Workshop 3
Energetics and Dynamics

The Complexity of Teaching Chemistry: This program emphasizes the importance of learning about the basic principles of energetics and dynamics. The complexity of teaching concepts such as the collisions theory, reaction kinetics, and electronic energy levels is introduced using a variety of teaching strategies. These concepts are related to everyday phenomena through topics such as nuclear and solar energy.

Learning Objectives

- To emphasize the role of energetics and dynamics in chemical processes
- To discuss ways to facilitate the complexity of teaching chemistry

Pre-Workshop Preparation

1. Read the following: "The Constructivist View," by Dorothy Gabel, in *ChemSource,* version 2.1 (Orna, Mary Virginia, O.S.U.; Schreck, James O. & Heikkinen, Henry, eds.), vol. 1, PEDA, pp: 7–8, 1998 (in the Appendix of this guide). What is the complexity of teaching chemistry? How does the SAP approach aid in addressing this difficulty? Give examples from your own classroom.
2. Choose a topic about nuclear chemistry which you find complex to teach. Explain what the difficulties are in teaching it and how you would solve them in your lesson plan. List any concepts that you need to introduce and the illustrations that you would use.
3. Review reaction kinetics. Go to http://www-scf.usc.edu/~chem105b/beaudet/resources/Kinetics/simulator_intro.html. Go into the instructions section, follow them, and write down your results of the "things to try" in your notebook. Have fun.

Workshop Session (On-Site)

Getting Ready (30 minutes)

Open the meeting with a presentation, by one or two of the teachers, of the lesson plans they designed at home about nuclear chemistry. Hold an open discussion about the presented activities. Discuss the difficult concepts, the complexity of teaching them, and how you would teach them in class. Suggest other teaching strategies that may be used to teach similar subjects.

Watch the Workshop Video (60 minutes video/60 minutes discussion)

Focus

This workshop is about the energetics and dynamics of chemical processes. It presents the complexity of teaching chemistry and ways to overcome it.

Unit 3.2. When Particles Collide

Stop the video after the slide about the catalytic converter.

> Refer to the quote from R. Duit, 1990, [On the Role of Analogies, Similes, and Metaphors in Learning Science, paper presented at the annual meeting of the American Educational Research Association, Atlanta, GA]: "In order for an analogue to be effective, it must be familiar to the students and it must be in a domain in which students do not have any misconceptions." Discuss how the analogues that Ms. Walsh uses apply to this definition. What are the limits of Ms. Walsh's analogy?

Unit 3.3. Reaction Dynamics

Stop the video after Ms. Walsh's laboratory about clock reactions.

Comment on the complexity of teaching chemistry in the laboratory in Ms. Walsh's class.

Are the safety measures sufficient? Are the students familiar with the methods? Do they understand what they are doing? What interaction is there among students and between the students and the teacher?

Unit 3.5. The Energy of Light

Stop the video after the slide about UV and tanning.

What methods does Mr. DeGennaro use to visualize chemical concepts to his students? Could computer technology be useful to illustrate these concepts? How does the teacher's energy influence the dynamics of learning in the classroom?

Unit 3.6. Radioactivity

Stop the video after Ms. Berry's laboratory about radioactive sources.

Would you show the segment about radioactivity (Unit 3.6) in your class, in order to enhance your students' understanding, or would you prefer that they conduct these activities by themselves? What are the advantages in each method? How does the work with actual sources of radiation and analogies impact the affective side of learning nuclear chemistry?

Unit 3.7. Nuclear Power

Discuss how you could use the natural interest and curiosity of students about radiation and nuclear chemistry in order to teach them related topics. Can the students apply their knowledge from nuclear chemistry to the understanding of its everyday applications?

Workshop Session (On-Site), cont'd.

Going Further (30 minutes)

Continue the debate from the Teachers' Forum in the last segment: Do you think the sciences should be taught integratively, or should they be taught separately? Do you find that relating to other sciences while teaching chemistry facilitates the introduction of chemistry concepts to students? Use examples from the program to explain. Discuss your comments about teaching in each segment.

Between Sessions (On Your Own)

Homework Assignments

1. Teaching about radiation: Go to Ms. Berry's Teaching Tips for the Radioactive Sources Laboratory in the Activities Guide in the Appendix. Explain her goals in performing this laboratory. Do you agree with her opinion? Do you see other advantages to this activity? Do you think that the use of real scientific methods and equipment and free planning of the experiment improve students' understanding of the learned subject? (Relate your answer to the program and see also the students' guide for this activity.)
2. Read the quotes in the Appendix by Prof. Darleane Hoffman about radiation and about the history of discovery of radioactivity by Henri Becqeurel (see also Unit 3.4). How would you use these in your teaching about nuclear chemistry? How can these stories facilitate teaching about radiation?
3. Search the Internet for sources about solar and nuclear energy (you could also use the links and readings here). Explain these technologies, the advantages and disadvantages of using both, and the chemical processes behind them. Discuss where in your curriculum you would address them.

For additional information and activities about nuclear chemistry, go to the ChemSource Web site at http://intro.chem.okstate.edu/ChemSource/chemsource.html.

In particular, go to the Concept/Skills Development section at
http://intro.chem.okstate.edu/ChemSource/nuclear/nuclchemindex.htm and practice the Pattern Recognition/-Problem Reading section [*ChemSource,* version 2.1 (Orna, Mary Virginia, O.S.U.; Schreck, James O. & Heikkinen, Henry, eds.), vol. 3, NUCL, pp: 7–9, 1998].