which the lowest grade was a C. Students still transfer out of our majors courses' into one of our review Chemistry courses, and some just withdraw. Still this kind of performance has been quite rare, in my sections or in sections of my colleagues. See Karen Timberlakes' article in this Newsletter for more detail and ideas.

Action has switched to one of our new remodeled classrooms with multimedia equipment. We have a 1200 lumen Sharp projector mounted from the ceiling, a high quality screen which pulls down, and has a lock down feature which makes it very rigid. A large wheel based table has connections for my portable PowerBook, an Elmo projector, VCR, and both phone and T1 connections for the Internet.

My procedure at the moment, after some experimentation, is to connect the power cord, projector cable and remote mouse accessory then start my PowerBook in my office. I boot the system, a PowerBook 292, bring up PowerPoint, Director and Netscape if I'm going to show animation or Internet material. I open the PowerPoint lecture I'm currently using and go to the slide we left off on. I generally check the slides I'm using for the next lecture to make sure all is well, especially if links to movies, etc., are still good. If I need material from a CD I put the CD in now. I put the PowerBook into sleep mode, disconnect the power cord, move the cart (which has three shelves, with the PowerBook on the top; spare wires, remotes, batteries, handouts on the next; and my briefcase on the bottom) to the classroom. I also have about 1.5 inch foam rubber strips under the PowerBook to cushion bumps, and still let air circulate for cooling.

In the classroom I turn on the projector (ours must be turned on before you connect to the PowerBook or they can't talk to each other), plug in the PowerBook, and connect it to the projector. Touch any key and the PowerBook is up and running within seconds with the application programs I'm going use already running. When I'm finished I put the PowerBook back to sleep, disconnect, wheel the cart back to my office, reconnect to my T1 line and at a click of the mouse I'm up and running, checking material for my next lecture. My Mac reconnects to the Internet without any action on my part..

This cuts down substantially on the time and stress of completely shutting down and rebooting my system. We are having some problems with the very impressive remote for the projector. It doesn't work in the present configuration, which means I can't zoom in on movies, programs, etc. You can zoom in movies, stop, start, loop, etc. in QuickTime 4. To do this requires opening a movie in QuickTime and saving it in QuickTime format. If you just link to a movie that you last played in Simpletext or some other program it will reopen in the same application.

Working on the PowerBook, even with its 14.2 inch screen, is still less efficient for me, so I prefer to use my desktop machine with a 20" screen. Unfortunately for some reason when the files are transferred to the PowerBook many links to movies, etc., are broken. Transferring with everything (440 MB and growing) lessens the problem, but some links still break. I've been having better luck connecting the PowerBook to my desktop machine with a special cable from Apple, the PowerBook then appears as a hard drive on the desktop. All files being changed are saved to the PowerBook as a hard drive. This method works well but there are still some intricacies and inconsistencies which have eluded me. For that matter I can move shapes on a slide in my office in PowerPoint, leave the machine on as described above and have it change by the time I use it in lecture? Technology is fun, but it is more fun when it works consistently.

Great Expectations for Computer Usage by Undergraduate Chemistry Students

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Over forty years ago at MIT I started using computers for calculations in chemistry. I have moved from a mainframe computer fed by punch cards for each run to teletype terminals connected to mainframe computers by slow telephone lines to the early microcomputers with 8K of memory (Commodore PETS and Apples) to the Pentium III machine I am writing this article on. I have served my time on computer committees and even was offered the position to manage our network. I continue to help friends with their computer problems and amazed that I can hold my own with most professional computer staff personnel. For the past twenty five years I have been a consultant/ evaluator for the North Central Association (NCA), the national accreditation agency for the Midwestern states, doing one to two accreditation visits per year to colleges similar to Ripon College. Usually I look at the Sciences, the Library, academic and administrative computing. On these visits computer usage is a frequent discussion topic with members of the accrediting team and members of the institution being examined. Budgets for computer services as a percentage of institutional budgets have been going up each year. Cost of computer facilities and services are about the same for colleges as for the library. There is a realization that college computer costs must level off and be controlled.

Initially, I had great expectations for the power of the computers and how they could be a great boon to instruction of Chemistry for the undergraduates at institutions such as Ripon College. Ripon College is a Liberal Arts College of about 800 students and is a member of the Associated College of the Midwest. Our department has four Ph.D. chemists and is ACS approved. We graduate 5-12 majors a year and are currently coming out of an enrollment decline. About 80 % of our students have their own personal computers in their dormitory rooms. They have more computer power than they need. Fast hookups to Email and the Net are available to all. Below I will recount some of our failures, successes, and what I think we as educators can do to improve the quality of computer usage.

We have tried computer assisted instruction (CAI) for several courses. Very early I wrote a series of programs to teach fundamental chemical chemistry principles and calculations and found that this was not worth the effort. Students must learn by hard work and effort. The problem is getting them to think and study. A good text book and classroom lecture-discussion are helpful. Last year my students used the new edition of Atkin's **Physical Chemistry** with what I thought was a very excellent CD to get an overview and review of the chapter. They did not use it, but decided very early that Physical Chemistry was too hard and nothing would help. The class was small and I felt that I did not have a critical mass of students to have serious discussion and competition.

We have not used computer simulation of experimental equipment for we have a rich array of instruments from FTIR's, gas and liquid chromatographs, uv-visible spectrometers to a 300 megahertz superconducting FT-NMR. We have preferred a hands on instrument approach. Most of the instruments operate from Windows based computers of various vintages. We are finding that strip chart recorders are becoming a thing of the past. Students, with our encouragement, frequently paste chromatograms and spectrograms into their reports

Students currently use STN to search Chem Abstracts in our junior-senior courses for research papers and senior thesis research. We are just getting into online journal usage, and students use the Web to obtain information for their seminars and presentations. Some of the web information used is poor to outright incorrect and very opinionated. Usage in this area exceeds our expectations. Students are eager to obtain and believe information from the Web.

We are currently using Spartan Pro and Gaussian 98 on PC for molecular modeling and quantum chemistry calculations. We use Spartan in all our organic courses and physical chemistry courses. We have a projection system for classroom use and are applying for funds for Spartan systems for Organic I, our first semester freshmen course. We hope our students will consider these quantum chemistry programs as tools on the par with instruments.

One area that I note on my NCA visits, on campus, and reading Wisconsin newspapers is that administrative computing, namely change overs to more powerful data base programs are costly and create serious pain for users including students and faculty. Our registrar and finance office for over six months has been entering data in the old and new data base. Department budget records are not being issued. Student transcripts have been issued on time, but some administrative offices have serious delays in using the new data system. One of our Midwestern universities could not issue transcripts for months and now the ones they issue have an accuracy disclaimer. Because of these changeovers student registration has regressed. These changes are not trivial and have proved to be much more costly and time consuming then many expected. On some of my recent NCA visits, recent data I requested was unavailable because the old system out and the new system could not retrieve data from the new common data base.

Most students who selected the programmable calculator option for calculus use their calculators for numerical integrations, solving transcendental equations, and repetitive calculations. Spreadsheets are routinely used for linear regression calculations and graphing. Most will not put in the effort to develop their own spreadsheets for repetitive problems that occur in our physical chemistry course. They do not see the advantages one obtains when you must redo an incorrect calculation correctly using a spreadsheet. Little use is made of software such as MathCad or Maple. I am still using Scientific Workplace and Scientific Word for Physical Chemistry laboratory reports (See an earlier edition of this journal) which has Maple and T_EX incorporated into it. Students appreciate its power, but resist the effort needed to write in it, and do not like some of its constraints. They resist using help menus and the manuals. I believe it is important for them to see the power of this type of program for future reference.

The overall quality of student formal reports has improved due the use of word processing programs. We have a writing program at the College and a junior laboratory course emphasizing research report writing. Most students will not use the full power of word processing unless you demand it. The prefer to write in equations, drawings, reference numbers etc. even when they know that they will have a number of drafts. Suggestions to use the word processing program to do this early falls on deaf ears in most cases. This was brought home painfully for students and instructors alike when the students were writing their senior theses.

In conclusion, computers have brought improvements to the quality of instruction of undergraduate chemists and their work. Our expectations in the computer area have as in other areas fallen short. This is the nature of education, teaching and learning. '

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Using Student Centered Learning Strategies in the Chemistry Classroom

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If we consider that learning is enhanced when students are engaged in the processing of information, then our challenge as teachers is to find creative ways to design dynamic learning environments that involve students in doing and thinking about chemistry. Over the past few years, I have developed a teaching strategy, which I call LecturePLUS that converts the traditional lecture into a student-centered format. The LecturePLUS environment integrates mini-lectures, formative assessments, and activity worksheets for team learning in the classroom.

Background

Most of us who teach chemistry grew up learning chemistry from the lecture method. For many years, I never doubted that it was the way to teach chemistry. Today the lecture system is the preferred teaching style used by 89% of science professors. Indeed, lecture is a comfortable format for many instructors and a non-threatening one for students. It is low cost, easy to control, and an excellent method for organizing course content. However, many of us are becoming more aware that during lecture students are not actively engaged with the topic, they don't seem to listen for very long, and their retention of concepts is minimal. Studies show that students are not attentive 40% of the time they are in class and that although attention is high for the first 15 minutes, it declines rapidly until the final 10 minutes of class. About 10 years ago, I began to hear about student-centered teaching strategies, but I saw little of it at the college level. Now that is beginning to change. Don Paulson , Chemistry, California State University, reports that the use of active-learning strategies from 1994-1998 provided an average retention rate of 75% for one year of organic chemistry compared to 38% when he used the lecture method. In addition, he reports that students who learned with the intense active-learning approach in lecture did significantly better in both retention and GPA in the laboratory class.

Student Centered Strategies

In a student-centered classroom, students are encouraged to participate actively in learning the material as it is presented rather than being passive and perhaps taking notes quietly. Students are involved throughout the class time in activities that help them construct their understanding of the material that is presented. The instructor no longer delivers a vast amount of information, but uses a variety of hands-on activities to promote learning.

As I learned more about student-centered learning environments, I began to alter the way I taught my chemistry classes. I have now developed a group of learning strategies that I call LecturePLUS to promote **P**articipation, **L**earning, **U**nderstanding, and **S**uccess. My LecturePLUS system includes mini-lectures using PowerPoint presentations, in-class collaborative learning, peer presentations, ongoing assessment tech-