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2007-2008 Instructional Grants

Projects which advance the General Education Goals by means of Instructionally-Enhanced and/or Technology-Enhanced Course Redesign

TEMPLATE FOR FINAL PROPOSALS

Final Proposal Deadline: Sunday, February 18, 2007

All final proposals should be electronically submitted as a Microsoft Word attachment by email: *mailto:instructional-grant@udel.edu*. Notice of receipt of final proposals will follow via email. Proposals will be reviewed by Center for Teaching Effectiveness and Information Technologies.

Title of Project	**Virtual Simulation of Determination of Molar Volume Expt.**		
Principal Investigator	**Charles Riordan**		
Rank	**Professor, Chair**	**E-mail**	**riordan@udel.edu**
Department	**Chemistry and Biochemistry**		
Co-investigator(s)	**Mary Elizabeth Kramer**		
Rank	**Staff, Lecturer**	**E-mail**	**kramermb@udel.edu**
Department	**Chemistry and Biochemistry**		
X	***This project has been discussed with all department chairs of the Principal Investigator and Co-Investigator(s).***		

Nature of Project. Project will advance the following **General Education Goal**. *(select only one)*	
	Capstone – Goal # 7 is given priority in review of grant projects.
X	Quantitative Reasoning – Goal # 1 is given priority in review of grant projects.
	Student Multimedia Design Center – Goal # 1 is given priority in review of grant projects.
	Academic and Student Affairs – Goal # 7 is given priority in review of grant projects.
X	Other *(please specify)* – Meritorious grant projects strongly supporting **one** General Educaton Goal will be considered.
To advance the above **General Education Goal**, this project will use. *(select as appropriate)*	
	Problem-based Learning
	Active Learning Approaches, e.g., case studies, collaborative learning
WebCT	Technology, e.g., WebCT, multimedia, emerging technology
X	Other *(please specify)* Critical Thinking Skills

Course Number	**Course Title**	**Semester(s) Offered in 2007-**	**Est. Students**	**Percent Major**

		08	Per Semester	
Chem 104	General Chemistry	Fall Winter Spring	100 50 350 - 400	<5% <5% <5%
Course fulfills the following University/College/Department requirements.				
Chem 104 is required for BA chemistry majors, BS and BA biology majors and many agricultural and nutrition majors.				

1. Description of Project *(2 page limit)*

Please describe nature of your project, stating the instructional problem(s) to be solved.

a. *How will the project impact student learning in the course?*
Address each question separately in preparing your project description.

b. *How will the project complement your current teaching activities (e.g. instructional approach, methods, pedagogy)?*
Address each question separately in preparing your project description.

c. *How will the project impact department / college / university objectives*
Address each question separately in preparing your project description.

d. *How will the project best utilize existing departmental resources (e.g. equipment, software, facilities, expertise, personnel)?*
Address each question separately in preparing your project description.

General Description.

This project is to design a virtual lab simulation to replace a laboratory experiment that is no longer a part of the curriculum because of safety considerations. A search of the internet provided no simulation that could replace this experiment. The simulation will follow as closely as possible the actual manipulations that would have been performed in the lab. By reinserting this experiment in the lab sequence we will reinforce important gas laws chemical concepts. Also, the experimental calculations require critical thinking, quantitative reasoning and data evaluation.

a. Impact on student learning in the course.

Although hands – on laboratory experiments are still the best method of reinforcing material learned in the classroom, safety considerations have caused the elimination of this experiment from the laboratory sequence. By developing this experiment in a virtual environment, we can reinsert it into the curriculum. This experiment develops critical thinking and quantitative reasoning skills, and reinforces the gas laws concepts covered in class. The virtual experiment will be designed to run as closely as possible to an actual hands – on experience.

The procedure for the experiment will guide the student in assembling the equipment and performing the experiment. In the hands – on version of the experiment, materials may be put together incorrectly or the chemicals heated too quickly – both of which can lead to explosive results. In the virtual experiment, we will allow the students to make the same mistakes that can happen hands – on but without the consequences. When these results occur, it is up to the student to determine (with prompting if necessary) exactly what happened and how to rectify the error.

The experiment will produce numerical results based on the amount of material used and the reaction conditions. From these data, the students will be required to work through the quantitative calculations. The value obtained will then be compared to the accepted value and students will be able to calculate percent error and determine how well they have done.

Evaluation of their results should lead to thinking about sources of error and what could have been done to improve the results.

b. How will the project compliment your current teaching activities.

The addition of this laboratory experiment in a virtual mode will enhance and compliment the existing hands – on laboratory experience that students have. It is not meant to replace all hands – on experiments but to preserve a valuable experience no longer practical in a hands – on setting.

By adding this experiment back into the lab sequence, we will be able to further reinforce the important concepts of stoichiometry, molar volume, and partial pressure, as well as other concepts that are covered in class. This additional experience with these concepts will help the students better grasp these important ideas.

The presentation of this material will also further improve the students' critical thinking and quantitative reasoning skills and explicate, in a meaningful way, the concepts covered in class.

c. Impact on department/college/university objectives.

This project will advance the goals of critical thinking skills and quantitative reasoning skills. Also, it should make general chemistry laboratories a more engaging and useful learning experience for nonmajors.

d. Utilization of existing departmental resources.

Even though the experimental data will be collected in a virtual environment, the lab report will be written by the students in the same manner as lab reports generated from data collected in a hands – on lab. This will allow the Graduate Teaching Assistants, who oversee the labs, to grade this experiment in the same manner as other experiments are graded.

2. Implementation *(2 page limit)*

Support involved in project (e.g., User Services, CTE, Library, Media Services)	Assistance confirmed (name of personnel)
User Services	Janet de Vry
CTE	Gabrielle Bauer Kathleen Pusecker

a. *What is your timeline for development of the project (between July 1, 2007 and June 30, 2008)?*
Address each question separately in preparing your project description.

b. *What stumbling blocks do you anticipate which may hinder the success of the project?*
Address each question separately in preparing your project description.

c. *How will the project be sustained by your department / college upon completion?*
Address each question separately in preparing your project description.

a. Timeline

Summer 2007 the development and programming of the simulation will take place. This will require close cooperation between the programmer, Becky Kinney, and the investigator, Mary Beth Kramer. The project will go through a pilot test in August with approximately 20 student volunteers. After the results of the pilot testing, revisions will be made if necessary. The project is designed to be accessed by the students using WebCT. This part of the project along with actual simulation will be tested when the simulation is used in the Fall 2007, Chem 104 class. Data collected from this larger scale testing will allow further refinements to be made to the project.

b. Stumbling Blocks

Since it is difficult to determine how long the actual programming will take, finishing in time for the project to be piloted in August may be a problem. If it is necessary to pilot the project in the Fall rather than August, the larger testing will have to be done during the Winter session 2008.

c. Project Sustainability

Once the project has been through final testing and is on WebCT, it may be utilized by any of the General Chemistry classes.

3. Assessment *(2 page limit)*

An assessment guide is available at www.udel.edu/cte/eval.htm.

Support involved in project (e.g., CTE, Office of Educational Assessment)	Assistance confirmed (name of personnel)
CTE	Gabrielle Bauer Kathleen Pusecker

a. *Describe how you will evaluate the students' learning. What assessment means will you use to evaluate student achievement of project goals (e.g. assignments, student work, portfolios, types of exams)?*
Address each question separately in preparing your project description.

b. *How you will determine the effectiveness of the project?*
Address each question separately in preparing your project description.

a. Evaluation of student learning

The students will be completing a standard lab report after collecting data in the virtual environment. The lab report will be graded by the Graduate Teaching Assistants. The grade on the report is based on the student write up of the procedure, the percent error from accepted values, and the answers to post lab questions. This experiment will be one of 11 or 12 that the students will perform and will be one part of their total lab grade.

Since the experiment will be entered from the WebCT environment, the time that the students spend on the simulation and the number of repetitions that are performed. may be tracked. As the student finishes the simulation, self reflective questions will be included before a second trial can be performed. Identifying what worked, what difficulties were encountered and what was discovered that could make the simulation work better, should allow the students to learn from any mistakes that occurred.

The chemical concepts covered by the simulation will be tested by in class quizzes and exams. Evaluation of the students understanding of the concepts will be determined by their performance on these tests.

b. Effectiveness of the project.

There have been recent publications that indicate a better student understanding of concepts using simulations. Since the project will be implemented in the Fall, during the Chem 104 course this Spring questions will be asked on quiz material that address the topics covered by this simulation. Then, the same questions will be used in the Fall after the students have had the reinforcement of using the simulation. Comparison of the results should give us an indication of the effectiveness of using the simulation.

Before the student can close out of the simulation, the student will have to answer questions on the efficacy of the simulation. For example: How does the experience compare to a hands – on experiment? How much time does it take compared to a hands – on experiment? Did the simulation focus you on the topics that are involved in a clearer way than a hands – on experiment? Answer to these questions will allow us to make a formative assessment of the simulation for improvement purposes.

Also, once the project is working smoothly, it can be used by any of the General Chemistry classes. I have already talked to the Professors involved in teaching the Chem 101/102 sequence which is designed for non science majors. They too, would be interested in using the simulation.

4. Funds Requested - typically awards have not exceeded $20,000 *(2 page limit)*

Address each aspect separately in preparing your project budget.

ITEM	AMOUNT REQUESTED	DEPT/COLLEGE actual and in-kind funds	EXPLANATION/JUSTIFICATION
TOTAL of Budget Items	$7107	$1795	
Faculty summer S-contract	$4017 for Kramer summer $2090 for Kramer fall		*Summer Supplemental Faculty includes 8% fringe.* *½ Fall Supplemental Faculty, includes 8% fringe.*
Graduate stipend	0		
Graduate stipend fringe 4%	0		
Graduate student non-contract (no fringe), or undergraduate student misc wage (no fringe)	0		
Consultant non-UD S-contract	0		
Consultant non-UD S-contract fringe 8%	0		
Equipment (itemize/detail)		$1795	Departmental Computer upgrade of Primary investigators computer system. Includes $1765 for 13" MacBook and $30 for carry sleeve.
Software (itemize/detail)		$500	Microsoft Office and Spyware
Supplies & Books (itemize/detail)	$500		Cost for data storage devices to collect and store dtudent results
Conferences & Travel (itemize/detail)	$500		Travel and associated cost to attend professional meeting to present results of project.
Other (itemize/detail)	0		
Sustainability costs	0		Costs to be covered to sustain course and maintain equipment and software once grant funds are expended.

Pending support from 0other source(s)	0		
Prior grant(s) (2000-2006)	0		