

Problem-Based Learning

The Aquarium

Fourth Grade

Math

MA12402



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Math

Overview

Your class is getting an aquarium, along with money to buy fish! How will you choose which fish to purchase? Students will explore concepts related to operations & algebraic thinking, numbers base ten, and measurement & data.

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PBL Problem Guide

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Timeframe

This lesson plan will take approximately 1 - 1.5 hours.

Step-by-step guide

- Put students into teams of three to five members.
- Ask for a volunteer to read the STUDENT PROBLEM aloud [page 6].
- As a whole group, ask students to list What We Know [FACTS, page 7].
- Have each team create a list of What We Need to Know [NEED TO KNOWS & LEARNING ISSUES, page 8].
- Have each team begin a list of POSSIBLE HYPOTHESES [page 12].
- Provide ADDITIONAL INFORMATION for NEED TO KNOWS [pages 9 & 10].
- Allow teams to research LEARNING ISSUES [page 8].
- Teams re-evaluate POSSIBLE HYPOTHESES [page 12] and determine one DEFENDABLE SOLUTION for Final Product [page 14].
- Teams create and present DEFENDABLE SOLUTION and individual students write ACTION PLAN [page 14].

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PBL Resources

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Resources provided

Included with this case are:

- Choosing Fish for Your Aquarium Brochure
- Freshwater Fish Chart
- How to Write a Friendly Letter website

Resources to assemble

You may wish to assemble the following resources ahead of time:

- Large chart paper or poster board
- Calculators (optional)

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Student Problem

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Your class won the school talent contest and will be receiving a 30 gallon aquarium as the prize! You will also be awarded \$25.00 to spend on fish. Your team's job is to decide which fish to buy using the "Choosing Fish for Your Aquarium" brochure. Then, you will write a letter to your teacher explaining which fish you would like to choose for the aquarium.

Consider:

- What fish will you include in your plan?
- Are there restrictions for specific fish in aquariums?
- How will you put your plan into letter format?

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Key Facts

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- Your class won the school talent contest.
- You will be receiving a 30 gallon aquarium as the prize.
- The class will also be awarded \$25.00 to spend on fish.
- Your team's job is to decide which fish to buy.
- Use the "Choosing Fish for Your Aquarium" brochure to help you choose the fish.
- Write a letter to your teacher explaining which fish you chose.

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Need-to-knows / Learning Issues

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NEED TO KNOWS

- What talent did our class perform to win the talent show?
- What is on the "Choosing Fish for Your Aquarium" brochure?
- What materials are provided besides the aquarium, and money for fish?

LEARNING ISSUES

- What types of fish should we buy with the \$25.00 budget?
- What types of fish can live in our aquarium?
- How do we write a letter to our teacher?

NEED TO KNOW ANSWERS

- Students may ask this, but it isn't important. The facilitator may make up an answer.
- Give this to teams upon request [provided in Additional Information for Students on page 9].
- No extra materials are provided.

LEARNING ISSUE RESOURCES

- Students will investigate using the Learning Issue Resource Guide, page 13.

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Additional Information

FOR STUDENT USE

Choosing Fish for Your Aquarium Brochure

Planning Ahead

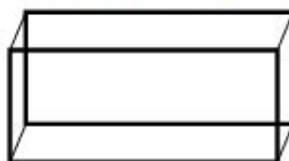
Use the information in this brochure to help you choose fish that will be happy and healthy in your aquarium. To choose your fish, you must know about the size of the fish, their cost, and their special needs.

Size of Fish

To be healthy, fish need enough room to swim and move around. A good rule is to have one inch of fish for each gallon of water in your aquarium. This means that in a ten gallon aquarium, the lengths of all your fish added up can be ten inches at the most.

EXAMPLE

With a ten gallon aquarium,



here are a few of your choices:



one ten-inch long fish, or



a seven-inch long fish and a three-inch long fish, or



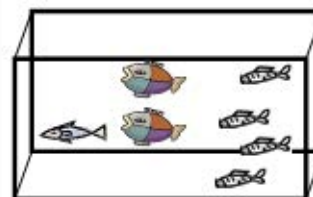
five fish if each is only two inches long.

Cost of the Fish

Some fish cost as little as one dollar, others cost more. The prices of each kind of fish are listed in the fish chart.

Special Needs

Use the fish chart to learn about the special needs of each kind of fish. Some fish need to live together in schools (a group of four or more of the same kind of fish) while others live in pairs or alone. A few kinds of fish have other special needs, which are listed in the chart.



alone pair school

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Additional Information

FOR STUDENT USE

Chart for Freshwater Fish

Name	Cost	Length in Inches	Color	Special Needs, Facts
Zebra Danio	\$1	1 ½ inches	blue with gold lines	Lives in schools; gets along with other kinds of fish.
Marbled Hatchetfish	\$1	2 inches	yellow	Lives in schools; can leap 3-5 yards.
Guppy	2 for \$3	2 inches	red, blue, and green	Lives in schools.
Red-tailed Black Shark	\$5	1 ½ inches	black with red tail	Fights with other sharks, but gets along with other kinds of fish.
Cardinal Tetra	\$5	1 ½ inches	red and green	Lives in schools.
Blind Cave Fish	\$2	3 inches	silvery rose	Lives in schools; uses its sense of smell and vibration to find food.
Dwarf Cichlid	\$5	2 inches	rainbow	Lives in pairs; rarely lives longer than 2 ½ years; gets along with other fish.
Oscar fish	\$5	12 ½ inches	olive with stripes	Can be trained to take food from the hand and can be petted. Must be kept only with other cichlids.

This information has been adapted from Aquarium Task by the **New Standards Project** (NSP; 1992).

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Additional Information

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This lesson has been adapted from the New Standards Project (NSP; 1992). The charts and content have been re-created in a newer version, but the information is the same.

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Hypotheses

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- Hypotheses will vary by each team's selection of fish and their explanations in the letters to the teacher.

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Learning Issue Resource Guide

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WEBSITE

How to Write a Friendly Letter

www.nhcs.net/parsley/curriculum/postal/FriendlyLetter.html

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Final Product and Writing Guide

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Team

- Each team will create a plan for their aquarium which shows which fish they have chosen, the total cost (and that they are not overspending) and the total length (and that they are not overcrowding).

Individual

- Each student will write a letter to the teacher explaining how they selected their fish and why they think they will be able to live together given their special needs.

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Rubric

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AREA	ABOVE AVERAGE Three points each	AVERAGE Two points each	BELOW AVERAGE One point each	NO EVIDENCE Zero points each	POINTS
Final Product	<ul style="list-style-type: none"> All Learning Issues addressed Three or more hypotheses present High quality final product 	<ul style="list-style-type: none"> Most Learning Issues addressed Two hypotheses present Roles somewhat defined Fair quality final product 	<ul style="list-style-type: none"> Few learning issues addressed One hypothesis present Low quality final product 	<ul style="list-style-type: none"> No learning issues addressed No hypotheses present No final product 	
Writing Assessment	<ul style="list-style-type: none"> Problem Summary, Learning Issues/New Information Integrated well presented Hypotheses well presented Solution and Defense well presented 	<ul style="list-style-type: none"> Problem Summary, Learning Issues/New Information Integrated presented Hypotheses presented Solution and Defense presented 	<ul style="list-style-type: none"> Problem Summary, Learning Issues/New Information Integrated poorly presented Hypotheses poorly presented Solution and Defense poorly presented 	<ul style="list-style-type: none"> Problem Summary, Learning Issues/New Information Integrated not presented Hypotheses not presented Solution and Defense not presented 	
Collaboration	<ul style="list-style-type: none"> Individual works well with group members Individual communicates well with group members Individual carries out their individual responsibilities 	<ul style="list-style-type: none"> Individual works acceptably with group members Individual communicates acceptably with group Individual mostly carries out their individual responsibilities 	<ul style="list-style-type: none"> Individual does not work well with group members Individual does not communicate well with group members Individual attempts but fails to carry out their individual responsibilities 	<ul style="list-style-type: none"> Individual interferes with group members Individual does not communicate at all Individual does not attempt to carry out their individual responsibilities 	

24 – 27 Points = Above Average

15 – 23 = Average

6 – 14 = Below Average

0 – 6 = Failing

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