AN 'ADVENTURE' IN LEARNING

UNIT: **THE WORK**

LESSON I: Simple Machines

A. Curriculum Frameworks: Content Strands and Performance Standards

STCF: Strand 2: (Domains of Science): Physical Science: Motions, Transformations of Energy.

STCF: Strand 3: (Technology): Design, Nature & Impact; Change; Tools & Machines, Communication, Manufacturing, Transportation

B. Concepts:

Simple Machines

The Importance of Simple Machines in Work on Adventure and in Daily Life

C. Materials:

Block and tackle display

Examples of simple machines (hammer, screws, crow bar, etc.)

Simple machine kits for students

Descriptive posters showing simple machines

D. Learning Activities:

1. “Look at the fishing boats in the harbor. Is Adventure newer or older?” (about 50-60 yrs. older) “What do you notice about Adventure that’s different from the modern fishing boats that you see in the harbor?” (Adventure is bigger, has masts, has dories…) “What doesn’t Adventure have that the modern boats have?” (motorized machines to do work, electronic equipment) Nothing on Adventure was motorized. That means that all the work done on Adventure was done with man-power. “Do you think working on Adventure was hard?” “What were some of the hardest things to do while fishing on Adventure?” (raising the sails, anchors, dories, steering the boat…) “Was there anything on the boat that helped the men do the work?” (pulleys, engine and propeller, tools, oars…)

2. All of these things are called simple machines. Show poster of simple machines. Explain how each machine works (one at a time) and ask students what type of job that machine would be used for.(lifting, moving, steering…) While explaining, have students build the machines with the parts in their bag. For each machine, ask students “Where do you see this type of machine on Adventure?” (screw- propeller, pulley-sails, dories, windlass, inclined plane- gangway, wedge-knife, wheel-steering, lever-oars, windlass, pitch-forks)

3.Now give students a task that they have to complete using one of the simple machines and have them build that machine with the parts in their kits. (Tasks could include lifting something heavy into the boat, moving something on the boat to a new location, be creative.) Have each student show the machine that they built and explain how it would work.

4. Ask students “Do we still use simple machines today? Think of 3 different simple machines that you used today in your home or school.

LESSON II: The Dory

A. <u>Curriculum Frameworks: Content Strands and Performance Standards</u>

STCF: Strand 3: (Technology): Design, Nature & Impact; Change; Tools & Machines, Communication, Manufacturing, Transportation

HSCF: Strand 1: (History), LS6

B. <u>Concepts:</u>

Form and Function of Dory Fishing

Technological Advancement

Daily Life of a Doryman

Reasons for the Decline of Dory Fishing

C. <u>Materials:</u>

Dory (or model dory)

Trawl tubs

Trawl lines

Dory Equipment

D. <u>Learning Activities:</u>

LESSON III: Knot Tying

A. <u>Curriculum Frameworks: Content Strands and Performance Standards</u>

STCF: *Strand 2 (Domains of Science) :Physical Science: Motion, Transformations of Energy*
STCF : *Strand 3 (Technology): Design, Nature & Impact*

B. <u>Concepts:</u>

Knots and Functions

Knots Used in Fishing and Boating

D. <u>Materials:</u>

Handout with step by step diagrams of knots

2.5' line for each student

Knot boards

D. <u>Learning Activities:</u>

1. Ask students to think of ways that knots were used on Adventure. Show archival pictures to illustrate.(tie hooks on lines, hold sails up, lash objects to the boat, keep clothes and shoes on…). "Do you think it was important for the crewmen to know how to tie knots?" (yes, it could mean life or death sometimes)

2. Ask students what types of knots they use. (bows on shoelaces, on fishing hooks, in crafts) Discuss the different knots in the students use everyday, emphasize that there are many different types of knots used for all kinds of things.

3. Ask the students "What problems have you had with knots?" (they slip, won't come undone, come undone too easily, etc)

4. Ask students to take out their line. The first knot we're going to learn is the figure-eight knot. (Teach knot) "What do you think this knot would be good for?" (it is big and doesn't slip, is easy to untie even if it is pulled tight. It is good to use as a stopper knot) "Where do you think they used this on Adventure?" (rigging, sails, on the end of lines to keep them from going through pulleys) Now try to untie the knot. The figure-eight knot doesn't jam, that means that it's always easy to get out even when it has been pulled very tight or gets wet. That fact is important on Adventure and other boats. "What can you think of that you would use a stopper knot for in your life?"

5. The next knot that we are going to learn is the wrapped clove hitch.

LESSON IV: Be the Mast

A. <u>Curriculum Frameworks: Content Strands and Performance Standards</u>

MCF: Geometry: Exploratory Concepts & Skills

STCF: Strand 2: (Domains of Science): Physical Science: Motions, Transformations of Energy.

STCF: Strand 3: (Technology): Design, Nature & Impact; Change; Tools & Machines, Communication, Manufacturing, Transportation

B. <u>Concepts:</u>

Forces of Compression and Tension

The Mast

Other Compression/Tension Structures

C. <u>Materials:</u>

Posters showing diagram of mast and rigging

Compression/tension display models

Posters with illustrated vocabulary

D. <u>Learning Activities:</u>

1. Ask students to point out the masts on Adventure. "How tall do you think Adventure's masts are?" (the main mast is 85 ft. and the fore mast is 77 ft.) The fact that Adventure has two masts (with a taller main mast) defines Adventure as a two-masted schooner.

2. Ask students "How do you think *Adventure*'s masts are made?" Explain that Adventure's masts are made from the trunk of a single tall tree called a Douglas Fir. Describe the difficulties of getting trees like that for Adventure today. (such tall trees are considered old-growth and now it is illegal to cut those trees down. Adventure has to get special permission from governments to cut down some large trees in order to continue the restoration of the vessel)

3.Explain to students that Adventure's masts aren't bolted, screwed, nailed, or glued to the keel or the deck. Ask students for ideas about how *Adventure*'s masts stay up. After gathering ideas from the students, show the rigging diagram. Explain that Adventure's masts are held up by the standing rigging that is comprised by shrouds and stays. Point out the shrouds and stays on the diagram and explain the definitions of each. Next, point out *Adventure*'s shrouds and stays.

4. Show students the Compression/Tension poster. Explain that the keel of the boat and the mast are compressed by the tension of the standing rigging (point out labeled forces on the poster) and that this type of system allows the masts to be flexible but very stable.

5. Distribute compression/tension models to students. Have each pair of students insert the mast into the model. Ask students to push gently on their mast and have students describe what they observe. Have students attach the blue line to the eye at the top of the mast and then to tie the ends of the line to the eyes on the sides of the model deck.(make sure that the line is quite taught for this line will act as the shrouds) Have students gently push on the mast again. Have students describe what is different now that the shrouds are in place. Now have students attach the yellow line to the eye on the top of the mast and then to the eyes at the bow and stern of the model deck. (again, make sure that the line is taught as it will serve as the stays) Have students gently push on the mast again and describe their observations. Now allow students to adjust the tension of the model shrouds and stays and observe how the tension affects the stability or flexibility of the mast.

6. Ask students to hypothesize: (write ideas on a white board)

1. Why is it important that a mast be flexible? (to allow for the proper shape of the sail, so that the mast will be able to bend and not break)

2.What other types of structures use compression/tension systems in their design? (suspension bridges, gate on a pick-up truck, tents)

3. Why do you think that these other structures need to be sturdy but flexible? (wind, lower cost, function)