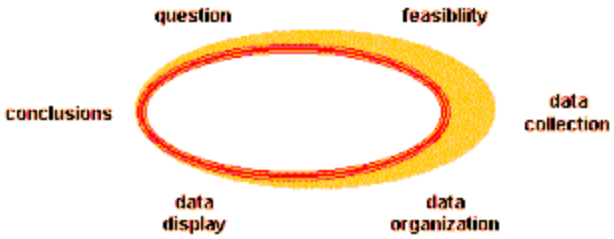
Lift Bridge Design, Analysis and Construction

LEARNING AREA: Inquiry and Research
EDUCATIONAL LEVEL: High School
CONTENT STANDARD: Technical Systems

Students will apply knowledge, skills and tools of technology systems by:

1. investigating and analyzing the scientific principles and elements (inputs, processes, outputs, feedback) of a specific technological system in relation to macrosystems;
2. using basic skills and tools related to operating a specific system;
3. creating, modifying, analyzing, or trouble shooting a technological system;
4. transferring knowledge of a specific system to create or modify a plan for a macrosystem;
5. examining short-term impact on the environment and long term sustainability.

LARGE PROCESSES/CONCEPTS:



ASSESSMENT TASK:

DESCRIPTION:

Students will design, analyze and construct a lift bridge in approximately 15 class periods at 50 minutes each. Students need to design plans for a functioning lift bridge meeting the design criteria. Finally, students will construct a bridge according to their design plan.

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PRODUCTS/EVIDENCE OF LEARNING:

Student will:

1. Investigation and analysis of lift bridge systems
2. Create two page report on lift bridges
3. Design plan on lift bridge on CAD system
4. Analyze bridge plan
5. Construction of lift bridge
6. Creating, modifying, analyzing, or trouble shooting lift bridge
7. Modify design plan on CAD in any are needed
8. Analyze concepts of lift bridge (sustainability, are there better alternatives)

OVERVIEW:

Problem: Many times there are situations where pedestrians, vehicles, and trains need to cross water-ways that are also used by large ships. In this situation the bridge needs to be raised for the ship traffic, one option is to use a lift bridge to accommodate all types of transportation.

Solution: Students need to create a free standing lift bridge that has a center bridge section which moves up and down. The bridge will be constructed using toothpicks, popsicle sticks, straws, glue, string and scissors.

Constraints and Criteria: The bridge will need to operate at a balanced level so the up and down movement will only need to overcome friction and gravity. Movement of the bridge can be done manually by assisting the weight modules. The total height of the bridge will not exceed 16 inches, it may not be longer than 16 inches and no wider than 8 inches. The section of bridge that moves up and down must clear a distance of 6 inches and be at least 6 inches long and the area under the bridge must also be free of any obstacles. The lift bridge must also accommodate a wood block 2 inches wide, 2 inches high and 4 inches long. The bridge must have clearance for this block along with the strength to support the block. Students are allowed to use as much of the materials that is needed while constructing this bridge.

Procedure:

1. Students will work in groups of 4 and the groups will vote on a group leader. The leader will need to report to the instructor on the progress of the group. One other person will keep a log of group activities for each day.

2. The groups will be responsible for investigating and analyzing lift bridges and also writing a two-page report, which indicates their understanding of lift bridges.

3. Next the groups will use CAD to create a design plan for the lift bridge that they are going to construct (these plans will most likely be altered during construction).

4. The groups will then be asked to meet with the instructor to analyze and trouble shoot their design, before construction begins.

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5. Construction begins on the bridge with all four-group members participating. Students are allowed to use all materials and in whatever fashion they need to complete the bridge.

6. At this point students will most likely need to recreate, modify, analyze and problem solve for difficulties that they will find. If changes are made at this time they will also need to be altered on the CAD program.

7. The focus of the project is to have the students create a workable bridge or at least have an understanding of how lift bridges work and why they are used.

8. After completion of the bridge students will analyze the sustainability of lift bridges and state in a one-page report if the lift bridge is a good design or if there are better options.

CHECK LIST:

STUDENT	TEACHER	
_____	_____	Two page report on lift bridge that includes investigation and analysis of lift bridges
_____	_____	Used CAD program to create a design plan for lift bridge
_____	_____	Verbal analysis of bridge plan with instructor
_____	_____	Construction of lift bridge meeting all preset criteria
_____	_____	Modification and problem solving are included in log and on CAD program
_____	_____	One page analysis of bridge to determine if better alternatives exist (explain why or why not)
_____	_____	Completion of log that has progress entries from each day

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