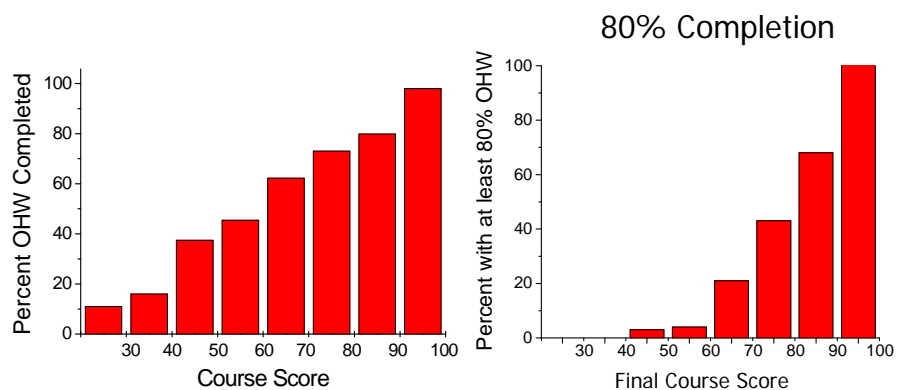


Use of Tutorials

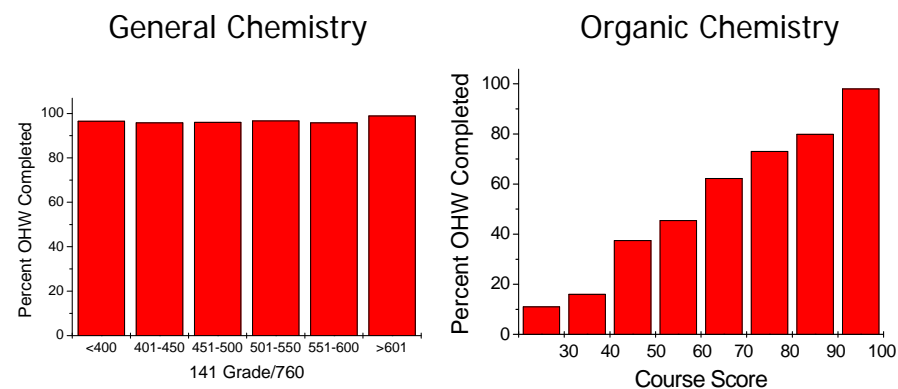




Final Course Score

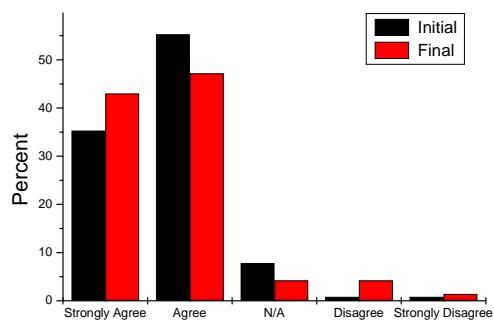


Final Course Score



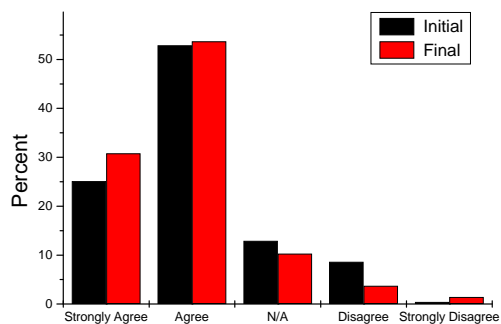
Surveys

I feel that online homework problems help me to learn the course material and achieved higher scores in my chemistry classes.



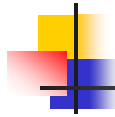
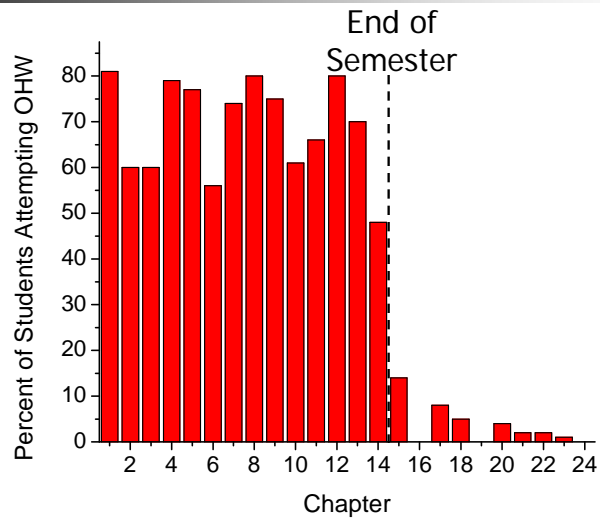
Surveys

If practice problems were offered online but were not required of the class, I would complete them.





OHW in Second Semester



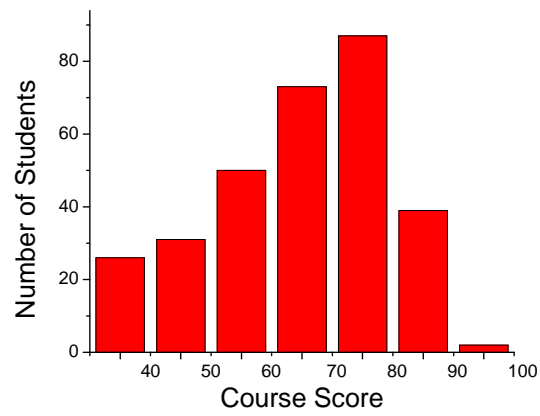
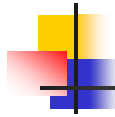
Conclusions

- Careful consideration should be given to using feedback and number of attempts
- Participation based scoring does not seem to be enough motivation
- Ultimate variable in success of homework programs is student motivation



Acknowledgements

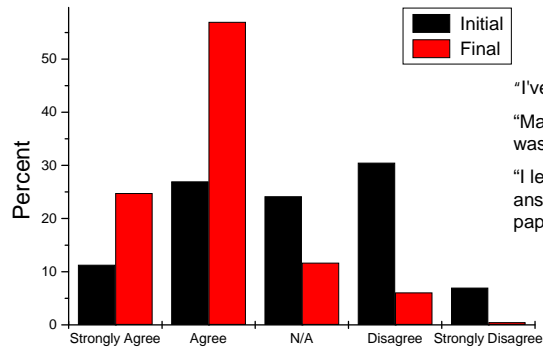
- Dr. Kevin Walker
- Dr. Joyce Parker
- My CEM 251 students





Surveys

I feel that I am prepared to take standardized tests (MCAT, DAT, GRE) on a computer



"I've learned to pace myself."

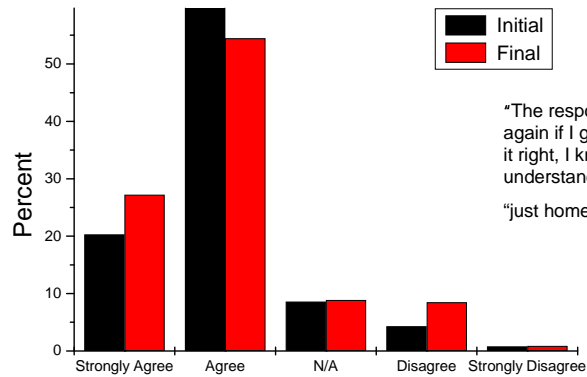
"Maybe not fully prepared, but more than I was."

"I learned to use the online problems and answer them electronically instead of on paper."



Surveys

I am able to learn material through online homework

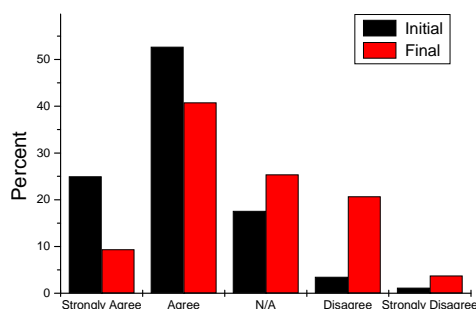


"The responses that I got back made me try again if I got the problem wrong and if I got it right, I know how much material I actually understand."

"just homework in general"

Surveys

Online homework has prepared me for taking course quizzes and exams by allowing me to practice the specific material that will be covered and the form that the questions will take.



"The homework was a lot like the quizzes, and if I was confused I would go on OWL to see how it was done."

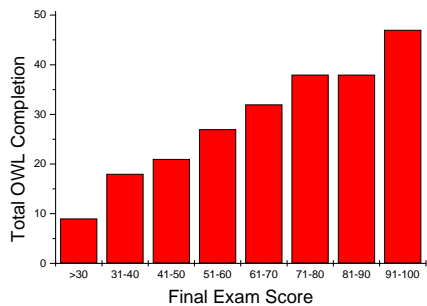
"I am usually always on my computer and by having online problems it was easier for me to do them rather than by reading the text and doing the text problems."

Suggestions for future classes?

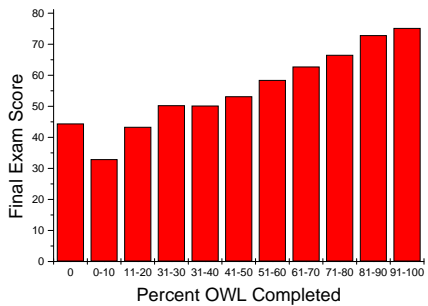
- I don't like that you have to use all the tries for the problem before owl will give you an explanation of the answer. If we don't get it correct the first time then we don't understand it and need an explanation for why we got it wrong.
- have more tries to get the problems right
- I used owl as a trial and error system, learning from my mistakes. For us it was extra credit work, so going over the limit or tries didn't harm our grade. In the future though I think it would be more useful to allow more tries per problem.
- It is very helpful... maybe there could be more tutorials for the last chapters because i found those the most confusing. Also, they could make a "flash-card section" just to help the students learn the reactions easier.



Final Exam



Final Exam





Final Course Grade

