ENGINEERING DESIGN CHALLENGE

WATER TRANSPORT

CHALLENGE: To design a more efficient, ergonomic method for transporting water for daily use a long distance.

Student groups will build a small scale prototype of a device that can carry water and be filled from a spigot (pump, tap) OR an open container of water. Suggested capacity of prototype is 2-4 liters depending on age of students.

BACKGROUND: In many parts of the world women and children carry heavy containers of water long distances each day. Impacts include: loss of time for school, work, play, family; health issues due to heavy load; safety issues in areas where travel is dangerous.

OVERALL PLAN FOR PROJECT:

1. Introduce overall background of problem with videos, statistics, graphics (resources attached)

2. Quick Build to model prototype, resource limitations. Based on Ready, Set, Design from Cooper-Hewitt. Use same challenge (carry water), different resources. NOTE: In many cases, 1 and 2 can be reversed.

3. Outline expected deliverables (see Challenge above and #12 below)

4. Students form groups (4-5 per group)

5. Students choose jobs (Project Manager, Ergonomics Expert, Sanitation Engineer or Health Official, Materials Manager or Engineer)

6. Each group needs to pick a country and, if possible, a specific region or village.

7. Research (in class or at home). Each student should produce 1-2 pages of bulleted information to share with the group. Sources should be listed, but formal citations are not needed. Helpful to supply resource list (attached) to students.
   a. A day in life in your village regarding water; what it is used for, how much is needed for the family, where it is located, time spent getting water, average weight of full container
   b. Solutions that have been developed; success; impact; problems
   c. Health implications of carrying heavy containers of water; also any issues with insuring cleanliness of water
   d. Cultural and social issues; how would you “market” this; can you change traditions

8. Physical research
   - Groups fill and carry a 1-5 gallon container of water (Note: 1 gallon weighs 8 lb)
   - Set up some sort of relay or requirement that each person in the group has to carry it a certain distance or for a certain amount of time.
   - Goal is to have students realize how heavy water is and how much you need in one day

9. Begin Engineering Design Process with Brainstorming

10. Groups settle on one design.

11. Build prototype from materials provided plus 3 items that they can bring from home with instructor approval.

12. Final product is consists of prototype and video OR poster with the following information:
    - Outline the problem in the region you have chosen
    - Advantages of your product versus the current method
    - Making distributing your product; where will it be made, how much will it cost, how will you distribute it, how will gain acceptance
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13. Final presentations (allow max of 5 minutes per group) to class.

MATERIALS:

The following are suggested materials. Substitute or add to these as needed or have students bring more, but put limits on that.

Duct Tape	Pieces of hose
Bubble wrap	Pieces of PVC pipe
Foam Core	Variety of buckets
Sharpies or Markers	Empty 2 liter bottles
String	Empty gallon milk jugs
Wire	Aluminum foil
Zip ties	Plastic wrap

Straws

Popsicle or craft sticks

Pipe cleaners

Large basin for testing method of filling container from an open source

Access to tap

Lunch Bags and materials for Quick Build

Larger buckets, containers for “research” phase

Scissors, Glue, Hot glue