



FISHING FOR MATH, SCIENCE, AND SOCIAL STUDIES

**Mary Ahern
P.S. 40Q, Samuel Huntington School
109-20 Union Hall Street
Jamaica, NY 11433
(718) 526-1904
E-mail: mma718@aol.com**

For more information, contact:

**Teachers Network
Attn: Peter A. Paul
285 West Broadway—Suite 540
New York, NY 10013
Phone: (212) 966-5582
Fax: (212) 941-1787
E-mail: ppaul@teachersnetwork.org
Web site: www.teachersnetwork.org**

TABLE OF CONTENTS

Program Overview.....2

Lesson Plans.....4

Resources.....8

Sample Worksheets/Report Forms.....9

Fishing for Math, Science and Social Studies

Mary Ahern, P.S. 40Q

PROGRAM OVERVIEW

Fishing for Math, Science, and Social Studies is an interdisciplinary program that links curriculum from social studies, math, and science to help develop literacy among ESL students. The program allows students to understand how stories, ideas, and methods from Native American cultures can be scientifically explained and validated. Students are first exposed to stories about Native Americans--specifically the story about the Patuxet Indian, Squanto--and how he helped the Pilgrims grow better crops by planting fish with their seeds. Students are asked to write about Squanto and explain how he helped the Pilgrims survive in their new land.

Afterwards, students “test” Squanto’s method of soil fertilization by conducting experiments in which some seeds are watered with tap water while others are watered with “fish tank” water. Students monitor the growth over several weeks and display information in the form of graphs, tables, and drawings. While investigating the increased growth of the “fish tank” watered plants, students contact various “experts” in the community via telephone, the Internet, letters, and visits. Some of the contacts include: Alley Pond Environmental Center, New York Hall of Science, Queens Botanical Gardens, and local garden shops. The students then conduct additional experiments with water and soil testing kits to find what additional nutrients are found in the “fish tank” water. Follow-up activities include visiting the Native American Museum and integrating the knowledge obtained into a completed class project. Through this program students see the value of recycling, conservation, ecosystems, and interdependence among living organisms.

Expansion of this program may include hydroponic and/or aeroponic gardening where plants are grown in a water/nutrient-rich solution without soil. This will help students further observe how plant growth is affected by withholding or increasing certain nutrients. The exploration of hydroponics will also broaden and heighten students’ horizons, bringing them to concepts of the Space Age: feeding an ever-increasing world population, space travelers, and space stations.

THE STUDENTS

The program was implemented with a self-contained third-grade ESL class at PS11Q. This hands-on approach helps to enhance students’ language skills while at the same time integrating math, science, and social studies curriculum in an authentic learning experience.

Fishing for Math, Science and Social Studies

Mary Ahern, P.S. 40Q

Fishing for Math, Science, and Social Studies allows the students to observe, record, investigate, and communicate with a purpose. All of the children, regardless of language ability, are able to learn together through the use of hands-on activities and cooperative learning. The program engages the learners and encourages them to be researchers, investigators, and problem solvers. Students participating in this project won Second Honors in the 1999-2000 District 30 Science Fair. The program can be easily adapted to any classroom.

Assessment may include observing the students' ability to work in groups, accurately graph results, share information with the class, learn new vocabulary words, and write about the process and the completed project.

Fishing for Math, Science and Social Studies

Mary Ahern, P.S. 40Q

LESSON PLANS

The initial lesson plans ensure that students share a common knowledge base of seeds, plant growth, and soil fertilization. During these initial lessons, students are provided with the vocabulary and concepts necessary to communicate their findings to each other and to the class. Afterwards, the life of Squanto and the needs of the Pilgrims are introduced, and connections are made between Squanto's method of fertilization and what has already been learned about plant growth. Later, students are guided towards developing a project that will allow them to test Squanto's method of soil fertilization and display of their findings while increasing their understanding of common measurements. Finally, students are asked to contact experts in the community and further expand their knowledge of soil and water nutrients and their effect on plant growth.

Learning About Seeds and Plants

1. Plant Growth

Objectives: Students will investigate the various stages of plant growth, the different types of seeds and the parts of a seed and plant.

Time: About 4 class periods (over a period of several weeks)

Resources Needed: Various types of seeds (perhaps collected during a "nature walk"), magnifying glasses to examine the seeds, and pots and potting soil so students can examine the growth of plants (from seeds) over several weeks.

Soak the seeds in water for varying amount of time (one minutes, one hour, one day). Have students examine the seeds to determine what effect the water has on germination. Plant the remaining seeds to determine what effect soaking them in water will have on growth. Students will work in groups to examine and measure plant growth and share that information with the class. (We used lima bean seeds, as they are large and inexpensive, and germinate in a fairly short period of time.)

Suggested worksheets include the following from Frank Schaffer Publications, Inc.:

What's Inside a Seed?
From Seed to Plant

A Life Cycle
The Plant World

These worksheets are shown as attachment #4 through #7 and can be found on the

Fishing for Math, Science and Social Studies

Mary Ahern, P.S. 40Q

reverse side of the Frank Schaffer Publications, Inc. poster entitled “How Seeds Grow.”

Learning About Chemical and Natural Fertilizers

2. Understanding Soil Fertilization

Objectives: While studying a unit on farming communities, students will recognize the need for soil fertilization (natural and chemical) for plant growth. The use of natural and chemical fertilizers and sources of each will be discussed.

Time: About 1 or 2 class periods.

Resources Needed: Textbooks, books, and articles that deal with farming and the fertilization of plants.

During this time, you may want to conduct an experiment using a chemical fertilizer (such a Miracle-Gro) and its effect on plant growth. A follow-up activity may include visiting a farm.

Identifying Fish

3. Classifying and Identifying Fish

Objective: Students will be able to identify fish according to their characteristics.

Time: 1 or 2 class periods

Resources Needed: Posters, textbooks, books, and pictures of fish. Additional reading may include *Fish is Fish* by Leo Lionni, a story about two friends--a fish, and a tadpole--who grow up and go their separate ways.

Attachments #8 and #9 may assist students in classifying fish and identifying body parts. These worksheets may be found in the Frank Schaffer Publications, Inc. poster, “What is a Fish?”

Go Fish

Fish Facts

If live fish are available, have students observe them and then draw and label a picture.

Fishing for Math, Science and Social Studies

Mary Ahern, P.S. 40Q

Learning About Squanto and the Pilgrims

4. Learning about Squanto

Objectives: After learning about the Pilgrims, students will become familiar with the life of Squanto. They will understand the needs of the Pilgrims and how Squanto's method of soil fertilization helped them grow better crops and thereby survive in the New World.

Time: 4 or 5 class periods.

Resources Needed: Books, stories, and videotapes about Squanto, the Pilgrims, and the first Thanksgiving; and U.S. and world maps

Squanto, The Pilgrim Adventure, by Kate Jassem

Squanto, Friend of the Pilgrim, by Clyde Robert Bulla

“Squanto and the First Thanksgiving” (video), by Eric Metaxas

Read several picture books about Squanto and the Pilgrims and discuss why Squanto told the Pilgrims to put fish in the holes with the seeds. You may want to have students trace Squanto's journey on the U.S and world maps.

Making Connections

5. Making Connections / Designing an Experiment

Objectives: To design an experiment to test a hypothesis. If farmers use animal waste to fertilize crops (cow manure, etc.) and Squanto used fish, could we use fish water, which should contain fish waste, to fertilize plants?

Time: Ongoing: 1 to 2 periods per week for several months

Design and conduct an experiment with students.

The students will write about how we can perform an experiment using fish tank water. What do they think will happen (hypothesis)?

Students will work in small groups to compile a list of materials and procedures necessary to conduct the experiment. Distribute package that brings together all of the students' ideas and leads them to develop a science experiment.

Students will conduct the experiment. They will examine, measure, compile information, create charts and graphs, and share information during the course of the project. Each

Fishing for Math, Science and Social Studies

Mary Ahern, P.S. 40Q

group will have both types of plants: Plant A, which is watered with plain tap water (control), and Plant B, which is watered with fish-tank water (variable). Students will understand the need for accuracy when measuring and reporting their findings.

Over the course of several weeks, students will continue to measure plant growth and share their results with the class. A compilation of group information will be used to prepare class charts and graphs.

Students should see, first hand, that the fish tank water has resulted in a substantial increase in plant growth. Now they will be asked to explain why. Various experts in the community will be contacted to explain the results. (We sent an e-mail to The New York Hall of Science and students made telephone calls to The Alley Pond Environmental Center. Both sources confirmed that the fish-tank water contained nitrates that helped the plants grow better.)

We used our experiment as our class science project for which we were awarded Second Honors in the District 30 Science Fair. This was a great ego-booster for the students who at times feel that what they are learning and doing in the ESL classroom may not be as meaningful as what is being done in the “grade-level” classrooms.

Follow-Up Activities

6. Extensions or Follow-Up Activities

Follow-up activities may include purchasing and using an inexpensive soil-testing kit to determine which nutrients are found in the fish-tank-watered soil.

Learning about Squanto may lead to additional interest in Native Americans. As such, a visit to the Native American Museum or further study of various tribes may be interesting.

Additional expansion activities include the exploration of hydroponic gardening. By using water to grow plants, various nutrients may be added or withheld to determine the effect on plant growth.

The role of hydroponic gardening can be further explored as well as its role in the future (research stations, space stations, etc.).

Fishing for Math, Science and Social Studies
Mary Ahern, P.S. 40Q

RESOURCES

New York Hall of Science; 47-01 111th Street, Flushing Meadows Corona Park, NY 11368; (718) 699-0005; <http://www.nyhallsci.org>; email: NYHallSci@aol.com

Queens Botanical Gardens; 43-50 Main Street, Flushing, New York 11355; (718) 886-3800

The George Gustav Heye Center of the National Museum of the American Indian, One Bowling Green, New York, NY; (212) 558-6624; <http://www.si.edu/nmai>

Jassem, Kate. Squanto, The Pilgrim Adventure. 1979, Troll Associates

Bulla, Clyde Robert. Squanto, Friend of The Pilgrims. 1990, Scholastic

Lionni, Leo. Fish is Fish

Metaxas, Eric. *Squanto and the First Thanksgiving* (video)

Frank Schaffer Publications, Inc. *What is a Fish?; How Seeds Grow* (posters with reproducible worksheets)

Hydroponic Garden Centers; 146-49 Horace Harding Exp., Flushing, NY 11367; (718) 762-8880; hydroponicgarden.com

Brown, Patricia A. Classroom Hydroponic Plant Factory. 1988, Foothill Hydroponics, N. Hollywood, CA

Bradley Hydroponics, www.hydrogarden.com

Institute for Simplified Hydroponics, www.carbon.org

SEED OBSERVATION REPORT

Fishing for Math, Science and Social Studies
Mary Ahern, P.S. 40Q

Type of Seed: _____

Scientist: _____

Date: _____

Seed #1 was soaked in water for: _____ minutes / hours / days.

Describe how the first seed looks, feels and smells. _____

Seed #2 was soaked in water for: _____ minutes / hours / days.

Describe how the second seed looks, feels and smells. _____

Seed #3 seed was soaked in water for: _____ minutes / hours / days.

Describe how the third seed looks, feels and smells. _____

Draw a picture of the three seeds.

Seed #1

Seed #2

Seed #3

Attachment #1

OBSERVATION REPORT

Fishing for Math, Science and Social Studies
Mary Ahern, P.S. 40Q

PLANT #1

Date: _____

Scientists: _____

Plant #1 was watered with tap water. Describe how these plants are growing.

Measure Plant #1: _____

DRAW A PICTURE OF PLANT #1.

Attachment #2

OBSERVATION REPORT

Fishing for Math, Science and Social Studies
Mary Ahern, P.S. 40Q

PLANT #2

Date: _____

Scientists: _____

Plant #2 was watered with fish tank water. Describe how these plants are growing.

Measure Plant #2: _____

DRAW A PICTURE OF PLANT #2.

Attachment #3

