Daniel Hillel (1930–2021)

Innovating the Way We Conserve Water

Biography

Daniel Hillel was born on September 13, 1930, and grew up on a kibbutz in British Mandate Palestine. His early experiences on the kibbutz inspired him to study earth sciences and agronomy in college. After completing his studies, he played a key role in establishing Kibbutz Sde Boker in the Negev desert in 1952, where he applied his expertise in soil and water management to help optimize natural resources for agricultural production.

While living at Kibbutz Sde Boker, Hillel pioneered a groundbreaking approach to irrigation known as microirrigation or drip irrigation. This system distributes water efficiently by carrying it through narrow plastic tubes with small, strategically placed holes that release precise amounts of water directly above plant roots. Before the advent of drip irrigation, farmers typically relied on flood irrigation, which wasted large amounts of water and left fields prone to rapid drying. Hillel's innovation not only conserved water but also significantly increased agricultural productivity, particularly in arid regions.

One of Hillel's close friends at Kibbutz Sde Boker was David Ben-Gurion, Israel's first prime minister. Recognizing the potential of drip irrigation, Ben-Gurion encouraged Hillel to expand its use across Israel and share it with the world. Hillel's system proved transformative, helping many developing nations to improve their agricultural output. The United Nations Food and Agriculture Organization adopted and promoted his methods, recognizing their global impact.

In 2012, Daniel Hillel was awarded the prestigious World Food Prize for his pioneering work in drip irrigation, which revolutionized farming in arid regions and contributed to global food security.

Throughout his life, and until his death in 2021, Hillel remained a strong advocate for water conservation, emphasizing its critical role in Israel's sustainability and

agricultural success. He educated generations of scientists, policymakers, and farmers about the importance of efficient water use, particularly in countries such as Israel, with limited freshwater resources. Indeed, in Israel, water from the Kinneret (Sea of Galilee) in the north must be physically transported to the Negev desert in the south, or seawater from the Mediterranean must undergo desalination (removing salt from seawater) before it can be used for farming.

Thanks to Daniel Hillel's pioneering work, Israel has become a global leader in agricultural innovation. He developed advanced irrigation and conservation techniques to benefit water-scarce regions worldwide. His research and innovation continue to shape how countries approach water sustainability.

Framing

Inspired by his childhood on kibbutz, Daniel Hillel combined his love for the Land of Israel with his scientific knowledge to develop an early version of the drip irrigation system. The goal of this unit is to learn more about Daniel Hillel, drip irrigation, and the topography and produce of Israel.

Scope

This unit can be completed in 3 classes of 45 minutes:

- Introduction and Video: 5 minutes
- Activity #1 (Zoom in on Saving Water): 30 minutes
- Activity #2 (Test Your Water Knowledge): 30 minutes
- Activity #3 (Simcha Blass and Netafim): 25 minutes
- Activity #4 (Save Water Activity Sheet): 15 minutes

Preparing the Time Capsule

- Zoom in on Saving Water Canva Presentation
- Art supplies for learners to create a poster promoting the importance of saving water (if using the technology-free version for Activity #1)
- Calculators for the What's Your Shower Score? worksheet

Printing

- Save Water Primary Sources – A3 size to hang around the classroom (if using the technology-free version for Activity #1)
- Test your Water Knowledge – enough for each student
- Simcha Blass and Netafim Timeline Cards – enough for each group
- Netafim Newspaper Article – enough for each group
- Save Water Activity Sheet – enough for each student

Activity 1: Zoom in on Saving Water

- Using the Zoom in on Saving Water Canva Presentation, show learners the two snippets of a larger poster that the Tel Aviv Municipality published to promote saving water and discuss:
    - What do you see in the snippet? What details stand out?
    - What larger image do you think this snippet is part of? What details led you to that conclusion?
    - What message could this poster be trying to send?
- Show learners the full poster and discuss (additional information about each poster can be found in the appendix):
    - Is this the poster you expected to see?
    - How do the images in the poster reflect the importance of saving water?
    - What action does the poster invite people to take? Is it effective?
    - How does the poster reflect the slogan?
    - Is there similar imagery or colors across the various posters?
- Learners to write a slogan and create a poster promoting the importance of saving water.
    - You can use the Curate and Create Design Guide to help learners understand the different aspects of a successful poster.

A technology-free option is available here.

Activity 2: Test Your Water Knowledge

- Give learners 5 to 10 minutes to answer the Test Your Water Knowledge Quiz worksheet.
- As a class, review their answers and discuss:
    - Which of the answers was surprising?
    - What do the answers tell us about the importance of saving water?
    - Are you willing to shorten your shower by one minute?
    - How can you use the information learned from the quiz to help you and your family conserve water?
- The correct answers for this activity can be found in the appendix.

Activity 3: Simcha Blass and Netafim Timeline

- In groups, learners organize the Simcha Blass and Netafim Timeline Cards in chronological order to learn about Netafim's growth and the advancement of drip irrigation.
- In groups, learners read the article (pages 62–63) and choose one of the challenges (salt crisis, temperature, affordability and accessibility, and food scarcity) that Netafim is working to solve and create a poster explaining how Netafim is solving this problem.
    - Optional: Groups present their posters, and a gallery wall is created in the classroom.
- The correct answers for this activity can be found in the appendix.

Activity 4: Saving Water Activity Pages

- Learners complete these activity pages to examine primary sources promoting water conservation through puzzle solving while reflecting on their own water conservation thoughts and practices.
- The correct answers for this activity can be found in the appendix.

Appendix

Additional information

- Zoom in on Saving Water Posters
    - Poster 1: Reflective Drops
        - The two drops of water reflect each other. The brightly colored drop is the color of water with flowers and leaves depicted inside. The other drop is brown and depicts dry land resulting from a lack of water.
        - One drop can be the difference between a desert created as a result of wasting water and flowers growing as a result of using the right amount of water.
    - Poster 2: The Lifeblood of Israel
        - Water is needed for Israel to live. The water is flowing out of a set of pipes shaped like a menorah, which is a religious symbol and the symbol of the Israeli government.
        - Leaves are growing on and falling off the branches of the pipes, which can also be interpreted as a tree. The stem has a knob to control the use of water.
    - Poster 3: Overflowing Bucket
        - A cause and effect of overflowing and wasting water today, on the right, leaves the land dry and uninhabitable tomorrow, on the left.
    - Poster 4: 64 Years of Israel
        - This poster was produced by the Israeli government in 2012 in honor of Israel's 64th independence.
        - The poster depicts the centrality of water to Israel, with water flowing into a pool shaped like a Star of David. It portrays the different uses of water in Israel: farming, imports and exports, sports, beaches, and home life.
    - Poster 5: Blood of the Earth
        - Blood (red drop) is being compared to water (blue drop).
        - Blood is what keeps people alive, while water is what keeps the ground alive.

    - The brown city behind the drops is the land on which both the people and vegetation grow.
- Additional information about Simcha Blass and Netafim's advancements in drip irrigation.
- Additional information on the development of drip irrigation.

Correct Activity Answers

- Answers for the Test Your Water Knowledge Quiz

1) C	2) B	3) A	4) A	5) D	6) B
7) B	8) C	9) A	10) C	11) B	

- Correct Netafim Timeline Order
    - 70% of Israel is a desert that receives between 30 and 50 millimeters of rain per year. Israel was faced with the challenge of **how to grow food in the desert with limited access to water**.
    - **Simcha Blass** notices a tree growing near a leaky pipe and gets an idea for slow, steady watering.
    - **Netafim** is founded at **Kibbutz Hatzerim**, and Israel begins producing drip systems.
    - Drip irrigation is **adopted across Israel**, turning deserts into fertile farmland.
    - Netafim helps farmers in **India and Africa** grow more food with less water.
    - Netafim designs **home-use water-saving systems,** like garden drip kits, to help private households conserve water.
    - Netafim develops **smart irrigation technology** controlled by computers and sensors.
    - Netafim begins using **recycled materials to create its products** and develops **eco-friendly irrigation products** to reduce waste and environmental impact.
    - Netafim becomes a **world leader** in sustainable agriculture, operating in over 100 countries.

- Activity Page
  - In Which Poster Did You Find the Image?
    - Magen David – 4
    - Menorah – 2
    - Trees – 2 or 4
    - Angry face – 6
    - Desert – 1 or 3
    - Farm – 4
    - City – 4 or 5
    - Body of Water – 4 or 6
  - How Many Do You See Across All of the Posters?
    - Drops of water – 10
    - Leaky faucets – 3
    - Posters about wasting water – 2
    - Posters about saving water – 4
  - Answer the Following Questions
    - Poster 1: **S**AVING water is expressed through the drop with the flowers, while WAS**T**ING water is expressed through the drop of the desert.
    - Poster 2: The water **P**I**P**ES that form the tree can be turned on or off to allow for growth without wasting water.
    - Poster 3: Letting the FAUCE**T** run, wasting water, causes the land to become **D**RY.
    - Poster 4: WATE**R** is essential for all areas of life in **I**SRAEL.
    - Poster 5: Water is like the BLO**O**D of the EART**H**.
    - Poster 6: The faucet is angry because it is L**E**AKING.

S – T – P – P – T – D – R – I – O – H – E
It is important to turn off the faucet and to **Stop the Drip**