LEARNING CHEMISTRY BY CREATING SIMULATIONS ON PC'S

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The advent of relatively inexpensive microcomputers and the associated software in the past few years has provided us with a new tool for teaching and learning. I have been using these tools for the past five years. The first projects were limited to one or two students working on special projects that were primarily number crunching and data manipulating excercises. The projects have since evolved to the stage where the microcomputers are being used to create interactive simulations of micro- and macro-models of chemical phenomena (there is no need to limit these to chemical phenomena, I just happen to be a chemist).

The latest step of this evolution has been to incorporate these projects as an integral part of a course in physical chemistry. Ninety-eight students in a physical chemistry class consisting of twenty chemistry and seventy-eight chemical engineers were assigned a project to create an interactive animated simulation of a physical chemistry phenomenon. The students were divided into groups of 2, 3 or 4 of their own choice. Group grades were given. They were also allowed to choose any subject that was described in their text, preferably one that had either not been covered or needed expansion.

Most of the students had had a one quarter course in programming using Fortran. The animation software that we used was designed for use with Pascal, few had any experience with that language. One group of students used Basica and developed their own animation programming. The lack of Pascal was not a significant deterent.

My interactions with them on these projects were very minimal. I met with them on a one-on-one (group) basis to discuss the chemical concepts and how to proceed. I provided them with a few guidelines for the overall result. The guidelines were:

1) Create a macroscopic model.

2) Create a microscopic model corresponding to the macro-model.

3) Design the models to change interactively with the user.

4) Make the programs usable by a non-programmer.

The programs were all viewed by their classmates at a "Show and Tell" time during the last three class periods. It took about 5-10 minutes per program with about 28 successful programs. I then evaluated them privately and assigned grades to the results.

This experience was very rewarding to the students (as evidenced by class evaluations) and me.

The advantages to this project are:

1) high student interest and enthusiasm,

2) group cooperation experience,

3) study of subject matter in depth not covered in class lecture,

4) and use of a new tool to express themselves.

In conclusion, I found that the interest generated in creating these interactive animated simulations with microcomputers caused the students to successfully overcome their lack of programming skills and in depth chemical knowledge, and to ultimately enhance their learning.