Topic: Math, Chemistry, and Food

http://www.enzymedica.com/enzymedeficiencytest.pdf
Enzyme properties in food

Grade 9-Adult
An integrated lesson plan covering one session of approximately 1.5 - 2 hours.

Lesson-Planning Approach

Some learners perceive their "world" as a whole, where all things are interconnected and dependent upon each other. These "integrated" students face major challenges in coping with our dominant educational, social, and economic systems, which tend to present information in a linear fashion without the necessity of integration into meaningful context. Integrated students are at-risk of failing as they attempt to grasp information in ways that do not match their experience. Among large populations of at-risk students are many from Native American and similar cultures who do not regard their world as a sum of parts but as a blend of all that they experience.

This lesson plan does include some traditional, linear approaches to delivering information (checklists, rules, analysis, problem solving and organization). In addition to the traditional, linear delivery of information, this lesson plan also includes some of the following strategies, designed to appeal to at-risk students as they learn academic/life skills:

- Integration of technology
- Story telling/anecdotal information
- Non-competitive group and team work
- Performance-based assessment and rubrics
- Visual presentations and practice through technology and other means
- Project-based assignments that integrate family and community
- Activities appealing to multiple intelligences (Gardner)
- Application of Scientific Method to formulate and solve a problem.

Lesson Overview

This lesson is designed to familiarize students with the concept that food and cooking involve many complex chemical reactions that can be measured using basic math. Students will prepare pineapple jell-o with fresh and canned ingredients and compare the enzyme activity.

Lesson Objectives

Project Objectives: When students complete this session, they will be able to…

- Follow a simple recipe
- Explain how enzymes work.
- Combine different ingredients and predict how they will react.
- Design and carry out an experiment to test a hypothesis about enzymes.

Integration of Other Functional/Academic Skills: (Critical thinking is required throughout the lesson.) Students will be able to…

Math:	Estimate and accurately measure different ingredients.
Reading:	Comprehend the written directions, ask questions and clarify the procedure.
Writing:	summarize; define; explain
Listening:	Follow the oral directions and safety precautions
Science	*Ap*ply scientific method to design and create another enzyme experiments
Technology:	Apply basic features of Microsoft Word and search a site on the Internet

State/National Standards (Complete as Appropriate)

http://www.cde.state.co.us/cdeassess/sci.htm#standards Science
http://www.sssoftware.com/standards/colorado.html Math

Websites

Required:
http://www.enzymedica.com/enzymedeficiencytest.pdf **Enzyme test**

Support:
http://acsinfo.acs.org/journals/jafcau/ Journal of Agriculture and Food Chemistry

Pre-requisites: Read at sixth grade level or above.

Required Materials

- 1 Box lemon Jell-O 1 can pineapple 1 cup of fresh pineapple chunks

Handouts

- What are enzymes? (Handout 1)
- Lesson Checklist (Handout 2)
- Experimental Design (Handout 3)
- Lesson Rubric (Handout 4)

Required Equipment/Technology

- 1 computer, with Internet connection and a MS Word for every group of 2-3 students
- Balance
- Stove or hot plate to boil water

THE LESSON

Note: Students do not learn from what <u>you</u> do but from what you have <u>them</u> do.

PART I
Preparation

Research Enzymes Purchase enough small boxes	**Show students how to use URL addresses.** **Show students how to look up words and information in http://encarta.msn.com/ ,** **http://dictionary.msn.com/ ,** **Have students practice accessing several different URL's with your help.**

Presentation

Activity	Instructor Notes
Show students how to use URL addresses. Show students how to look up words and information in http://encarta.msn.com/ , http://dictionary.msn.com/ , http://www.howstuffworks.com/enzymes Have students practice accessing several different URL's with your help	**Tell the story of Sisyphus rolling the stone up the mountain. Sis·y·phus** [sísəfəss] *noun* **king of ancient Corinth:** in Greek mythology, a cruel king of Corinth who was condemned for eternity to roll a boulder up a hill only to have it roll down again just before it reached the top.(Enzymes reduce the size of the mountain so that it is easier for the reaction to occur).
Perform the experiment and refrigerate for several hours	**This is a very simple experiment, and I suggest the students set it up and get it into the refrigerator before you discuss enzymes.**
Examine and discuss the results.	**Go through each handout and have students explain enzymes before you discuss the article**

	in depth. They might also like to take the enzyme test to see how their own enzymes are working

Performance and Practice

Instructions for students	**Teacher notes**
Discuss the results	**The jell-o containing fresh pineapple should not gel because it contains the enzyme that breaks down protein. Discuss how enzymes are killed by heating and processing**
Have students design a second activity that would test enzyme activity	**Possible activities might involve chewing a cracker until it becomes sweet (Starch is converted to sugar in the mouth). Lots of diet pills these days include enzymes. You might want to test them on different food groups to see if they break them down**

Lesson Assessment Strategy (Formative – As the lesson progresses)

Preparation, Presentation and Overall Implementation (Instructor)

1. Are the instructions and expectations for the class clear from the beginning?
2. Am I spending sufficient time on modeling the skills I want students to acquire?
3. Is there enough variety in the lesson to appeal to most learning preferences?
4. How many learning intelligences am I addressing?
5. Are students "connecting" to lesson objectives? How?
6. How is this lesson "integrated?"

Performance and Practice (Student)

1. Do all students have the skills to follow instructions? If not, what measures am I taking to address the challenge?
2. Are all students participating in the activities either by active observation or by voicing their thoughts?
3. Am I identifying the strengths of each student and pairing/grouping people accordingly? What results am I getting?
4. How are students performing? Are all of them able meeting 80% of the lesson objectives? If not, what am I doing to help them achieve more?

Technology

1. Is the technology working?
2. How are students reacting to the technology, and what do I need to remember when I teach this lesson again?
3. How are students applying or wanting to apply their technical skills in other areas?

Activity Checklist (Handout 2)

Discuss the topic.	
Examine and discuss handouts.	
Observe how to find URL's and navigate relevant sites.	
Prepare the two types of Jell-o	
Go to the Internet and visit http://www.enzymedica.com/enzymedeficiencytest.pdf Read and take the test In a group or in pairs, discuss your body type according to the results	
Explain enzymes using pictures and words	
Observe any changes in the refrigerated Jell-o	
Compose a summary paragraph about enzymes and describe another digestive enzyme.	

Procedure (Handout 3)

- Carefully divide a package of lemon jell-o in half using the balance
- Place in two separate bowls or beakers
- Add ½ cup of boiling water to each. Stir until dissolved
- Add ½ cup of Fresh Pineapple to one bowl, and ½ cup of Canned Pineapple to the other bowl.
- Place in a refrigerator or freezer, or in the snow. If not available, add ½ cup of ice to each.
- Complete the rest of the activity while they chill
- Observe after and hour, and check on them the next day if possible.