



Group Learning in Freshman Chemistry

By

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Introduction

CHEM 110 is a course notorious for its difficulty and high drop rate. There have been many ideas to improve the quality of the course and improve the student's efforts toward it. One such proposal was the introduction of Learning Assistants (LA's). One goal for the LA's was to hold small group problem solving sessions to help the 110 students grasp the concept and get better during the class. But do the LA problem solving sessions actually achieve their goals? Studies on the topic suggest that small group problem solving sessions are effective and do raise the student's grades. Perhaps we should take a look at similar programs at other universities.

The University of the Sciences in Philadelphia (USP) adopted a program for the 2002 school year. By modifying the group problem solving sessions (recitation), USP attempted to improve lagging grades in freshman chemistry. Both the LA program at Penn State and USP's program have student-led group thinking at the core of its program.

Chemistry as a discipline involves problem solving and the only way to improve problem solving is attempt problems. However, Group work and problem solving sessions can easily devolve into passive Q/A sessions. Therefore, certain criteria are needed for the session for students improvement.

Criteria

- Attendance/Participation
 - Peer interaction leads to better thought processes
- Student Preparation
 - Do the assigned HW problems before the study session as to obtain feedback from the problems before going for help
- Equal Division of Work
 - TA/LA did not provide answers. Students figured it out in the session
 - TA/LA provide facilitation and clarification

Data

Table 1. Comparative Class Structure before and after Implementing Group Problem Solving in Recitation Sections

Treatment	Lecture Sections (Students in Each Section)	Recitation Sections (Students in Each Section)	Recitation Attendance	Faculty Resources	Teaching Assistant Resources for Each Section
Before Implementation					
Fall 2001	4 (90)	1 (90)	Optional	8 hours	None
After Implementation					
Fall 2002	2 (180)	4 (45)	Mandatory	7 hours	1 graduate TA
Fall 2003	3 (160-180)	4 (40-45)	Mandatory	7 hours	2 undergraduate TAs

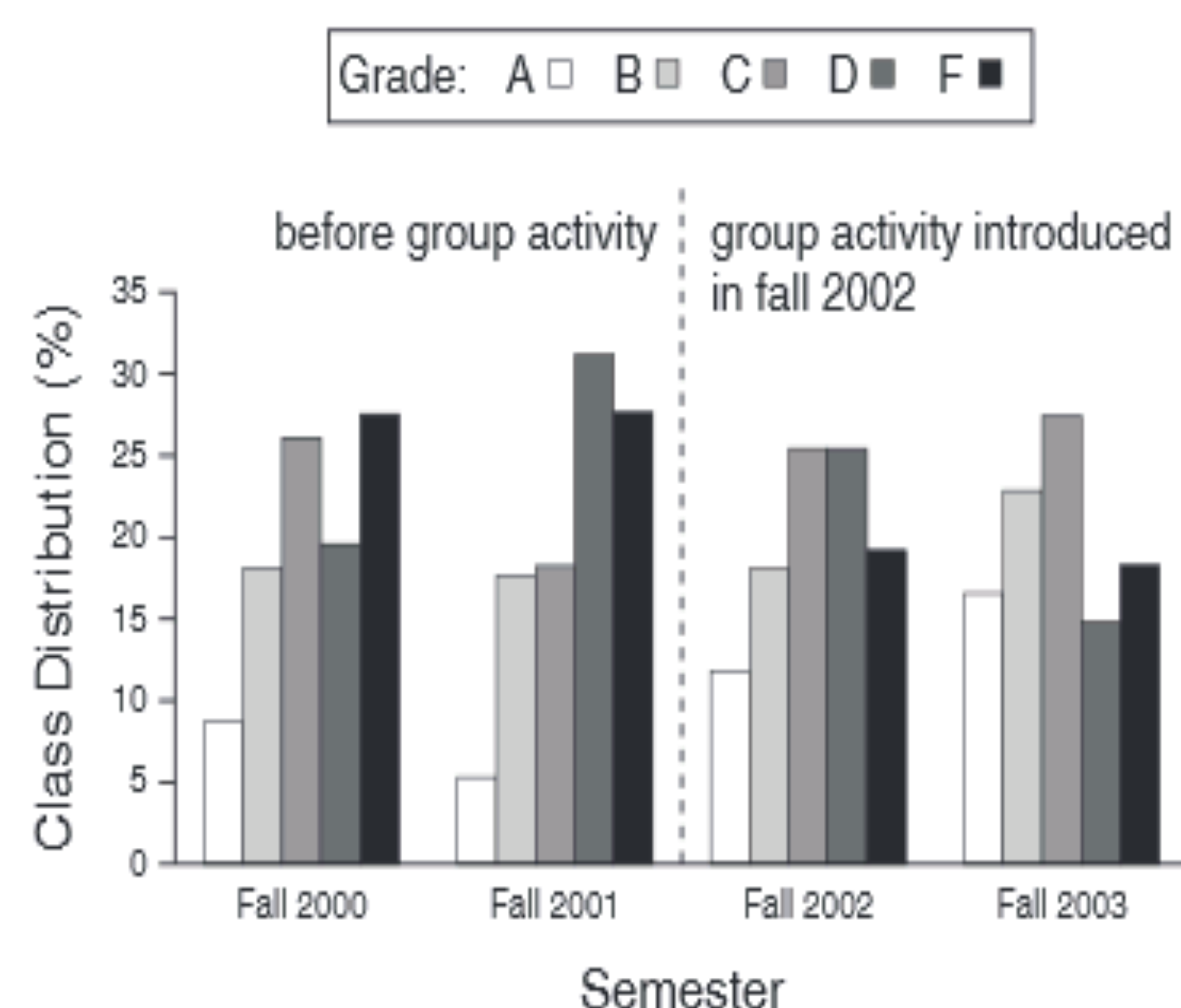


Figure 1. Distribution of letter grades before and after implementation of group problem solving. Group problem solving was introduced in Fall 2002.

Table 2. Distribution of Students Averaging Less Than 60% on Exams, before and after Implementation of the Group Work

Treatment Groups	Class Size (Sections)	Students with Exam Averages below 60% (%)
Before		
Fall 2000	138 (2)	27.54
Fall 2001	170 (2)	27.65
After		
Fall 2002	175 (1)	19.21
Fall 2003	177 (1)	18.29

Results/Discussion

As the data shows, there was a remarkable increase in students grades after the introduction of the group problem solving session. The program the University of Philadelphia Sciences implemented led to an increase in test points and higher grades. Furthermore, the grades only increased as successive iterations of the program occurred, most likely caused by more experience with the program and learning what was successful and what was not.

CHEM 110 is a very large freshman science course, in which students are new to the whole college environment. Therefore this class is a perfect class in which study groups would be the most affective since this is the time to shape students study habits and work ethics. As we had some regulars in our group study sessions we have seen them grow in knowledge as well as confidence in tackling the material in the course. Students from our group have given us positive feedback of how the study sessions have actually increased their grades significantly from just meeting once a week for 2 hours. The regulars Often in large courses like these professor-student interactions maybe hindered by the sheer amount of people. But in these group study sessions, students are more comfortable to open up and speak since it is in smaller groups with undergrads leading these. These group study sessions not only give students more interaction in the class but it also opens up multiple perspectives for the ways of tackling a certain problem by other students along with undergrads who have recently taken the course.

Conclusion

The experimental data shows that group work in freshman chemistry achieves positive reinforcement in the grades of the students. Programs like USP's and PSU's do contribute meaningfully to the success of the student. Furthermore, similar programs at the City College of New York and the University of Connecticut received National Science Foundation (NSF) funds to develop group problem solving sessions. The success of group work and small group problem solving sessions, like the type held by the LA's, have a long record of success. The program at Penn State is a great asset and should be continued and expanded to more classes that students struggle with. At Penn State, the LA program seems to be an effective program for all classes, not just CHEM 110, as personal experience can attest.

References

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