PreK-2 *Lesson plan is designed in alignment with Massachusetts standards for technology / engineering PreK-2 for*

Time Frame: Two 45-60 minute sessions (times can be easily modified)

AIM: How can we help the people of Balang Commune get water for their crops?

USEFUL PRIOR KNOWLEDGE:

- Background on Cambodia (available materials, poverty, and culture)
  - EWB Cambodia Link (location, photos,current design): http://ewbnycambodia.blogspot.com/
  - Human Translations (Villagers): http://www.humantranslation.org/Gal_Balang/index.html
- Discuss irrigation and potential water sources. Links include:
  - Irrigation lesson discussion points: http://esci.unco.edu/water/wtrwise/6t.htm
  - Introductory background information: http://home.howstuffworks.com/irrigation.htm
- Background on Dam Design
  - http://www.teachersdomain.org/resources/eng06/sci/engin/design/littledam/index.html
- Visuals of dams that are familiar to students
  - New Orleans Levee break: http://soundwaves.usgs.gov/2006/01/
  - Hoover Dam: http://www.pbs.org/wgbh/buildingbig/wonder/structure/hoover.html
  - Three gorges dam: http://www.pbs.org/wgbh/buildingbig/wonder/structure/three_gorges.html
  - Beaver Dams: http://www.fgmorph.com/fg_8_14.php

LEARNING OBJECTIVES: *Aligned with Massachusetts standards for technology/engineering PreK-2*

- Explain problem and develop possible solutions
- Identify and describe materials (natural and human-made) that could be used to build a dam
- Identify appropriate materials and tools for dam construction in Cambodia
- Show how the Cambodians can use the material to make their dam
- Explain why the material chosen will be best for the community now and in the future

GUIDING QUESTIONS (GQ):

1. What challenges do the Cambodian people face?
2. How could the Cambodian people get water for their crops?
3. What is the purpose of a dam?
4. What do we (our city or class) need to build a dam?
5. What materials could the Cambodian community use for their dam?
6. How should the community build the dam?
7. Why was your idea good for the community now and in the future?

LESSON PLAN / ACTIVITIES:

Materials: Wet sand, modeling clay, aquarium gravel (optional), popsicle sticks, Styrofoam trays, cardboard, water, tables/desks, small plastic tubs, plastic cups (for water or scooping sand), scissors, masking tape, drawing paper (white printer paper), crayons, paper towels for clean up.

Set up (for Task 3)*: Set up tub stations with wet sand sloped to one side. Don't wet the sand too early or it may dry out. Divide students into teams of at least four. Each team receives a tool set—including at least one empty plastic cup, 10-15 popsicle sticks, one plastic cup full of grave (optional), one Styrofoam tray, one square of card board at least 6" square, one block of modeling clay, scissors, drawing paper, assorted crayons. Provide water when the dam is ready for testing.*
Day One:

Task One: 5-10 minutes Present Cambodia Situation to students—read situation, show visual: Location, aerial photographs, current design: http://ewbnycambodia.blogspot.com/
Villagers: http://www.humantranslation.org/Gal_Balang/index.html

1. What challenges do the Cambodian people face?
2. How could the Cambodian people get water for their crops?

Task Two: 10-15 minutes After students have offered a dam as a possible solution for GQ #2, show them visuals of dams that are familiar to students (local and well known dams) and discuss below questions. Vary dam choice so that students become familiar with large and small scale dams. *Possible questions/comments for students: Let students comment on dams they know about or have seen themselves. Ask them what they remember about the dams. Was the dam big or small? Was it curved or straight? Could they see supports? If not, how can they think of a way for the dam to stand up? What did the dam stop, a river, a stream? Was it made of metal, concrete, stone, wood, soil, ect.? Did it seem safe?*

3. What is the purpose of a dam?
4. What do we (our city or class) need to build a dam?

Task Three: 25-30 minutes Construct a model dam in teams of at least four students. Teams will first mold a stream/river in the wet sand. The teams will build a small model of a dam that spans the river. The dams should hold the water back without leaking and without falling down. Teams share their dams with the class by pouring water through the river and answering the following questions:

- What materials did our team use?
- What did we use each material for? (base/support, connections, construction)
- Why did we choose each material chosen?

Recap: 5 minutes Teacher has below "Materials poster" and elicits use of materials and whether or not the choice/use of materials was a good/bad one and why.

Material	Use	Good Choice—Why?	Bad Choice—Why?
Popsicle Sticks			
Gravel			
Cardboard			
Styrofoam			
Clay			
Scissors			
Masking Tape			

Day Two:

Review and Extend: 5-10 minutes Dams and Materials poster are out from previous day. Teacher asks students to vote: After seeing all the dams, which is best and why? Are there any other materials that could have been used? Besides materials, what else did we need to build our dam? What would we need to do to the dams if we wanted to just slow the flow of water and not stop it all together?

Task One:* 10-*15 minutes What materials are available in the community in Cambodia? Use pictures to explore each of their characteristics for dams.

- EWB Cambodia Link (location, photos,current design): http://ewbnycambodia.blogspot.com/
- Dam Design: http://www.teachersdomain.org/resources/eng06/sci/engin/design/littledam/index.html

Write the characteristics down so they can be compared.

Dam (with picture)	Good characteristics	Bad Characteristics

Task Two: 25-30 minutes Final Project—Students draw picture of dams showing design and structures (base/support, reinforcement, connections) that will withstand the weight of water against the dam and hold water back without leaking (20-25 minutes) and in a turn and talk share what they drew and why they drew it (5-10 minutes). After turn and talk, all class discussion of following:

5. What materials could the Cambodian community use for their dam?
6. How should the community build the dam?
7. Why was you're idea good for the community now and in the future?

Recap: ***5 minutes*** Why is your idea good for the community now and in the future?

FORMS OF ASSESSMENT:
Oral answers to guiding questions
Physical Dam built/tested (with weight)/explained by teams
Follow up questions
Final Dam Drawing
Final Dam Review Turn and Talk / Class discussion

Possible extensions:

1. Water pressure activity shows how a dam must be able to hold the water behind it: http://www.pbs.org/wgbh/buildingbig/educator/act_pressure_ho.html

2. All dam drawings are taped to the board and students vote on dam that they think will be a good idea for the community now and in the future.
3. The class builds a cooperative class dam. Each member of the class is given a piece of the materials to contribute to the dam and they should state what purpose that piece will have in maintaining stability for the dam.