

Chem 0320, Spring 1999 [99-2], 8:00-8:50 am MWF
Prof. J.J. Grabowski
Final Report

Many course details can be viewed at the web site accessible via <http://courseweb.pitt.edu>; see especially Course Information for how the course was set up and graded.

1. Course Statistics

1.1 *Meeting Time:* MWF, 8:00 am, CSC-12a; Recitation W, 9:00 am, CSC-12a

1.2 *In-Class Exam Attendance* (63 students listed on Registrar's form for Final Grades)

Assignment:	Exam1	Exam2	Exam3	Final
# Students:	80	66	61	57

1.3 *Take-Home Assignments:*

- A. 50 of the 63 students who received a letter grade turned in 10 or 11 of the "Exam4 Take-Home Exams" (best 10 of 11 were used to determine the cumulative Exam4 score).
- B. Only 91% of the total number of Exam4 Take-Home parts were turned in by the entire class who received letter grades.
- C. The Final Exam4 Take-Home part was composed entirely of assigned problems from the textbook (this fact was not announced). Only 12 of the 53 assignments turned in received a perfect 8-point score though 31 more received a 7. The low on this exam was a 2, the average was 6.8 (85%) and was by far the highest class grade earned on a Take-Home assignment.
- D. Using all 11 parts of the Take-Home Assignment, the average cumulative student score was 60%; using the best 10 of 11 parts (as was used to determine student final grade) the class average was 68%. As expected, this 68% was the best performance on any of the "hourlies".

1.4 *Grade Distribution* See attached graph. (Compares 98-1 to 98-2)

Conclusions:

- A. Overall class performance was substantially less than previous courses (compare a course GPA of 1.98 this term versus 2.24 one year ago). My perception is this decrease is mostly (if not totally) due to a surprisingly large number of students who did very little work and who rarely attended lecture (compare F's for the two years). In-class hourlies were abysmal - though they improved throughout the semester (excepting the Final which was slightly less well-done than hourly 3).
- B. 24 students received a grade of F on the Registrar's transcript; of these, 11 did not take the Final Exam (worth 200-275 of the 500 course points).
- C. F Students:
 - 24 F's recorded on Registrar's transcript.
 - 5 F's had no recorded class participation beyond Exam 2.
 - 6 F's (in addition to the 5 above) did not take the Final.
 - 5 F's (in addition to the 5 & 6 above) did not complete Exam 4 (i.e., turned in less than 10 of the 11 parts).
 - Of the 14 F students who took the final, their average Final Exam score is 38 (out of 200).
 - Of the 14 F students who took the final, their average course points is 158 ± 26 (whereas 215 points is needed to get a D-).
- D. A+ Students: Two A+'s recorded. Course High = 499 points (on 500 point scale) and which includes the maximum of 50 extra credit points.

- E. Average extra credit score was 19 points (out of 86 offered). Only 3 students max'd out at 50 points of extra credit.
- F. 45 of the 57 students (79% of the class) who took the Final did better, on a pro-rated basis, on the final than on their worst in-class hourly and thus had that one in-class hourly dropped and replaced by the Final (pro-rated) score.
- G. Of the 57 students who took the Final, only 4 had missed one of the in-class hourlies.

** Note added in proof: One of the students assigned an F (did not take Exam 3 or the Final) was granted a Late Withdrawal; the above numbers and graph do not reflect this reduction (to 23) in the number of real F's.

2. CourseInfo (see: <http://courseweb.pitt.edu>)

2.1 Time Vs Usage Statistics . See attached graph "Chem 0320, Spring 1999"

- a. Usage statistics as provided via the CourseInfo control panel.
- b. Total number of "hits" as recorded is 48,082 (through Saturday, 5/8/99).
- c. Main graph: Daily number of "hits" beginning one week prior to Day 1.
 - Dates listed on x-axis are Wednesdays (also identified by heavy dots on graph).
 - Cumulative Hits are shown by dashed line.
 - Graded Assignment due dates are marked. "Exam 4s" were take-home assignments.
- d. Inset 1: Hits per hour of the day (cumulative, through 5/1/99).
- e. Inset 2: Hits per day of the week (cumulative, through 5/1/99).

Conclusions:

- A. Daily usage varies enormously. Heaviest two days were the day prior to Exam 1 and the Final. Spring break is obvious. Presumably the relatively low usage the week prior to Spring Break reflects the fact that Exam 2 in this course was after Spring Break whereas the student's other courses had assignments due immediately prior to Spring Break.
- B. Steepest local slopes on the cumulative hits line occurs just prior to each in-class exam; otherwise the cumulative usage grows at a constant rate.
- C. The heaviest hourly usage was at 9:00 am, immediately following the course meeting time. This suggests that most of the students enrolled may not have had a 9:00 am class which further suggests a migration of this section to a 9:00 am section might be possible.
- D. Significant CourseInfo usage exists between 9:00 am through midnight.
- E. Heaviest usage day was Thursday or Friday (may reflect the fact that assignments to be made on a Friday were posted on the day before). Least used day was Saturday.

2.2 Grade Vs Usage Statistics . See attached graph "Chem 0320, [99-2; JJG]"

- a. Usage statistics as provided via the CourseInfo control panel. Only "hits" assigned to a student who received a course grade are included.
 - Course Grade uses standard point values (4.25 = A+, 4.00 = A, ... 0 = F).
 - A Course Grade of "-1" reflects students who received a Course Grade but who did not take the Final Exam.
 - Heavy dots reflect individual students; open squares represent averages for that course grade and open circles represent median values for that course grade. The line is the best fit to the average hits per course grade.
- b. For reference, the professor is assigned 3201 of the total 48,000 course hits.

Conclusions:

- A. Individual usage of CourseInfo does not predict a grade (e.g., a student who hit the site 300-400 times earned every possible grade A-F).

- B. There is a definite positive correlation between average number of hits per course grade.
- C. The median hits Vs course grade is surprisingly consistent at about 700 hits/student.
- D. Students who received an F as an aggregate were the least likely to use the course site (300-400 hits Vs. 800 for non-F students) though the second heaviest individual student usage was recorded by a student assigned an F grade.
- F. The heaviest individual student usage is owned by an A-student.
- G. 91% of the hits in the course were recorded by students who received a grade for the course or by the professor.

2.3 Chat Room Statistics . (No graph).

- a. 37 students hit the Chat Room more than 2 times; this corresponds to 65% of the students who took the final exam.
- b. Considering only days when Chat Room sessions were moderated by the Professor shows an average of 18 hits, calculated from 15 of the 17 dates -- discarded where the high and low usage dates, 56 (the first Chat Room session), and 6 (the Sunday at the end of Spring Break), respectively.
- c. Factoring in the observation that each Chat Room session included students who logged in to the Chat Room, left, and came back (assuming an average of 3 such double hits per session) leads to a best estimate of an average of 15 unique participants to each hour-long Chat Room session (corresponding to 27% of the number of students who took the final).

Conclusions:

- A. For 57 active students, found an average of 15 students participated in a Chat Room session.
- B. For Chemistry tutoring, the Whiteboard tool is necessary but inadequate - need both a drawing tablet input capability and the ability to paste into the Whiteboard.

3. TextBook

3.1 How used by my Course.

• Chapter	Topic	# of Lectures
13	Conjugation and Aromaticity	3
14	Aromatic Substitutions	3
15	NMR Reviewed	1
16	Carbonyl Additions	4
17	More on Alcohols	3
18	-Carbonyl Reactivity	4
19	Carboxylic Acids	3
20	Acyl Compounds	4
21	Amines	3
25	Heterocyclic Compounds	4
26	Peptides and Proteins	4
--	RNA/DNA Chemistry	1
--	Anti-Cancer Chemistry: 5-FU	1
--	Blood Clotting: Vitamin K	1

(Note: I also lost one lecture to a snow day.)

- Skipped: 22 (Aromatic TS), 23 (Neighboring Group Participation), 24 (Carbohydrates). At the very last minute, I replaced the final 3 lectures of the course which were slated to be Chap. 24, with the special topics identified above (a replacement perceived to be well-received by the students.)

3.2 *Two specific anecdotes* exemplify lack of student immersion in this book and/or lack of their interest in interacting with me about the book.

- On the single page Chap 16 summary sheet that I prepared and posted on the web, I asked the students to identify the "personal lamentation" included by the author in one of the end of text problems. No one identified Jones as a baseball fan (#16.45, Lets Go Mets!).
- On the single page Chap 19 summary sheet that I prepared, I told the students one of the Learning Objectives was to identify the predicted product from mixing CH_2 with NH_4 and boil in osmotic fog. (Chap 19, introduction page; This quotation appeared in Morrison & Boyd originally, if memory serves.) No one identified the answer.

3.3 *General Comments.*

A. Orbitals were only lightly used (by me) in second semester.

- Well-used in the book to understand aromaticity - I extensively discussed the benzene system and orbital alignment in general for aromaticity. I skipped Frost Circles.
- Barely mentioned in the EAS chapter. (I don't think I mentioned in lecture.)
- I did mention the basic orbital configuration of π and π^* of carbonyls (Fig 16.4), but that was it for all chapters on carbonyl chemistry.
- Lots of orbital discussion in Chap. 22, "Aromatic Transition States: Orbital Symmetry", I skipped Chap. 22.
- Students were much more comfortable with mechanisms and arrow pushing than any other class I have ever taught (e.g., an astonishingly small number of "backward curved arrows" problems).
- Students were extremely comfortable with keto/enol difficulties due to geometrical constraints (an orbital problem that usually, but not this year, confounds students).

B. Particular strengths of this book (AKA, things I liked)...

- Textbook problems are exceptionally good (focus on quality rather than quantity).
- An extremely readable text (anyone count the # of times "surely" is used?).
- The End-of-Chapter items (Summaries; Difficulties) are well-done.
- Logical organization (for 2nd semester) is ok.
- Chaps 21-26 are easily rearranged, or ignored as instructor sees fit.
- Students enter 2nd semester as well prepared for mechanisms as I have ever encountered.
- Students enter 2nd semester well prepared for discussion of mechanisms nuances that depend on orbital/geometrical constants (e.g., keto/enol issues).

3.4 *A Few Very Specific Comments on the Jones Text* (these "suggested corrections" reflect a "first printing" version of the text and do not appear on the Typos identified on Mait Jones website as of 2/1/99. (I will send this following list to M. Jones.)

- My only serious complaint about the book is that the Index is extremely ill equipped to handle "queries" by typical neophyte Organic Chemists. For example, these terms are not found: EDG/EWG; Reaction Progress Diagram; α -position; phenoxide (an many others that 2nd semester Organic chemists would want to look up).
- p. 274/7, Fig 7.74/8. Identifying the $\text{EtO}^-/t\text{-BuBr}$ products as $\text{E1/S}_{\text{N}}1$ in Fig 7.74 and as $\text{E2/S}_{\text{N}}2$ in 7.78 confuses students in second semester when they were referred back to remind themselves about the details of $\text{E2/S}_{\text{N}}2$ competition.
- p. 593. Seems strange to find disubstituted benzenes being introduced and discussed under a heading of "Monosubstitution".
- Sec. 14.2. This section seems to be out of place.
- Sec. 14.3. This section is begging for a Reaction Coordinate (Progress) Diagram.

- p. 692. "Daughter ions" are longer PC, rather the American Society for Mass Spectrometry recommends "Progeny ions".
- p.842/Fig 17.51. Seeing this brief description of HIO_4 leads students to assume that HClO_4 does the same reaction.
- p. 879/Table 18.1. pK_a of acetone needs to be update to Kresge's 19.7 value?
- p. 960/Table 19.2 Are -chloro and -bromoacetic acids really identical in acidity? This table also presents another opportunity to bring gas-phase acidities/solvation issues back into the discussion as many acetic acids have well-characterized acidities (see NIST Webbook for the data).
- p.1034/Fig 20.55. 2nd structure violates "mass balance" requirement for microscopic steps (has two Li^+).
- p. 1065/Fig 20.102 Sec 4 Aldehydes: Wrong product for RCN with LiAlH_4 (is correct on p. 1034).
- p. 1102/ Fig 21.57, extra H in reactant amine of the second reaction.
- p. 1105/Fig 21.64. This reduction suggestions the need to communicate to the student the relative ease of various catalytic hydrogenations - they expect the carbonyl of the ester to be reduced based on their earlier work in the book.
- p. 1125/#21.46. Is this problem better presented to the students using the diester rather than the diacid?
- p. 1300/Fig 25.32, second example. Should be: 1. BuLi ; 2. RX ; 3. BuLi ; 4. RX (e.g., see general case above this box).
- p. 1351/Fig. 26.12. Inconsistent representation of neutral vs. zwitterionic representations between the general and specific cases.
- p. 1371/Fig 26.46. Figure suggests a $\text{S}_{\text{N}}2$ reaction on a sp -carbon of cyanogen bromide.
- p. 1371 and around there: There appears to be an inconsistent use of the words "peptide", "polypeptide", and "large peptides".

4. Questions

- 4.1 Is the Jones book appropriate for our level of students?
- 4.2 The UTU program conducted in General Chemistry emphasizes course points for doing homework to ensure students do them. Organic Chemistry does not directly offer course points for doing Textbook problems. Does this "lack of points" explain why so many Orgo students do not do the Textbook problems?
- 4.3 Class attendance is still worrisome - guesstimate 75% average daily attendance (based on the number of people who take the "next" exam. How can we increase attendance?
- 4.4 Recitation attendance and participation is also a concern; how to improve attendance?
- 4.5 How many hours do students spend on course work outside of lecture, per week? How do they spend that time? The average is likely to be substantially less than the 2 hours/per credit hour/per week that is required for an average student to get an average grade in an average course.
- 4.6 Given the demands of this course, is it possible to increase the credits from 3 to 4 with the only additional requirement of grading being possible in recitation?
- 4.7 Should the Organic Division prepare a general "statement" that identifies goals, expectations, and work-loads for the year-long Organic Chemistry course - this document would be distributed to all Chem 31 and 32 students at the beginning of each term.
- 4.8 I find that if I teach 2nd semester Orgo, I am very much at the "mercy" of what the students believe their 1st semester Orgo teacher feel about the textbook. Since I expect the students to make heavy use of the text, can we adopt a book or a policy wherein the 1st semester lecturers strongly use the book and are very careful to make NO negative comments about the book (students pick up immediately on negative comments and use that as an excuse not to use the book)? {For reference, see section 5 below.}

- 4.9 Would 1st semester Orgo Lecturers consider putting a book question (or two) either verbatim, or in a modified form, directly on their in-class hourlies? This may provide the motivation for students to do the problem. {For reference, see section 5 below.}

5. Exchanges with Students

- 5.1 *I received the following e-mail from a student in my course: ...*

"I was discussing the test and class with many of the students. All of us are use to the way Dr. Nelson and Dr. Bandik taught the class in Organic 1. The lectures contributed about 90% of the test in which your case questions come from everywhere. There is nothing wrong with your way of testing, it just took the first test to get the idea in my case. " (A- in Chem 0320)

I then posted that e-mail (anonymously) to the Discussion Board and invited comment; three students responded to my message...

Posted by JJG: "Do other people agree or disagree? Does this mean students in these two courses did not do the problems at the end of the Jones' chapter? Did everybody not understand the emphasis I placed on practice problems? "

Student 1...> I agree also. I came from Nelson's class and I did alright just by reading the chapters and understanding my notes. Although he assigned problems from the book it was not imperative that they were done to do well on the tests. I do realize that the problems are important, but I also have a problem doing the problems from the book because it is too easy for me to look at the answer and say, oh ok I should do this without really looking at the problem and making myself understand. I also did not have enough time to properly look over my test and finish it the way I had wanted too.

Student 2... > i agree with the student. most of my examples and problems came straight from lecture, and the Jones problems were used to re-enforce mechanistic/reaction problems; however, the emphasis seemed to be on theory, which Dr. Bandik readily admitted Jones was too verbose too often to bother with. In fact, as the semester progressed, the more we were encouraged to use the book only for the problems and not for reading. i suppose what ultimately threw me for a loop on the exam was the mechanism that i thought i had never seen. perhaps, rather than pushing the arrows in class for the apparently easy mechanisms, take a step backwards for a lecture and explain why certain types of molecules are favored for mechanistic purposes than others. just another chance to re-emphasize what i should already know. if what i'm writing makes no sense, i think i can demonstrate what i mean better than type it out on this screen. thank you for your concern.

Student 3...> i agree. Coming from Dr. Bandik's class, I know that a lot of the students didn't bother with the Jones' problems. His emphasis on theory and the driving force behind reactions was just not explained well enough in Jones (at least in my perspective to Bandik's expectations). It's like I have a new text book for the term, and it will take a little bit to think the way Jones does. But I understand your emphasis on Jones' problems. You saying it and my test results is enough motivation to change my study habits for organic chemistry.

- 5.2 Conversations with another 6 or 7 students corroborated the above generalizations.