

The Elixir of Life

SUMMARY INFORMATION

Keywords

Water conservation, Dams, Reservoirs,

Topics Covered

Engineering Physics, Chemistry

Target Grade(s)

7, 8

Estimated Time Required

3 hours

LESSON

Goals and Pre Requisites

Goals

- To introduce students to structural designing
- To bring awareness to students on the need for water conservation

Pre Requisites

Knowledge on the concept of Dams and Reservoirs

Instructional Objectives

Students would develop:

- Structural and Design based learning
- Critical Thinking
- Problem solving skills

Instructional Resources

Problem Statement

Dams are built for the purpose of storage and consumption of water in times of scarcity. But, how effectively does it stand in terms of construction and design for water storage? There can often be a significant drop in the water levels stored. How can we design dams or reservoirs such that there is no decrease in water levels?

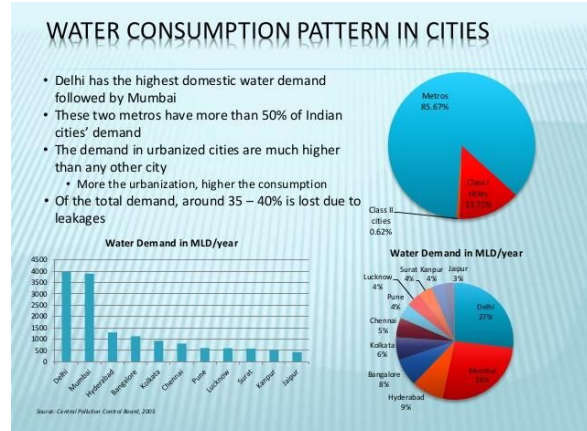
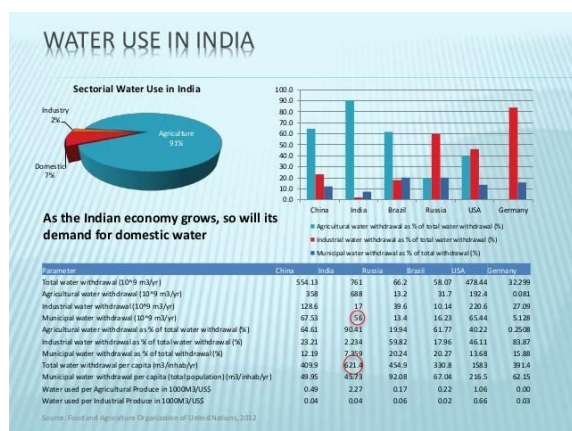
Background

Water Conservation

Water conservation encompasses the policies, strategies and activities made to manage fresh water as a sustainable resource, to protect the water environment, and to meet current and future human demand. Population, household size, and growth and affluence all affect how much water is used. Factors such as climate change have increased pressures on natural water resources especially in manufacturing and agricultural irrigation.

The goals of water conservation efforts include:

- Ensuring availability of water for future generations where the withdrawal of fresh water from an ecosystem does not exceed its natural replacement rate.
- Energy conservation as water pumping, delivery and waste water treatment facilities consume a significant amount of energy. In some regions of the world over 15% of total electricity consumption is devoted to water management.
- Habitat conservation where minimizing human water use helps to preserve freshwater habitats for local wildlife and migrating waterfowl, but also water quality.



Dams and Reservoirs

A **dam** is a barrier that impounds water or underground streams. Reservoirs created by dams not only suppress floods but also provide water for activities such as irrigation, human consumption, industrial use, aquaculture, and navigability. Hydropower is often used in conjunction with dams to generate electricity. A dam can also be used to collect water or for storage of water which can be evenly distributed between locations. Dams generally serve the primary purpose of retaining water.



A **reservoir** is a storage space for fluids. These fluids may be water, hydrocarbons or gas. A reservoir usually means an enlarged natural or artificial lake, storage pond or impoundment created using a dam or lock to store water. Reservoirs can be created by controlling a stream that drains an existing body of water. They can also be constructed in river valleys using a dam. Alternately, a reservoir can be built by excavating flat ground and/or



constructing retaining walls and levees. *Tank reservoirs* store liquids or gases in storage tanks that may be elevated, at grade level, or buried. Tank reservoirs for water are also called cisterns. *Underground reservoirs* store almost exclusively water and petroleum below ground.

To know more, follow the link given below:

<http://www.differencebetween.com/difference-between-dam-and-vs-reservoir/>

Procedure

1. Introduce the **Problem Statement** to students.
2. Form students into groups of four.
3. Allow them to brainstorm with their groups, on the given **Problem Statement**.

4. Each group must come up with their unique solution(s) to the given problem.
5. Each group can compare their solutions with fellow groups and with their teacher to check on the feasibility of their solution.
 - In order to check on feasibility, instruct students to discuss with their team mates and have a rough sketch of their plan before constructing it. Students must be able to provide justification for their choice of materials.
6. Ask students to build a timeline (within the estimated amount of time provided under summary information) and ensure that all members of each group are involved in planning the project in terms of availability and cost of materials.
7. Students must make sure that the design incorporated in their process would address the existing problem.
8. Each group can present their solution and evaluate feasibility with peer groups and the teacher.

Sample Methodology

Note: The following is an example of how the given **Problem Statement** might be addressed. **For Teacher Reference only.**

Materials Required

Water

Perforated cloth/ Glass

Plastic Container

Procedure

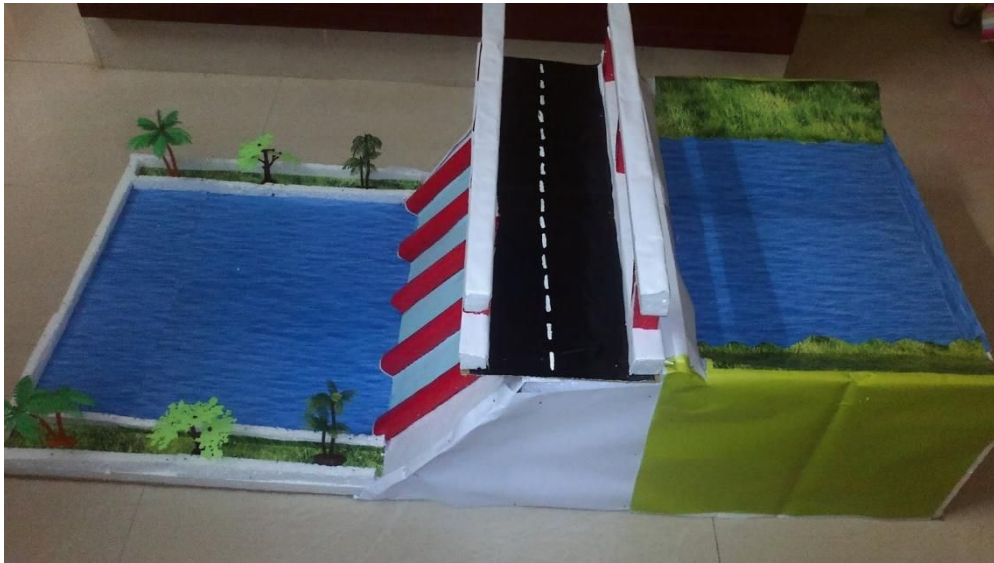
Case I: Fill the plastic container with water and take note of the initial water level. Now, place the container directly under sunlight. After a specific amount of time (4-5 hours), observe the decrease in water level due to evaporation.

Case II: Now design a covering over the container that would restrict evaporation due to excess heat, but at the same time enable sunlight to pass through. A perforated cloth may be used for this purpose. Refill water in the container. Observe the decrease in water level due to evaporation after placing a covering above the model of the dam.

Compare the two cases:

- Was there a significant reduction in water level due to evaporation in case I?

- How efficient is the design involved in Case II? What may be the real time challenges involved if this method was to be implemented?



Tip: Students may replicate a dam like structure within the plastic container (if needed) by using materials such as Plaster of Paris or Modelling clay and carry out the experiment.

Conclusion

Conservation demands a qualitative and quantitative approach.

Extension

- Is the natural vegetation around Dams hindered of their regular amount of sunlight due to artificial covering above?
- Provide your ideas to build your own reservoir at school/locality
- Research on the various designing and structural processing used to build conservation systems in foreign countries.

Assessment and Rubric

Define the need or problem – Did students identify the need to resolve this problem? Were they able to relate the problem to their own environment?

Come up with ideas - Did students weigh various possibilities brainstorm on various ideas before arriving at a solution? Did each group collaborate effectively to (1) work within the time given (2) give equal opportunity for participation (3) consolidate relevant information (4) provide rationale for their decisions and choices.

Select the most promising idea or design - Were students able to evaluate the feasibility of their solution to the given problem statement? On what basis was the feasibility of the solution determined?

Communicate and plan the project – Were groups able to provide justification for their choice of materials? Were students able to see completion of the activity within the estimated time?

Create/Build and test a design –Were all members of the team participative during the course of the activity?

Evaluate and revise the design – Were student groups able to present their solutions in a clear and distinct manner with other groups? Were they keen on improving their model further?

Credits

- <http://archive.defra.gov.uk/environment/quality/water/conserve/>
- <http://onlinelibrary.wiley.com/doi/10.1002/aqc.2681/pdf>
- http://www.traianvs.net/textos/presas_in.htm#_ednref4
- <http://www.bartleby.com/61/45/D0014500.html>
- <http://www.etymonline.com/index.php?term=reservoir>
- Quora:<https://www.quora.com/What-is-the-differences-between-dam-and-reservoir>
- Differencebetween.com:
<http://www.differencebetween.com/difference-between-dam-and-vs-reservoir/>
- <http://newsmarkets.in/wp-content/uploads/2015/05/SrisaillamDam01-India.jpg>
- <http://www.visitcumbria.com/wp-content/gallery/cow-green-reservoir/3-cowgreen-ernet002.jpg>
- <http://educationlearningbydoing.blogspot.in/2015/06/thermocool-models.html>
- <http://www.slideshare.net/PinakiBhadury/water-conservation-60079528>
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