2004 Transportation Education Academy Activity:

Title: Unlock The Waterway Highways.

Curriculum Level: Middle School grade 6-8

Time to Complete: 4-5 days

Standards being met: #1 Characteristics and Scope of Technology
#2 The Core Concepts of Technology
#12 Use and Maintain Technological Products and Systems
#18 Transportation Technologies

Class Size: 24-34 students (put in groups of 4)

Description of the Activity: In this activity students will build and lock and dam. Students will work in groups to design, draw a working drawing, and build a lock and dam system. Students will have to demonstrate how a boat will go through the locks from up stream and from down stream.

Objectives:

-To use the design cycle.

-To be able to work with other student effectively.

-Student will show the operation of a lock and dam.

-To make a working drawing of the project.

Background Information:

Define the lock and dam as a system. Discuss with the class why the water is such an important system to the state of Minnesota. It is used on rivers and lakes to allow boats, ships and barges to go into another body of water, with a drop rise in elevation within itself or. The lock and dam allows for longer journey, travel or movement of goods without having to remove goods from one vessel and put them on another vessel.

When students are put into groups they will need to be told about how to use the design cycle in this project. The lock and dam should be from 3-4' in length. The width of the river will be 5 ½" and the banks of the river will be 3 ½" in height. The group should make 2 or 3 thumbnail

sketches of the lock and dam. From the sketches the group will produce a set of plans with measurements of the parts of the lock and dam and the river.

As the building of the river and the lock and dam is being constructed it is important that all of the wood pieces are cut and laid out on how it will be assembled. The dam (wood) at the lock should measure a height of 1". The wood block at the end of the river should measure 1½ " in height. During the testing of the working of the locks it is advised to have a large sink or a wallpaper water well to have underneath in case of water leaks when water is added to the river. You should have approximately 1" of water. You can pour the water in or have a hose flowing slowly to create the river to flow.

To have a vessel you should cut a piece of wood 3/8" X 3/8" X 1". For the doors of the locks leave one edge flat and that will slide in the joint on the edge of the lock and the river bank. The height of the lock door on the upper should be a minimum of 1 ½" tall. The height of the lock door down stream should be 5 ½" tall.

Safety Precautions:

-Students must wear safety glasses.
-Students must pass safety quizzes.
-Follow all the laboratory class rules.

Tools, Materials, and Supplies Needed:

Pencil
Pipe cutter or hack saw
Band saw or scroll
Block or hand plane
Vise
Drill or drill press
Hammer
tin snips
Ruler or tape measure
2-1/4" cpvc valves
4-1/4" elbows 90 degrees
3' of 1/4"cpvc pipe
6' of 1 X 4 pine
6' of 1 X 6 pine
36- 4d box nails
5/8" drill bit (forstener)
Silicon caulk
20 ga. metal 3 X 5

Procedure:

1. Measure and cut out 2 river bases 2' long and 5 ½ wide out of 1 X 6.
2. Measure and cut out 4 river banks 18" long out of the 1 X 4.
3. Measure and cut pieces for the sides of the lock and dam out of the 1 x 6.
4. Lay-out and cut out divider for lock.
5. Measure on the river beds where the hole will go. You will have one hole in the upper river bed and three holes in the lower river bed. The hole in the upper river bed should be before the door of the lock. In the lower river bed there should be two holes inside the lock door and one on the outside of the lock doors. Mark the bottom of the upper and lower rivers for water intake and drain
6. Drill holes for water intake and drain with a 5/8" drill.
7. Attach the two rivers (upper and lower) to the lock and dam. One river should be 2" higher than the other river.
8. Measure, lay-out and cut-out the lock assembly which will go from the upper river and extend down into the lower river
9. Assemble the lock and dam.
10. Cut 1/4" pvc to lengths needed.
11. Put water intake and valve together without cement
12. Put drain unit and valve together without cement
13. Cut wood for a dam on the upper river. Dam should be about 1" in height.
14. Cut a piece of wood for the lower river. This goes at the end so water will stay in the river to allow vessel to float. Nail in place.
15. Measure, cut and bend metal for the lock doors.
16. When fully assembled, put silicon caulking in the butt joints of the river and locks.
17. Put water in the river and work the locks.

Evaluation and Assessment:

Multiple Choice Test:

1. To move a vessel from a higher elevation to a lower elevation you need to:
   A) Have the lock fill with water and then empty
   B) Have the lock at a low level then fill
   C) Just got over the dam
   D) Unload goods from one vessel and put the goods in a vessel on the other side of the locks

2. Who takes care of the Locks on the water way highway?
   A) MnDot
   B) U.S. Army Corps of Engineers
   C) Individual Cities
   D) U.S. Coast Guard

3. The Locks at Ste. St. Marie connects which two Great Lakes?
   A) Superior and Michigan
   B) Michigan and Huron
   C) Superior and Huron
   D) Superior and Ontario

4. If there is a lock on a waterway there is also a
   A) Bridge
   B) Dam
   C) Road going over the river
   D) Low level of water

5. The locks serve what purpose?
   A) To allow river and lakes to maintain a certain level.
   B) So that cities and states can make money for their state.
   C) To allow water vehicles to avoid level drops in rivers and lakes.
   D) To make lakes and rivers very deep.

Essay Questions

1. How does the locks on rivers and lakes work?

2. Why is the river and the great lakes such an important form of transportation.

Assessment:

Students will be assessed on how well they move the vessels through the lock and dam. Students will move a vessel through the locks from upstream and from downstream.