Contextual Teaching & Learning
Linda Hatcher

Contextual Science

How are the culinary and science professions alike?

Research

As we learn more about how students think and learn, we also need an ongoing study of ways to motivate them to continue to learn, because lifelong learning will be even more important in a continually evolving technological society. Contextual learning is the best framework for providing a more effective, satisfying education for all students (Parnell, 1995). To keep students learning, we must draw from their interests and personal experiences and demonstrate the connections between what they need to learn and how that learning will be used in the real world.

Science lends itself well for conceptual teaching practices because the laboratory setting is an excellent place to use many of the methods we have been discussing. The traditional "sit and listen" approach to teaching might well be called the "freezer method" of education (Parnell, 2001). The hands on activities carried out in the lab are definitely not the sit and listen approach used by too many educators today. The military has found that slow learners require two to five times as much individual instructional time as fast learners. It has also found that slow learners learn best when they apply information as they learn it (Parnell, 2001). This application can and does take place in the lab.

Most science teachers normally will assign a variety of projects to be completed throughout the school year. Projects should closely resemble the kinds of "authentic" accomplishments achieved by adults in the "real world" (Blank, 2001). Real life is all about getting projects completed successfully-whether in the workplace, in the home, or the community.

Whether students are working in the laboratory, at home, or in groups they learn from each other, building understanding and tolerance of differences and at the same time learning to value the diversity (Blank, 2001). One of the best ways for students to learn is to be able to connect their learning to prior knowledge and experiences. Connections are what students desperately require surviving and succeeding in our high-speed, high-challenge, rapidly changing society (Parnell, 1995).

Students in most schools and colleges go from subject to subject, from grade to grade, and from school to school with little sense of continuity or connection (Parnell, 1995). Most students have little sense that one class builds on another or that their education is preparing them for real life situations (Parnell, 2001). Teachers should

integrate the subjects so that students can see the connection. Schools are the only place where subjects are separated. In the real world all areas are definitely integrated. Everyone asks the question: where is education headed? Teachers, administrators, and educational leaders across the nation are beginning to catch the contextual learning vision and to turn education in this country right side up (Parnell, 1995).

Content

* You will learn to make measurements using the metric system.
* These measurements will encompass mastering the metric ruler, triple beam balance, and the graduated cylinder.
* You will demonstrate your ability to convert the original measurements to lower and higher values by moving the decimal point the correct number of places in the proper direction.

Materials
Laser Player & Television
Laser Disc Volume 1
Data sheet airplane checklist 8 1/2 x 11" white paper (two for each student)
stapler clear tape masking tape paper clips pencil or pen
Meter sticks (one for each pair of students) student handout
1/2 C flour salt baking soda 1-stick butter
brown sugar white sugar vanilla extracts 1 egg
1 package chocolate morsels

State Standards

QCC 8.3 Defines and identifies standards of measurement.
* 3.1 Names the prefixes used in the SI system.
* 3.2 Identifies the SI units and symbols for length, volume, mass, density, time, and temperature.
* 3.3 Converts measurements among related SI units.
* 3.4 Uses appropriate tools for determining mass, volume, temperature, density, and length.

QCC 8.4 Selects and uses multiple types of print and nonprint sources for information on science concepts.

Procedures/Activities

Day One/Introduction with the Laser Disc Player

Why do we need a measurement system?

When experiments are performed there are almost always some observations where questions like "how fast", "how far", or "how much" must be answered. The only way to answer these questions is through measuring.
What is a standard?
A "standard" is something that is used as a comparison for measuring. It must never vary and be available to all.
What system of measurement is used today in the United States?
The system of measurement used in the United States is the English system. (Foot, inch, pound, etc.)
Why is it difficult to have more than one system of measurement in the world?
It is difficult to have more than one system of measurement because we communicate world-wide.
What is the International System of Measurement?
Metric system
Why do we find it difficult to use the metric system?
We are not used to using this system.

Day Two/Class Discussion on Metric Units

Before class, access the Web site and print out (and copy) the math problems (English system vs. metric) found there. Keep this ready to hand out or copy to the board. Begin a discussion of measurement by writing several units of measure on the board in 2 columns, one for metric, one for English. Ask students which units they would rather use. (Generally, they will prefer English, foot, pound, etc.) Now produce the math problems form the Web site and test to see which system is simpler to use. Explain to students that they will be researching this system and filling out a question attachment as they go. Handout the URL guide and the student attachment and ask if there are answers they already know. Direct students to begin research. If possible, save the URL guide to a disk so students can access the sites directly. (If computers with Internet connections are limited, the students can work in teams. If Internet is unavailable, the main Web sites can be accessed and printed elsewhere and copied ahead of time for the class.) In closing, ask students to compare these systems. What recommendations would the students make if they were part of a commission to study permanent adoption of either system? Why?

Day Three/ Why Decimal?

Question: Which column would you rather add?

Inch-pound units	Metric units
1 yard, 2 feet, 3-1/4 inches	1.607 meters
1 foot, 11-3/16 inches	0.589 meters
2 feet, 5-1/2 inches	0.749 meters
3 yards, 1 foot, 6-5/8 inches	3.216 meters
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? yards ? feet ? inches ?	meters

Hint: The two sums are the same.
Answer: 6 yards, 2 feet, 2-9/16 inches; or 6.161 meters

Why Decimal?
A room measures 15 ft. 3-3/4 in. by 21 ft. 7-1/2 in. (4.667 m by 6.591 m).
Questions:
What is its floor area in square yards? 36.79 sq. yd.
What is its floor area in square meters? 30.76 m2

Why Decimal?
In designing a calendar you wish to divide an area of 7-1/4 in. by 11 in. (184 mm by 279 mm) into 35 rectangles; that is you wish to divide 7-1/4 in. by 5 and to divide 11 in. by 7.
Questions:
What are the dimensions of each rectangle in inches?
What are the dimensions of each rectangle in millimeters?
Answers:
1-29/64 in. by 1-37/64 in., or 36.8 mm by 39.9 mm

Day Four/Cookie Baking

Explain to students that this lesson will put measurement skills to use and may prove delicious! Handout the student recipe "Mmm, Mmm, Metric." This provides the Chocolate Chip cookie recipe with both units of measurement listed, and the recipe for chocolate chip cookies, with the ingredient list given in metric units. Direct students to convert the measurements given from one system to the other, using the reference handout and the web site. If computers with Internet are not available or if simpler, access the Web site ahead of time and print and copy the information found there. A place for chefs! A metric conversion chart (ml to g and oz to g, plus more) and an online temperature converter make life much easier for the cook. The next day, return student recipe conversions and review the measurements. If possible, have students actually use the recipe to mix and bake the cookies. Alternatively, they can take the corrected recipe home and complete it for homework.

Day Five /Measurement Lab

This measurement lab requires advance set up of several tables containing various measuring tools as well as direction and completion sheets for students.
Explain to students that in this lab they will be using various forms of measurement. Ask them to guess the measure of various items and spaces in the classroom. Begin with an example such as the science text, using pounds as the unit of measure. Following several guesses, explain that, were in just about any other country, they would not be using English measure but metric. Repeat the guesses, this time in metric measure.
Divide students in teams of 4 or so and handout the student attachment. Direct them to begin rotating from one measurement center or table to the next, completing the necessary measurements and filling in the data as they go.

Day Six/Airplane Lab

1. Review science process skills with class. Information that should be included in this review is attached. Teacher may use it as a guide or as a handout for students.
2. Explain that students will be making two paper airplanes to fly in the hall outside the classroom or in the gym. One called the "basic" we will make together as a class activity. Be sure to point out this plane is the control. The second plane, which they will make on their own and name whatever they want, will be made the same way but they can make modifications (paper clips, staples, flaps). Explain that the modifications will be the manipulated variable. Hand out two Data Sheets (attached) to each student. Explain that they will record the results of each "flight" on these sheets. They are allowed five and only five throws of each plane.
3. Teacher will hand out the checklist (attached) and go over it with the students. Be very clear that this is how they will know exactly what is and is not an acceptable plane.
4. Teacher will pass out two sheets of white 8.5x11" paper to each student. Demonstrate step by step how to make the basic plane (see Web page for directions). Teacher should monitor the class and work with students individually to help each student make the plane correctly.
5. Repeat the "basic" steps for the second plane. When students are finished, pass out staplers, paper clips, tape, and scissors. These are used to make whatever modifications students want. It is helpful for the teacher to model cutting flaps or taping the nose of the plane to give students ideas on how to modify the plane. Be sure the students know they can modify only the second plane. At this time have students consider both planes' physical characteristics at desks and form their hypothesis, which should be written in space provided on Data Sheet.
6. Review measuring distances using meters and centimeters. Ask students to practice measuring distances in the room (width of table, length of board) using the meter stick.
7. This step may be done in the hall or school gym. It is helpful to pre-measure distances using masking tape. Place start tape on floor and mark off every 3 meters stopping at the 15 meter mark. Select pairs of students to measure and throw planes together. Give each pair one meter stick. Working together helps keep them honest. Monitor and demonstrate how to measure the flight with each pair.
8. When students have finished "flights" of planes, have them write their conclusions on the space provided on data sheet. They should also take this time to calculate averages of each plane and show work on data sheet.
9. Teacher should lead students through the process of using Power Point and creating a graph of the results of their "flights." Students should use the guidelines stated in the rubric to complete graph. See attached Web site for guidelines and instructions on using PowerPoint if needed.

Day Seven/Continue with Airplane Lab

Day Eight/Assessment-Rubric

Bibliography

1. Blank, William E. and Sandra H. Harwell (2001). Promising Practices. Waco, Texas: CCI Publishing. ISBN 1-57837-278-x.
2. Parnell, Dale (1995). Why Do I have to Learn This? Waco, Texas: CORD Communications, Inc. ISBN 1-55502-519-6.
3. Parnell, Dale (2001). Contextual Teaching Works! Waco, Texas: CCI Publishing. ISBN 1-57837-278.

Biography

Linda Hatcher is a twenty-third year earth science and biology teacher in Bartow County, Georgia. She taught twenty-two years in Polk County, Georgia before moving to Bartow County in 2002.