



What's Inside? A Closer Look at Chocolate Candy

Introduction

Students will conduct a scientific inquiry of the ingredients in a variety of chocolate candies, making use of qualitative and quantitative observation, and inference.

Students will record and present collected data in chart form for comparison with other data.

Students will construct a dichotomous key for candy sample identification.

Academic Content Standards

Ohio science academic content standards, benchmarks and grade-level indicators are currently in draft form. Official state adoption will not occur until December 2002. The suggested alignment to science strands for this lesson is subject to change as the draft standards are revised.

- ❖ *Possible alignments: Ohio Academic Content Standards for Science: Scientific Inquiry Standard*

Getting Started

Materials

- Measurement devices including metric sticks, rulers, balances, weights, etc.
- Chart paper
- Markers or crayons
- Chocolate samples, unwrapped and cut into small pieces
- Paper plates, labeled A, B, C, etc., one for each sample
- Cups of water and/or saltine crackers for refreshing taste buds after sampling candy
- *Handout A*, Group Instruction Sheet
- *Handout B*, Sample Data Collection Sheet and Questions

Vocabulary

- Inquiry
- Classify
- Dichotomous key
- Metric measurement
- Hypothesis

Lesson

Orientation Activity

Review the use of metric measurement tools including meter sticks, rulers, balances, weights, etc. Have a variety of measurement tools available for student groups to select from to conduct inquiries.

Introduce the unwrapped chocolate samples to the entire class. Place one sample on a separate plate. Label the plates A, B, C, D, etc.

Introduce the concept of a dichotomous key.

Learning Activity

Group students into teams of four. Students will observe and conduct an inquiry of a variety of chocolates. Each group will create and design a procedure for collecting data, categorize and record data on a corresponding chart, and evaluate the data and findings. (For groups of students that need assistance in creating charts, use the *Handout B* as a model sample, or as the actual recording sheet.)

Create a master list from student group observations made for each of the chocolate samples. Discuss and evaluate the contributions from each student group. Identify and correct any misconceptions about perceived findings and observations. Regroup students for sharing of information about all of the chocolate samples.

Have each student group organize the chocolate samples into a dichotomous key based on the ingredients of each sample. Display the keys along with student written descriptions of each chocolate sample. The dichotomous key will be used in a supplemental activity that requires use of a series of questions and choices for student identification of candy samples. (The activity will also serve as an introduction of the use of dichotomous keys to identify characteristics of a given object or thing.)

Evaluation and Follow-up

Assessment Tools and Methods

Observation of group work and construction of the dichotomous keys will provide tools for assessment and measurement of student understanding of the assigned tasks, as well as student ability in cooperation and communication skills. Written descriptions of the candy sample will provide measurement for a student's ability to create expository text.

A final assessment will be student evaluation of the content of samples of other objects and/or foods, observation of ingredients or contents, the construction of a dichotomous key to further identify characteristics, and written explanation of the findings and data.

Interdisciplinary Connections

- Measurement tools and processes for Mathematics
- Written expository text for Language Arts
- Communication and cooperation within a group setting

Technology Integration:

- Use of a program such as Graph Master or Microsoft Excel, to create charts and/or spreadsheets for the recording and display of collected data
- Use of a digital camera to take pictures of each chocolate sample for pictorial inclusion in the dichotomous key.

Web Links:

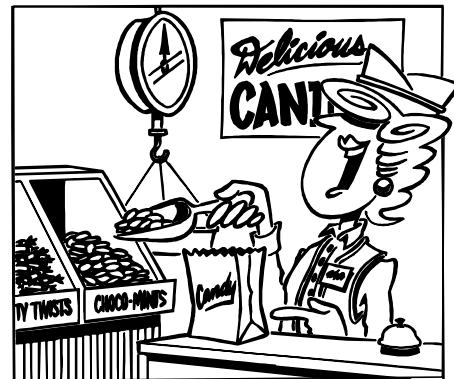
<http://www.mce.k12tn.net/chocolate/made/made.htm> How Chocolate is Made

http://www.askeric.org/Virtual/Lessons/Science/Process_Skills/SPS0002.htm Dichotomous key

<http://www.umd.umich.edu/casl/natsci/slc/slconline/DICH/index.htm> How to Use a Dichotomous Key Made

Handout A: Group Instruction Sheet

Yummy! Yummy! Yummy! All of this candy is making me hungry... What should I devour first? Wait, I'm not sure what's inside? Maybe I should find out, you, know, just in case. I remember one of my teachers talking about observation safety and using my sense of taste. What was that? Oh yeah, only use taste with permission. OK. Here we go...



Hang on a minute! Read the instructions closely and carefully throughout this exploration.

Yes, you do have permission to use your sense of taste, that is, if you do not have allergies to the contents of the candy. If you are in doubt, check with me, privately, and we will determine the samples that are “safe” for you!

Work with your group to complete this exploration. Each of you is responsible for completing the written work and for participating and cooperating within the group.

Hypothesize What makes each candy sample unique?

Write a **Hypothesis**:

Procedure

1. **Gather** sample plates and measurement devices that your group believes will be helpful during the exploration.
2. **Create** a chart for recording observations. This may take some discussion within your group to determine the design of the chart. Remember to consider qualitative and quantitative observations. How will you include these in your chart? Each person will complete a chart using the observations from the group.
3. **Predict**, from your initial visual observations, what ingredient makes each sample unique to this chocolate candy collection. Write your predictions in the Prediction 1 section of the chart.
4. **Experiment**: Examine each sample. Use all of your senses to gather qualitative data. Record data on your chart.
5. **Measure**: Use a variety of measurement devices to gather quantitative data. Remember to use standard metric measurement units that best fit the mass and dimensions of your samples. Record data on your chart.
6. **Organize** all of your data on the chart. Be sure that every member of the group has collected and recorded data that can be used to distinguish unique characteristics of each sample.
7. **Write** a new prediction, in the Prediction 2 column of the chart, based upon the data collected by your group.

Handout B: Sample Data Collection Sheet and Questions

Sample	Prediction 1	Prediction 2
B		
C		
D		
E		
F		

Conclude and Apply

1. **Compare and contrast:** How does your data compare with the rest of your group? Were there any differences? Why?

2. **Interpret Data:** Which candy was the easiest to identify as a unique ingredient? Why?

3. **Analyze:** Explain how having a unique characteristic benefits the candy and/or company that makes it?

Going Further: Problem Solving

4. If your samples contained more ingredients than you could easily identify and classify using the procedures that you conducted today, what process or processes would you use to identify those ingredients?