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**ACS Technology Fellowship Report Final Report**  
**Project Title: Web Based Tutorials for General Chemistry**  
**Grant Period: 2004**

**The Proposed Project.**

With the aid of this grant we proposed to initiate the development and evaluation of web-based tutorials for General Chemistry. The specific goals for this project are to develop alternative methods to engage the students so that they could:

- do more exercises without using a lot of class time
- visualize three dimensional molecular structures and thus, develop chemical intuition
- self-test which will assure that they have grasped the major concepts
- perfect their problem solving skills
- assess their understanding of the material before taking their exams in class

We proposed to design web tutorials for four topics:

1. Nomenclature
2. Solubility and reactions in aqueous solution
3. Molecular geometry
4. Intermolecular forces

**General Description of the Tutorials**

As a part of the introduction, each tutorial contains the general theory and explanation of major concepts, and is divided into smaller units where appropriate. Each unit has practice questions some of which provide hints when incorrect answers are submitted. For the unit on molecular geometry, structures of molecules are provided so that students can correlate the number of valence electrons with the geometry. Finally, a quiz at the end of each tutorial allows the students to gauge whether the expected level of understanding was achieved. The practice questions and quizzes contain multiple-choice questions. The order of these questions as well as those of the answers, are shuffled every time these are accessed to ensure repetition does not occur.

Tutorials for only three of the four suggested topics were completed since a folder containing a huge database of questions on all four topics was accidentally deleted from the server, resulting in a major set back for the project. The current database will be expanded in the future so that with a larger number of questions, several sets of practice sessions at the same level as well as at increasingly difficult levels are available.

### **Implementation and dissemination**

The three completed tutorials were made available for use during the academic year 2004 – 05. The ones on nomenclature and solubility were used during the fall semester and the one molecular geometry in the spring semester. All tutorials are available on web and a link to these may be found at [www.southwestern.edu/~footezm](http://www.southwestern.edu/~footezm).

### **Assessment:**

A formal but qualitative assessment of the tutorial on nomenclature revealed a considerable enthusiasm for these tutorials and a desire for more. Instant feedback on the practice sessions and quizzes had the desired effect in that the students could self-evaluate their preparation prior to an exam. Four of the five objectives applicable to this tutorial were achieved although some to a lesser degree. For instance, improving problem-solving skills requires a larger number of practice questions than were currently available. However, the students clearly understood the need for these and requested that more questions be added. The other two tutorials were assessed only informally and received favorable reviews. A more thorough quantitative as well as qualitative assessment will be conducted during the next academic year.

7/8/2005