

# Experiences and Experiments - There is a Difference

## Summary

Students plan and conduct an experiment on the topic of food spoilage.

## Time Frame

2 class periods of 45 minutes each

## Group Size

Individual

## Materials

No classroom materials are needed.

Student will be responsible to collect their own materials for their experiments.

A teacher may want to provide some materials to assist student efforts.

## Background for Teachers

Students have had many experiences in science and have participated in and designed simple investigations. This lesson directs students in identifying the steps of experimentation. While microorganisms are the topic and the subject of the experimentation, the emphasis and learning should center on scientific steps and processes of scientific experiments.

Designing and conducting an experiment involves an integration or combining of science process skills.

## **Research Questions and Hypotheses**

Questions rise out of experiences and observations. Hypotheses or statements of potential explanation to the research question suggest the type of strategies that might be used to answer the question.

## **Controlled Experiments**

An experiment planned to test a hypothesis includes two identical set ups. Both are the same with the exception of one variable condition in the set up. The factor that differs is called a variable. The variable is related to the hypothesis and is the condition being tested.

## **Collect/Record Data**

At all stages of the experiment, data must be collected and recorded using systematic procedures. Remember to record facts and observations. Though ideas and inferences can be helpful in interpreting the data, they should not be confused with observations. The Newbery Award winning book, *The Hero and the Crown* (1985) by Robin McKinley gives a wonderful account of the scientific steps of experimenting. The heroine, Aerin, finds an idea of kenet, an ointment that protects one against dragonfire. She experiments and shares the steps, frustration, and long-awaited success. These ideas can be found in *The Hero and the Crown*, page 31, paragraphs 2 and 3; page 56, paragraph 2-5. Read these passages to your class as you prepare for this lesson.

## **Analyze Data and Draw Inferences**

A conclusion is a statement of what was learned when all the data from an experiment have been collected and analyzed.

Experimenting provides important information whether or not it supports the initial hypothesis.

Students have a misconception that an experiment is wrong if they cannot support their hypothesis. It is vital to ensure that importance is placed on scientific openness and willingness to analyze procedures and seek alternate explanations and not getting the "right" or "wrong" answer.

## Intended Learning Outcomes

- Formulate a simple research question.
- Plan and conduct a simple experiment.
- Display results in an appropriate format.
- Record data accurately.
- Use data to construct a reasonable conclusion.
- Science is a way of knowing that is used by many people not just scientists.
- Understand that there is not just one "scientific method."

## Instructional Procedures

In this activity, students will design and conduct experiments related to food spoilage. The variables will be those things which affect food spoilage. The following is an example of an experimental design. It should not be given to students to conduct but should serve as a model for designing their own experiments.

### **Sample Experiment**

#### **Question:**

What causes milk to spoil?

#### **Hypothesis:**

Warmth will cause milk to spoil.

#### **Controlled Experiment:**

1. Fill two glasses with 50 ml of milk and cover.
2. Label the two glasses A and B.
3. Place glass A in the refrigerator.
4. Place glass B in the kitchen window sill.
5. Leave glasses alone for 7 days.

#### **Collect and Record Data:**

Observe the glasses of milk each day before going to school and record observations. (Remember to only record the facts - what is observable.)

#### **Analyze Data and Draw Inferences:**

The milk in the refrigerator was not spoiled.

The milk on the window sill was spoiled.

#### **Conclusion:**

Refrigeration slows down the spoiling process in milk.

#### **Note:**

Although this experiment helped us recognize a variable that might assist the spoiling process, (heat) it does not tell us why the milk spoiled. To identify bacteria as the change agent and to link these results to the fact that chemical changes occur more quickly at room temperatures would take additional investigations.

### **Class Period #1:**

- Introduce to the students that they will be conducting their own experiment about food spoilage.
- Ask: "What foods spoil?" Have the students name several examples. List and discuss the observations students have already made about spoiling food.
- Have the students generate a list of questions they could ask about food spoiling. Be sure to use student-generated questions. Their involvement will increase motivation and interest in the experimental process.
- Explain the difference between a research question and a hypothesis.
- Have student narrow their list of ideas down to two or three questions they would like to investigate on their own.
- Use the sample experiment listed above to help students understand the components their

experiment is expected to contain.

Be sure to remind students that there is not ONE scientific method, but that most experiments contain similar components.

Give students an opportunity to refine their own ideas and develop a research question, hypothesis, and plan for conducting the experiment.

Collect and review their plans to check for quality work as well as potential safety concerns.

Once all plans have been reviewed, give students 1-2 weeks to conduct their experiment at home.

### **Class Period #2:**

Have students bring their completed investigations to class to share and report the results.

CAUTION: Students should not bring in the actual samples of spoiled food as it is potentially dangerous. Drawings, photographs, or descriptions should be used as alternatives.

Provide students will time to share and compare their investigations with one another.

Discuss their results and hold class discussions as appropriate.

Discuss science as a way of knowing that is used by many people not just scientists.

Point out again that science investigations use a variety of methods and do not always use the same set of procedures. There is not just one "science method."

### Assessment Plan

Use the Experiment Rubric to assess individual experiments.

### Rubrics

[Experiment Rubric](#)

### Authors

[Teresa Hislop](#)

[KIRSTIN REED](#)