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I wanted to use Guided Inquiry (1) to teach my classes

In a guided inquiry course, no lectures are given; students work in up to 5 groups of 4 or 5 students and are assigned certain roles; and each session starts with a brief 1 or 2 question quiz.
Each student has a role in the group and the role changes each class period. For example, one student does any calculation necessary, one student records answers for the group, one student is the group manager, another student will be the one who reports the group's answers to the class, while another student observes and reflects on the group dynamics.

During the class the students, first read about a model that can be tables, text, equations, figures or any combination of factual information. Following this information is a set of questions that are designed to make the students think about the factual information and use it to synthesize answers to questions that may require the student to make inferences. There are then exercises similar to those found at the end of any chapter in an introductory chemistry textbook. These questions give students experience in using the concepts they have learned during the group discussion and application of the factual information. For introductory chemistry, organic chemistry, and thermodynamics, there are commercially prepared materials available that can be used.

The instructor moves among the groups reading the recorders' answers to the questions. The instructor does not intervene unless it is obvious the group has missed the concept and requires some redirection. The students will learn more and retain it longer if they discover the answer for themselves.

My class size is 96 to 140 so some modifications of the above had to be implemented. In addition, there is no material commercially available for use in teaching an introductory organic and biochemistry class using this method. Furthermore, there are no areas on campus that can accommodate such a large number of students working in groups.

**During Fall Semester**, there were 12 groups of 6 and I only lectured the first day and that was to explain how the course would be run. The D2L web site for this course contained a detailed set of reading assignments for each chapter, a set of learning objectives, and a set of questions that the students were to work on with their group during lecture time.
The class was in two separate rooms which meant I had to move back and forth between the rooms, a minor inconvenience.
Instead of having a quiz at the beginning of each class, the students did a quiz at the end of each chapter (once a week). They could do the quiz at their convenience over the course of a week as the quizzes are all on line in the D2L site. They had 2 opportunities to take a quiz covering the same learning objectives.

Although I circulated among the groups during each class, there never seemed to be enough time to spend with each group to guide them when they had questions. At the end of each class, the groups turned in the work they had completed and I read it and provided written feedback in the form of suggested readings or ideas they might considered if they had answered a question incorrectly. The next class meeting they had a chance to correct answers and I encouraged them to talk to groups that had answered the question correctly.

My class average did not suffer and as a matter of fact it was numerically higher (80) when compared to the average the semester I lectured the previous semester (75). I also had students take a pre and post test. My post test results were terribly disappointing. Only 12 students scored a 60 % or better. Most students were in the 30-40% range. I guess when compared to the pre test results (class average 3%) they did learn something. The questions were taken directly from quizzes or exams. So every student had seen every question at least 2X (once in the pre test and once in a quiz or exam). Unfortunately, I do not have any pre, post test results from when I taught the class using lectures.

At the end of the semester, I asked everyone for feedback. The following questions were asked.

1. What should I do to improve this course.
2. What should I not change next semester? In other words, what works well?
3. Knowing how this class is set up and if you had it all to do again and could get into any lecture section at all, would you still register in the sections taught by this method. Please explain why.
4. If the above questions did not allow you to address a compliment/concern you have regarding this class, please address it here.

Responses

1. In general, the students felt that no lectures at all did not work and they want a BRIEF (brief was their word) lecture to start each chapter. They also wanted more tests, quizzes, exams. We had 5 exams and a final. They did not like being in 2 rooms. They could not see why they had to do a lab and did not see the link between the material they were working on in class and the material they were doing in lab. Many of them also asked why they had to learn some of the material they were being asked to learn.
2. They listed many things - the on-line quizzes and getting 2 tries, the detailed list of learning objectives, group work, allowing the students to assign grades to their group members for group work and others
3. Several students indicated that after the first lecture, they tried to get out of my section and into one that was the regular lecture but that now they were glad they had stayed. One student even said she had fun. Only 6 students said in no uncertain terms that they would never take a class like this again. They felt it was unfair to ask them to do so much work. Most students said something along the lines that it really didn't matter but maybe group work was better because they did not get bored.

4. They said the text book was too expensive and hard to read. I should do something about students who do not help with the group work or who do not want to participate.

With the student comments in mind, I made several changes for Spring Semester. I contacted the departments whose students are required to take the course and asked them to tell me what I should be sure to cover in the course and why. From the feedback, received it appears everything that is needed is covered. I incorporated the departments' response to the why they needed the information in the learning objectives that the students use as study guides.

During **Spring Semester**, we were all in one room with lots of space between groups so they could talk to one another and not have a hard time hearing the others in their group. We started the semester with 96 students so there were 12 groups of 8. I started the semester lecturing for the first meeting when we started a new chapter. About ¾ of the way through the semester, I changed that to lecturing for the first 10-15 min of each meeting so I could provide input when it appear the majority of students had misunderstood a point. This way my brief coverage coincided to the questions they were working on that day.

Unfortunately, due to the work load I reduced the number of exams to a total of 4. In addition, I revised the sets of questions and used more of the questions at the end of each chapter instead of my own.

This semester, I included references to the lab material as resources for finding answers to questions. The appropriate pages of the laboratory manual are listed as reading material for each chapter. This may not work as student who retake the class usually accept the laboratory grade they received when they took the class earlier and no longer have a laboratory manual.

There are several things that I plan to change for fall 2005 and am looking forward to the student comments this semester. This method of instruction is very time consuming as there are 12 sets of group work that must be read and comments provided 4 times a week BUT I hope I never have to lecture again. This is fun and I get to know almost all of the 90 some students in my class. In a lecture setting, I maybe get to know the 24 who are in my laboratory section.

1. Moog, R.S. and J.J. Farrell, *Chemistry: A Guided Inquiry*. 2nd ed. 2002, New York: John Wiley & Sons, Inc