Jason E. Ritchie
Teaching Portfolio

I was hired as an inorganic chemist and, accordingly, my teaching responsibilities have primarily been for teaching the freshman chemistry sequence and the senior-level inorganic chemistry class. I have also developed a graduate course in group theory (CHEM 502). I have outlined my teaching responsibilities by semester below and have included detailed descriptions of the freshman chemistry courses (CHEM 105/106) and the inorganic class (CHEM 401/501).

Teaching Responsibility by semester (enrollment)

Year	Fall Semester	Spring Semester
2000 - 2001	CHEM 401: Inorganic Chemical Principals (10) CHEM 501: Advanced Inorganic Chemistry I (3)[1]	CHEM 502: Advanced Inorganic Chemistry II (8)[2] CHEM 463: Undergraduate Research (4)
2001 - 2002	CHEM 401: Inorganic Chemical Principals (10) CHEM 501: Advanced Inorganic Chemistry I (7) CHEM 463: Undergraduate Research (2)	CHEM 402: Inorganic Chemistry Laboratory (5)
2002 - 2003	CHEM 105: General Chemistry I (106)	CHEM 106: General Chemistry II (81) CHEM 797: Dissertation Research (1)
2003 - 2004	CHEM 105: General Chemistry I (97) CHEM 697/797: Dissertation Research (2)	CHEM 106: General Chemistry II (87) CHEM 797: Dissertation Research (2)
2004 - 2005	CHEM 105: General Chemistry I (105) CHEM 697/797: Dissertation Research (3)	CHEM 106: General Chemistry II (74) CHEM 697/797: Dissertation Research (3)
2005 - 2006	CHEM 105: General Chemistry I (113)[3] CHEM 697/797: Dissertation Research (3)[4]	CHEM 106: General Chemistry II (planned)

[1] then taught as Chemistry 513
[2] then taught as Chemistry 501
[3] current enrollment
[4] anticipated enrollment

Chemistry 105 & 106: *General Chemistry I & II*

Taught: **CHEM105**: F'02, F'03, F'04
CHEM106: Sp'03, Sp'04, Sp'05

Teaching Responsibilities: Chemistry 105 and 106 consist of three hours per week of lecture, plus one hour of an optional problem session, plus one office hour. I have had an average enrollment of 103 students in the three Chemistry 105 classes, and 81 students in the three Chemistry 106 classes. These classes are typically made up of primarily of science and engineering majors, and pre-professional students (PreMed, PrePharm). Approximately 70% of the students in these classes are freshmen, 10% are chemistry majors, and 55-65% are women (which bodes well for our efforts at encouraging young women to pursue careers in science and engineering).

Philosophy of the Class: For most of my students, Chemistry 105 is their first college science class. It is very important that, through this course, the students develop a sense of **personal responsibility and discipline**. To accomplish this goal, I give a quiz or exam every Friday morning. The quizzes (~20 min; 2-3 problems from the assigned homework) test the students mastery of the homework. Because most of the students are new to college, the weekly quizzes serve the important role of forcing the students to attend class on Fridays and keep up-to-date with their homework. Cheating on the quizzes is deterred by offering two versions of the quiz containing different questions that are stylistically similar.

Most of the students in this class are science and engineering majors, hence, one of my main goals is to develop the students' scientific and numerical **problem solving skills**. It is especially important to impress upon our future scientists, engineers, doctors, and pharmacists the importance of correctly calculating numerical answers to scientific problems. The coverage of technical material in this course is also an important goal, but I view this as secondary to developing analytical and problem solving skills in the students. To this end, the quiz problems, which almost always require some calculation, test the student's ability to read the problem, develop a problem solving strategy, and correctly calculate a numerical answer.

The **grading scales** in CHEM105/106 are based on achieving a standard (>85%=A; >70=B; >55=C; >50=D). Because this grading model does not put students in competition with one another, they are encouraged to work together cooperatively. Multiple choice exams are constructed from a mix of conceptual and quantitative questions that I have evaluated as easy, medium, or hard. In order to pass the class (i.e. get a "C"), a student needs to correctly answering all of the "easy" questions which will, on average, give a score of 55%. In order to achieve at the "A" level (>85%), a student will have to correctly answer all of the "easy" and "medium" questions correctly, plus answer at least one "hard" question correctly. After each multiple choice examination, I analyze the class performance (i.e. what percentage of the class correctly answered each question). My expectation is that 80% of the class should be able to correctly answer an "easy" question, while less than 50% of the class will be able to correctly answer a "hard" question (5 choices per question). I have developed (and continue to refine) my easy/medium/hard model based on my three-years experience with student performance in CHEM105/106. Cheating on the exams is prevented by offering two different versions of each exam with scrambled question order and scrambled answers.

My teaching style discourages memorization (the lowest level of learning) in favor of encouraging the students to learn how to solve problems, apply the learned material to new problems, analyze their answers, and to develop new approaches to unfamiliar problems. I've found that the average student is capable of analyzing their answers to see if they are reasonable (Bloom's Taxonomy Level 4), while top students are able to synthesize in order to solve totally new problems (Bloom's Level 5). I have constructed the grading scheme with this paradigm in mind. Accordingly, a student who demonstrate learning at Bloom's Level 2 will earn a "C". That is, a "C" student will be able to answer "easy" questions that only require simple knowledge and comprehension (Bloom's Level 1&2). Students who demonstrate learning at Level 5, that is they are able to answer "hard" questions requiring creativity in their problem solving and the synthesis of a new approach, will earn an "A".

I believe that students learn best through an interactive teaching style that **emphasizes active learning and demands participation and engagement**. I have incorporated (and continue to refine) **cooperative learning** strategies into this chemistry sequence. For example, in CHEM106 in the Spring of 2005, I subdivided the class into four-person groups, and assigned problems in lecture to be worked by these small groups. Typically, I would work an example problem during lecture, and then ask the student groups to solve a similar problem (with the worked-out example still on the board). I would then randomly select a couple of groups, and ask them how they each worked a section of the problem (while writing their solutions on the board). If a part of the problem was worked incorrectly, I would let other groups point out and fix the error (sometimes I would prompt them to point out the error). I gave the students a class participation grade based on attendance during these in-class exercises (two exercises per week). The students seemed to enjoy and value these group exercises, in fact, seven of the 72 student evaluations specifically commented positively on the group exercises, with no students commenting negatively.

In my chemistry courses, I try to **develop a rapport with the students**. The average freshmen chemistry student has just transitioned to college life from high school and has never been in such a large and impersonal class. This loss of a personal relationship with the instructor can lead to anxiety on the part of the student who feels isolated in a large lecture class. My goal, as an instructor, is to individually engage each student in the class. To this end, I learn the names of each of my students, and use their names when calling on them in class and returning exams and quizzes. I engage the students in learning by bringing to the classroom demonstrations and real-world examples of the material we are learning. Because many of our students arrive at Ole Miss lacking discipline and study skills, I provide an optional weekly problem session for any students who desired extra time with me to help them work their homework problems. The casual and relaxed environment of the problem session appeals to many students, especially those who are unsure or lack confidence. Attendance at these weekly problem sessions averages about 20-30, and I believe that the outcome of my efforts and the students' labor has increased their success.

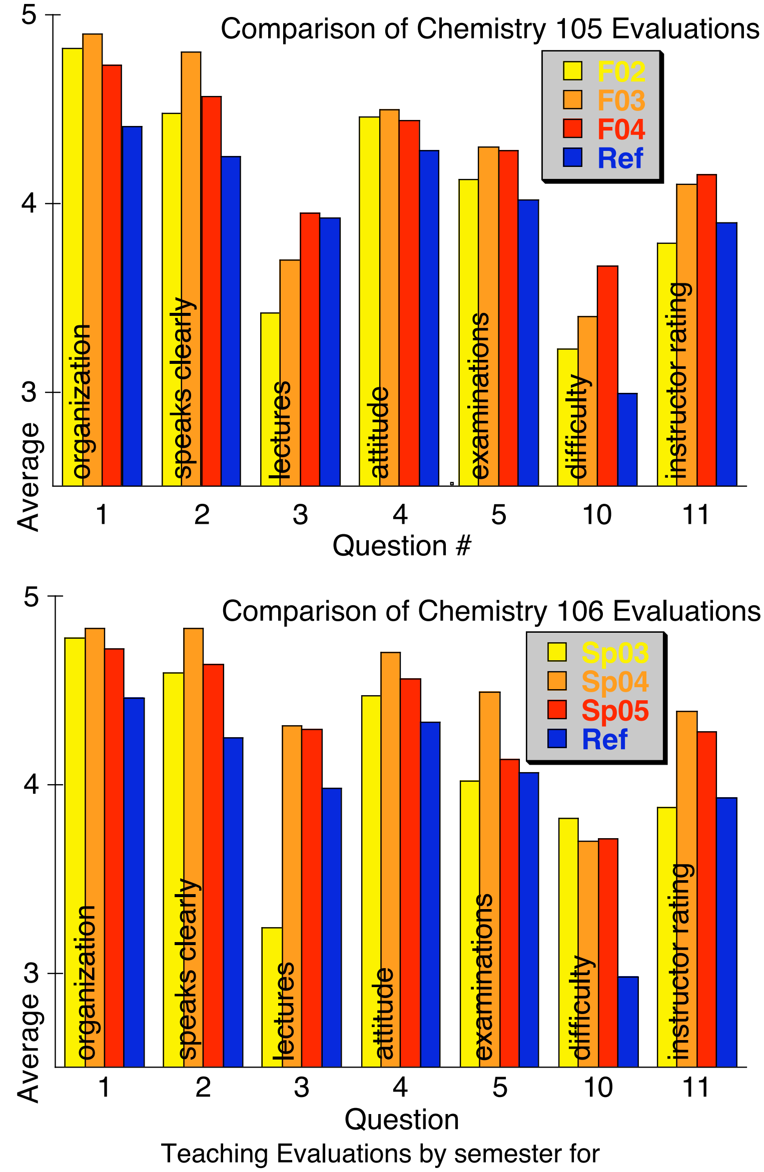
<u>Extra Credit Assignment</u>: In Chemistry 106, I offer an extra-credit assignment to the students at the end of the course (worth a little more than one quiz). The students are told the assignment will consist of writing a two-page paper, and those who decide to participate are given a number (I have attached two excellent examples of student papers to the end of this section). After signing-up for a number, they are told their number corresponds to an element on the periodic table, and that their assignment is to write an in-depth analysis of a "cool" (or at least interesting) application of their element. The quality of the work varies from outstanding papers which teach me a new application that I was unaware of (20/20 points), to papers summarizing the physical properties of their element from the CRC handbook (5/20 points), to text copied directly from the internet (0/20 and disciplinary action). I have been disappointed with the 1-2 plagiarized papers per year that I receive. After the first year, I have specifically discussed with the students, when assigning the paper, what constitutes plagiarism, the consequences, how to avoid directly copying material, and how to find and appropriately cite source materials. I believe that the students who plagiarize material despite this cautioning, do so out of laziness, and that they fully understand their transgression and the consequences of their behavior.

I specifically do not offer the CHEM105 class extra-credit, because I do not want them to believe that they can excuse poor work throughout the semester with last minute extra credit (as they were likely allowed to do in high school).

Evaluation of Teaching Effectiveness: The students have consistently ranked my teaching as excellent to superior (question #11), while ranking the course difficult to very difficult (Q10). While my instructor rankings (Q11) were slightly below the Liberal Arts average in my first year of CHEM 105/106 (yellow bars), my subsequent improvement in years 2 & 3 (orange & red bars) has put me consistently above the Liberal Arts average. Moreover, the perceived difficulty of this class is significantly above the Liberal Arts average (Q10).

My **student evaluations** in other areas have shown significant increases and now exceed the Liberal Arts average in all areas. For example, in the three years I have taught these classes, my evaluations show that I have improved significantly in the quality of my lectures (Q3) to the point where I now exceed the Liberal Arts average. The students also appear to be happy with my classroom organization (Q1), they are able to understand my lectures (Q2), and they appreciate my attitude towards the material (Q4). In each of these areas, I have exceeded the Liberal Arts average in all three years.

In addition to student evaluations, I also perform **self-evaluations** of my teaching. After the conclusion of each semester, I go back and consider what aspects of the class worked, what didn't work, and how to improve the next time. I try to identify reasons why particular material may have failed to work. This self-evaluation helps me to continually improve my teaching. In addition, I try to gauge the interest level and understanding of my students by looking at their body language and facial expressions. I know that when I see bored faces, I need to find a way to engage the students or move on. Expressions of confusion tell me that I need to slow down and work more examples or give a small group problem.



Teaching Evaluations by semester for CHEM 105 (top) and CHEM 106 (bottom)

Secondary Teaching Evaluation Criteria: The Department of Chemistry employs a secondary evaluation criteria for instructors in Chemistry 106. All Chemistry 106 students take the American Chemical Society standardized exam for general chemistry.

The use of this standardized exam allows us to compare the performance of our Chemistry 106 students against a national percentile ranking. The goal for our Department is to have our students average above the 40^{th} percentile. **My chemistry 106 students have consistently exceeded this expectation**, scoring in the 45^{th}, 44^{th}, and 51^{st} percentiles (Sp03, Sp04, and Sp05). In fact, in the most recent class (Sp05), 51% of the students scored above the 50^{th} percentile, and 20% of the students were above the 75^{th} percentile nationwide.

Reenrollment: Empirical evidence suggests that students will "vote with their feet" when choosing which Chemistry 106 section they register for after completing Chemistry 105. That is, a student who is generally happy with their current professor will tend to reenroll with that professor in their next class. The **reenrollment rates from my Chemistry 105 to Chemistry 106 classes have been high** (40, 40, and 43 students in my Sp03, Sp04, and Sp05 Chemistry 106 classes had taken Chemistry 105 with me).

Efforts to Improve Teaching: My personal goal is to be an outstanding teacher. In order to improve my teaching, I have sought to incorporate **active learning** elements into the Chemistry 105/106 sequence that increase the engagement of the students. I have incorporated Peer-to-Peer and cooperative learning strategies. I developed these strategies from a combination of information I gained from attending several of the Provost's Faculty Development Workshops, and in meetings I have had with Dr. Saundra McGuire of the Department of Chemistry and Center for Academic Success at Louisiana State University. My student evaluations specifically show that the students enjoyed the Peer-to-Peer learning strategies, and that the students' performance on the Chemistry 106 standardize final exam has improved since incorporation of these strategies.

Chemistry 401: *Inorganic Chemical Principles*
Chemistry 501: *Advanced Inorganic Chemistry I*
(previously taught as CHEM 513 in Fall '00)

Taught: F'00, F'01

Teaching Responsibilities: Chemistry 401 and 501 are co-taught in one classroom. Chemistry 401/501 consists of three hours per week of lecture, plus one office hour. I have had 401/501 enrollments of 10/3 (13 total) and 10/7 (17 total) students in Fall '00 and Fall '01. Chemistry 401 is required for BS chemistry majors and serves as an upper division elective for BA chemistry majors and chemical engineering majors. Chemistry 501 is a core class in the chemistry Ph.D. and M.S. programs and is taken by most graduate students in the chemistry department.

Goals and Philosophy of the Class: Most chemistry 401 students are seniors, and this class offers an excellent chance to **"bring everything together"** for the students before they graduate. Correspondingly, this class draws on many aspects of the students previous experiences in analytical, organic, physical, and freshman chemistry. For example, the students' understanding of analytical chemistry, gained in their junior year, is applied to the inorganic systems in this class, and their understanding of organic chemistry, gained in their sophomore year, is applied to organometallic systems.

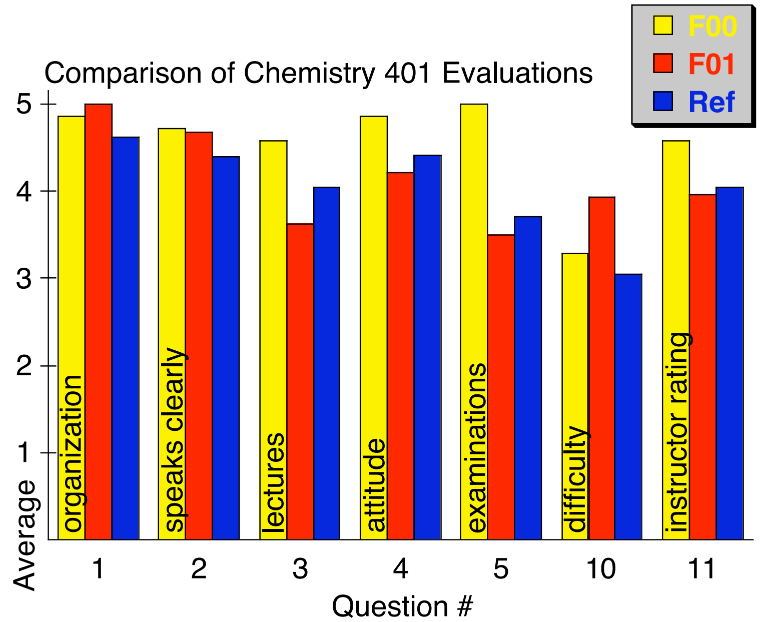
This class incorporates a **special project** that is worth 200 of the 600 points available. For their project, the students study the scientific publications of a "famous" inorganic chemist, and critically evaluate their work in a written paper and in-class presentation. The students write their paper in the style of a review article, and present their findings to the class in a 15-20 minute oral presentation. In order to favorably accomplish this assignment, students have to demonstrate that they have **critically analyzed** their inorganic chemists' works. This project also introduces students to the world of graduate research and exposes the class to active researchers in whose groups the students may consider working. I want students to leave this class with an understanding of the kind of work that goes on in graduate research laboratories.

Students who successfully complete this course will be able to combine different approaches learned in previous classes to solve problems related to inorganic and organometallic systems. Students will also be able to critically evaluate publications from the primary scientific literature. **Students in this course will demonstrate learning at the highest levels.** Specifically, the exams will be used to demonstrate that the students are capable of synthesis of different concepts and approaches to solve new problems (Bloom's Taxonomy level 5) and demonstrate through their special projects that they are capable of critical evaluation of the scientific literature (Bloom's level 6).

The **grading** in Chemistry 401/501 consists of two midterm exams (100 pts each), a review paper (100 pts), an in-class presentation (100 pts), and a final exam (200 pts). I've been fortunate to have excellent students in this class and as a result, I have been able to give a significant number of A's and B's. I have typically given students who are about 1/2 standard deviation above the mean an "A", and students who are above the mark of 1/2 standard deviation below the class mean a "B". Students who are more than 1/2 standard deviation below the mean will receive a C, D, or F. This grading scale results in about 30% A's, 40% B's, and 30% C's.

Evaluation of Teaching Effectiveness: In both courses, students ranked my teaching as excellent to superior (question #11), while ranking the course difficult to very difficult (Q10). While, my instructor rankings (Q11) for Fall '01 were slightly below the Liberal Arts upper division average (red bars), the average of the two semesters' responses to Q11 (yellow & red bars) are significantly above the Liberal Arts average. Moreover, the perceived difficulty of this class is significantly above the Liberal Arts average (Q10).

While my **student evaluations** in several areas showed slight decreases from the fall of '00 to the fall of '01, in each case the average of the two years exceeds the Liberal Arts average. The decrease in certain evaluations may be due to an increase in the perceived difficulty of the course from the fall of '00 to the fall of '01 (Q10). The students also appear to be happy with my classroom organization (Q1), and they are able to understand my lectures (Q2). In both of these areas, I have exceeded the Liberal Arts average in both years. On balance, I believe that my teaching in this class has been good, and that my above average evaluations bear this out from the students' perspective.



Efforts to Improve Teaching: I taught Chemistry 401/501 in my first two years at the University of Mississippi, and have not taught this class since the fall of 2001. In the intervening years, I have taken several steps to improve my teaching in general (see Chemistry 106 & 106 above). I greatly enjoy the special project portion of this class and believe that the students both enjoy and learn a great deal from the assignment. The next time I teach Chemistry 401, I will incorporate more **active and cooperative learning strategies**. For example, the enrollment in this course is perfect for breaking the class up into small groups to tackle in-class exercises. I have also encouraged the students to ask questions during their fellow students presentations, but when I teach this class again, I will formalize this evaluation and criticism by asking the students to submit written evaluations of their fellow students presentations.

Graduate and Undergraduate Laboratory Instruction

In addition to the classroom teaching described above, I am committed to training scientific researchers. I provide both undergraduate and graduate students opportunities to learn and excel in the laboratory. To date, I have mentored eleven undergraduate chemistry students in research elective courses (CHEM 463) and summer research programs. I am currently chairing the thesis research of three graduate students (2 Ph.D. students and 1 M.S. student) who are currently pursuing graduate degrees in my research laboratory. In addition, I have served on three M.S. committees and one Ph.D. students' committee while at the University of Mississippi.

2. *Dissertations and theses directed.*

- Ms. Q. Zhu (Ph.D. in Chemistry Sp'01; committee member, Major Advisor: Dr. Charles Hussey)
- Mr. Jacob Eftink (MS in Chemistry Sp'03; committee member, Major Advisor Dr. Walter Cleland)
- Ms. Zhaoxia Liu (MS in Chemistry Sp'03; committee member, Major Advisor: Dr. Charles Hussey)
- Ms. Zheyuan Luo (MS in Chemistry Sp'03; committee member, Major Advisor: Dr. Jon Parcher)

3. *Dissertations and theses in progress.*

- Mr. Braja Ghosh (Ph.D. in Chemistry; **Committee Chairman**, Research Advisor, expected completion date: 5/06)
- Mr. Kyle Lott (M.S. in Chemistry; **Committee Chairman**, Research Advisor, expected completion date: 10/05)
- Mr. Chengjun Sun (Ph.D. in Chemistry; **Committee Chairman**, Research Advisor)
- Ms. Alka Prasad (Ph.D. in Chemistry; Major Advisor: Dr. Susan Pedigo)
- Mr. Corey Nichols (Ph.D. in Chemistry; Major Advisor: Dr. Susan Pedigo)
- Mr. Ramakrishna Samudrala (Ph.D. in Chemistry; Major Advisor: Dr. Dan Mattern)
- Ms. Julie Anderson (Ph.D. in Chemistry; Major Advisor: Dr. Greg Tschumper)
- Mr. Gerald Rowland (Ph.D. in Chemistry; Major Advisor: Dr. Jon Antilla)
- Mr. Brian Hopkins (Ph.D. in Chemistry; Major Advisor: Dr. Greg Tschumper)
- Mr. Qiang Zhang (M.S. in Chemistry; Major Advisor: Dr. Jon Antilla)

4. *Other pertinent teaching activity.*

- Academic Advisor to ~40 undergraduate chemistry, biochemistry, and forensic chemistry undergraduate majors. I meet with these students twice a year to discuss and plan their schedules for the upcoming semester. (currently advising 18 students)
- Also supervised the graduate work of Mr. Jason Jones, who has left the university

Undergraduate Researchers:
- Robert Sindelar (BA in biochemistry 2002) **Goldwater Fellowship**
- Stuttee Amin (BA Chemistry 2002)
- Jacob Wolkowicz (UM undergraduate)
- Kamal Amin (BS Forensic Chemistry 2003)
- Erik Frazure (BS Forensic Chemistry 2003)
- Que Chung (current UM undergraduate)
- Kenisha DeLoach (SRIU Program Summer 2001, Mississippi Valley State)
- Jeff Crisp (Christian Brothers University undergraduate summer 2003)
- Andrea Cormick (Xavier University, SRIU in 2003)
- Ambika Ramsundar (Coppin State University SRIU 2004)
- Levenia Baker (Alcorn State University SRIU 2005)