

Workshop 6

The Chemistry of Life

Effective Teaching Strategies: This program discusses the chemistry of the wonders of life. It starts off with the way life began and goes on to deal with the structure and function of biological molecules. It emphasizes the value of relating chemical principles to biology studies and states that living organisms are huge chemical systems in equilibrium. Thus, learning processes are based on the chemistry of life, and this program shows how effective classroom strategies aim at enhanced learning.

Learning Objectives

- To relate the basics of chemistry to the mechanisms of life
- To discuss effective teaching strategies used to enhance learning

Pre-Workshop Preparation

1. Read the following: "Effective Classroom Strategies," by Dorothy Gabel, in *ChemSource*, version 2.1 (Orna, Mary Virginia, O.S.U.; Schreck, James O. & Heikkinen, Henry, eds.), vol. 1, PEDTA, pp: 10–18, 1998 (in the Appendix of this guide). List the various classroom strategies, and explain their importance for effective teaching. Give examples for each from your own teaching.
2. Choose one (or more) strategies, and use them in building a lesson plan on the subject of the chemistry of life. Explain why you have chosen this strategy, how your lesson plan uses these principles, and the advantages and disadvantages of this method.
3. Learn about the chemistry of amino acids through computer modeling. Go to <http://info.bio.cmu.edu/Courses/BiochemMols/PQuiz/PQInst.html>. Study the structure and properties of amino acids and explain the importance of this activity in light of the effective classroom strategies list that you made.

Workshop Session (On-Site)

Getting Ready (30 minutes)

Present the lesson plans that you have prepared and discuss what strategies are emphasized in each. Try to discriminate between the methods and explain in what situations you would choose either strategy. Give examples to its application in your own classroom.

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

Focus

This workshop makes the connection between life and the chemistry that drives it. Learning is also a biological process, and this workshop presents effective strategies to enhance learning.

Unit 6.2. Finding Chemicals in Unexpected Places

Stop the video following Dr. Pierce's activity.

What is the effect of the surprise of discovering iron in cereal on the process of learning chemistry? Brittany is not surprised by the result. How does Dr. Pierce handle the situation? What, do you think, is the importance of inserting student-mediated activities into the curriculum? What are the potential possibilities or difficulties in doing so?

Unit 6.3. Chemical Processes in Nature

Stop the video after the slide about the process of breathing.

The cabbage juice indicator activity is used as a take-home test. What is the value of this activity for the assessment of knowledge in chemistry? Are take-home exams a useful way of assessing student's knowledge? What is the value of doing kitchen chemistry?

Unit 6.4. Recognizing Chemicals in Different Forms

Stop the video after Mr. DeGennaro's class.

What teaching strategies does Mr. DeGennaro use in the activity about the calcium content of Tums? What are his main goals in this lesson? Are his teaching strategies effective in reaching these goals?

Unit 6.6. The Energy in Food

Stop the video after Mr. Muhiga's class.

Compare Ms. Morine's laboratory to Mr. Muhiga's. How does each teacher approach the same subject, energy in foods? What are the advantages/disadvantages of each of the laboratories for teaching the subject of energy in food? In what context would you teach this laboratory?

Unit 6.7. Chemical Processes in Biology

How do Dr. Pierce's questions lead the way to a better understanding of the concepts that she is teaching? What ideas does her lab bring forth? How does she relate between chemistry and biology? (Consult also her lecture notes in the Activities Guide in the Appendix.)

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

Going Further (30 minutes)

The program brings about several ways of teaching about the chemistry of life, using different teaching strategies, and topics from different disciplines. What do you think is the effect of teaching important chemistry principles from a biological point of view, and of teaching about biological processes from the underlying chemical processes? Do the students benefit from interdisciplinary teaching?

Between Sessions (On Your Own)

Homework Assignments

1. Go to the Quotes section in the Appendix and read the Scientists' and Experts' quotes. What are important relationships that they make between everyday phenomena and the chemistry that drives them? Read the teachers' forum and students' quotes and explain how the teachers can utilize the relationship between chemistry and biology to teach chemical principles. Bring examples from the program and from your own classroom.
2. Professor Terry Collins, an expert on the chemistry resources of our civilization, says that "One of the major ways to reduce pollution is to move the elemental balance of chemical technology closer to the elemental balance of life, wherever possible." Give examples from everyday life for this statement, and explain how modern industry deals with this problem. Conduct a debate in your class about whether or not humanity can afford to go into an all-natural industry, and write about it in your journal.
3. Go to the Web site(s):
http://www.linuspaulingexhibit.org/exhibit/body_proteins.html
<http://www.lbl.gov/Science-Articles/Archive/model-protein-folding.html>
or search for "protein folding." Read about the work of Prof. Linus Pauling on the subject of protein folding and about the importance of his works and that of his followers' discoveries. Summarize briefly and relate it also to his quotes in the Appendix.

For additional information and activities about chemistry and food, 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/Chemfood/chemfd13.htm> and try the Analysis of Milk activity [*ChemSource*, version 2.1 (Orna, Mary Virginia, O.S.U.; Schreck, James O. & Heikkinen, Henry, eds.), vol. 2, FOOD, pp: 15–22, 1998].