וּשְׁאַבְתֶּם־מַיִם בְּשָׂשׂוֹן

(You shall draw water with joy)

Solutions for Water Shortages: Then and Now

Teacher's Guide

Introduction:
The title for this activity comes from words spoken by the Prophet Isaiah to the Jewish people (Isaiah 12:3). With these words, Isaiah relays God's promise that the Jewish people will prosper in the Land of Israel.

In modern times, Israel has once again become the Jewish homeland. However, Israel is still challenged by the water shortages that have existed in the land since Biblical times. In this lesson, students will discover how our Biblical ancestors dealt with water issues, and how modern Israelis have drawn on the past to innovate new approaches to water management that have made Israel the world leader in water management.

Learning Methodology and Technology

The unit is designed as a blended learning program that combines online learning with traditional classroom activities. The online components are presented on a user-friendly online learning system in order to promote a high degree of interactivity, and to allow for flexibility in the presentation. Please note that student responses are not submitted. Card games are self correcting. It is assumed that responses will be reviewed in class discussions. If you would like to receive particular responses from the students, instruct them to post their responses in a chat box or to send to you by email.

Goals:

Students will:

1. Understand and be able to explain the water challenges that have faced the Land of Israel from Biblical times to the present by analyzing Biblical sources (*Devarim* 11:10-11) and geography sources.

2. Learn about Biblical water management strategies by analyzing the following sources:

    - *Beresheet* 21: 25, 27-28, 30-32
    - *Beresheet* 26:1, 15, 18-19
    - *Beresheet* 29: 1-3 (with Radak)
    - *Beresheet* 37: 23-24
    - *Shemot* 15: 23, 25 (with Ramban)
    - *Shemot* 15:27
    - *Devarim* 1:46 (with Rashi)

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3. Be able to compare and contrast the following Biblical management systems:

    - ***Be'er*** (בְּאֵר)—a well
    - ***Bor*** (בּוֹר)—a storage cistern
    - ***Ma'ayan*** (מַעְיָן)—a live spring
    - ***Marah*** (מָרָה)—purification

4. Learn about water management initiatives developed in the modern state of Israel, and their global impact, including:
    - The *Kinneret*
    - Aquifiers
    - Reservoirs
    - National Water Carrier
    - Desalination
    - Dew Collection (Talya)
    - Drip Irrigation
    - Water from the Air (Watergen)
    - A variety of home conservation techniques including the dual flush toilet and the reduced flow faucet

5. Categorize and compare Biblical and modern water management strategies into the following four categories:

    - Finding Fresh Water Sources
    - Collection, Transporting, and Storage of Fresh Water
    - Reclamation or Recycling
    - Conservation and Rationing

Lesson Guide

Block 1

The lesson begins with an animated introduction that utilizes Mark Twain's bleak 1860s description of Palestine to highlight the water issues that have plagued the region from Biblical times until the modern day. Students embark on a quest to find out how the ingenuity of our ancient ancestors inspired contemporary Israelis to develop innovative solutions to help solve not only Israel's water shortages but also global water issues.

The first step of that quest is to identify the problem. It begins with an interactive Google Earth image that challenges students to compare water sources in Israel and Egypt,

and then to compare them to the Biblical description of the water sources of these two ancient countries. They note that, while Egypt has a running source of fresh water, Israel is almost completely reliant on rainwater. They come to understand why this is so challenging by comparing the average rainfall of Israel with other major cities and by looking at the uneven geographical water distribution in the country—noting that the only large source of fresh water, the *Kinneret*, is located on the northern corner of the country, requiring sophisticated transporting techniques. You may wish to point out that Los Angeles, which is also a semi-arid area, has 4 times the amount of rainfall as Jerusalem).

Blocks 2-3

These blocks introduce students to four ways in which our Biblical ancestors dealt with water management:

Be'er (בְּאֵר)—a well
Bor (בּוֹר)—a storage cistern
Ma'ayan (מַעְיָן)—a live spring
Marah (מָרָה)—purification

Students are asked to peruse four slide shows (one for each category). Each show includes a description of the source, one or more Biblical references, and a visual archaeological remnant. In addition, the slide shows include the following elements:

Be'er—An explanation of Rabbi David Kimḥi (RaDaK), a 12th – 13th century biblical commentator and philosopher, as to why wells were often covered by large rocks.

Bor—
1) A video that demonstrates how large cisterns could fill up very quickly as a result of flash floods on the Israeli deserts.
2) A graphic comparison of a *be'er* and a *bor*—the *be'e*r being a live water source and the *bor* being a water storage system.

Ma'ayan—Video footage of the ancient Shiloah spring and how King Hezekiah rerouted its waters to secure the water source of Jerusalem.

Marah—
1) Ramban's natural explanation of the purification of the bitter waters.
2) A video of an experiment demonstrating how wood can purify water. If interested, teachers can have students perform this experiment.

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Block 4

A summary and processing activity in which students are asked to place the phenomena they have seen into four categories:

1. Finding Fresh Water Sources

2. Collection, Transporting, and Storage of Fresh Water

3. Reclamation or Recycling

4. Conservation and Rationing

Results:

Finding Fresh Water Sources	Collection, Transporting, and Storage of Fresh Water	Reclamation or Recycling	Conservation and Rationing
Kinneret *Ma'ayan* *Be'er* Ein Gedi The Nile	*Bor* Hezekiah's Tunnel Masada	Marah	Rock on the Well

It is advisable to discuss this activity in class after the students have completed it. These categories will be used again as students discover modern Israeli water management innovations.

Block 5

In this block, students are introduced to water issues in modern Israel and to a number of innovative solutions that have emerged over the past decades. After understanding that the water shortage in modern Israel is exacerbated by its increasingly large population and by drought conditions that have helped to deplete the water level of the *Kinneret*, students view two videos that describe a number of water management innovations developed on Israel and utilized throughout the world. Students should be instructed that as they watch the videos, they should record the various initiatives and consider in which of the four categories of water management each belongs. They include:

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1. The *Kinneret*
2. Aquifers
3. Reservoirs (You might want to add that there are 230 reservoirs in Israel.)
4. National Water Carrier
5. Desalination
6. Dew Collection (Talya)
7. Drip Irrigation
8. Water from the Air (Watergen)

Block 6

In addition to the national and corporate management methods discussed in block 5, many common Israelis are conscious of the water shortage and do their part by conserving water. This block presents a number of common practices that are used to save considerable amounts of water. Two interesting devices are the dual flush toilet and the "*has'cham*" faucet.

To summarize and process, students are asked to place modern water management techniques in the same categories that they used to categorize the Biblical water management techniques.

Results:

Finding Fresh Water Sources	Collection, Transporting, and Storage of Fresh Water	Reclamation or Recycling	Conservation and Rationing
Kinneret Aquifers Dew Collection Watergen (from the air)	Reservoirs National Water Carrier	Desalination Reclamation of Wastewater	Drip Irrigation Dual Flush Toilet "*Has'cham*" Faucet

Discussion: Which modern approaches are similar to Biblical approaches and which are new? Has technology changed the focus in water management? If so, how?

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Possible Projects:

1. Divide students into groups. Have each group research one of Israel's modern water management techniques, and then have each group share their findings.

2. Have students investigate water issues that their country faces. Write a report of how Israeli management techniques might be utilized to ease any water problems.

3. Do your part. Create and implement a campaign to develop awareness for how everyone of us can help to ease the impending global water crisis.

4. Students engage with modern Israeli water management techniques with one of these experiments:
   a. Desalination: https://www.youtube.com/watch?v=sEoZz3goZZs
   b. Water Purification: https://www.education.com/science-fair/article/water-purification-filtration/
   c. Water from the Air: https://www.youtube.com/watch?v=-Q75xt1NZG8 (This video uses cigarette filters, which we prefer to avoid asking people to purchase. Is there another example of this? Otherwise, can we just remove the video?)
   d. Catching Dew: https://www.sciencebuddies.org/science-fair-projects/project-ideas/EnvEng_p034/environmental-engineering/experimenting-with-dew-traps
   e. Devise a system for watering the school garden using rainwater harvesting and/or drip irrigation (research on google).
   f. Develop models for water conservation devices.

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