

## Sustainability

This guide provides teachers with information on using the student Waste Reduction Thinking Sheet as a rich multidisciplinary exploration of sustainability, design thinking, visual communication, and problem solving.



Humans generate a significant amount of waste which affects the health and well-being of people, animals, and our environment. Organizations around the world are collaborating to encourage everyone to reduce waste. Students have an important role to play in recognizing this problem and generating and implementing solutions for it. Water waste is one concern that students can address. This student Thinking Sheet challenges them to gather information and create a card game that requires problem solving and innovative thinking about how to reduce waste.

Only a fraction of the Earth's water is drinkable. Global warming has led to changes in river levels and encroachment of salt water into fresh water supplies, especially near coasts. Growing

populations will nearly double fresh water use by 2070. Raising students' awareness of sustainability can help them develop good habits towards using water wisely and reducing waste.

Challenge students to create card games that are based on learning objectives. Remind them of various ways these games can be played, such as drawing cards from a stack and responding to questions or prompts on the cards, matching problem cards with solution cards, and collaboratively helping other players blend ideas into new solutions. If they are designing a game where problem cards seek solutions, they could match pre-designed cards or have drawing new solutions as part of the game play.



Have students gather and respond to information about water waste.

- Take a walk around the school, home, and community, observing visible water waste problems. The questions on the student Thinking Sheet can help guide their observations.
- Have students conduct additional research on examples of water waste that are not directly observable or might not come to mind immediately.
- Have students sketch and jot down descriptions of what they researched. The Thinking Sheet provides space where they can draft some cards. When they are ready, have them sketch their refined ideas on cut paper cards or index cards.



As students explore ways to reduce water waste, they may consider:

- Fixing plumbing leaks—from dripping faucets at home to water supply pipes in the city's infrastructure. It is estimated that leaks waste more than 1 trillion gallons of water each year.
- Turning off the water while brushing teeth. Each person can save 8 gallons of water a day by taking this small action.
- Taking short showers. The average flow from a shower head is 2.5 gallons per minute. Have students calculate the length of their showers and then figure out how much water they could save by reducing the length by various amounts of time.
- Conserving water when washing and rinsing dishes by making sure the faucet does not run continuously.
- Collecting rainwater to use for watering plants.



Connecting problems and solutions is central to problem solving and opens the door for innovation.

- Emphasize that every problem could have multiple solutions and that some build upon or blend several ideas. Urge students to collaboratively brainstorm multiple innovative solutions for each problem.
- Discuss which solutions seem practical and whether they are traditional or innovative. The goal is to generate innovative ideas that could flip, twist, or stretch initial ideas.
- Sometimes reframing the problem leads to new and innovative ideas. To help them think more broadly, have students try to describe their problems in several different ways. What other solutions could be applied to this problem? For example would a terraced garden with multiple levels or steps allow water to flow down from the top and nourish plants as it slowly slides down a slope?



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The process of creating a card game already began when students identified and sketched illustrations of waste problems. They have also considered multiple solutions and ways to blend or stretch ideas innovatively. It is now time for them to collaboratively plan their game—the objective, the rules, the sequential steps, the point system (if there is one), and the way players could win—so they can apply their deeper understanding of this sustainability issue to design the game.

Encourage them to:

- Collaboratively design the card templates (consistent backs that indicate if it is a Problem or Solution Card). Transpose their draft ideas onto firm paper cut-out cards or index cards.
- Practice the rules and game play steps they articulated. For example, a player could choose a Problem Card and each player could select or sketch an innovative Solution Card.
- Confirm if the goals of their game were met and how playing the game helped players learn about innovative solutions to the water waste problem.



Presenting their game and modifying it based on feedback are important steps in the creative process. As students explain and refine their ideas with peers, it serves as an authentic assessment opportunity. Were students able to explain the game's learning objectives, purpose, and game play process clearly? Did they use flexible thinking to adjust parts of their game that did not work? Did they help other groups practice and refine their games? Students' self-assessment involves their reflections on learning and continuous improvement opportunities.



At the end of this activity, ask students to help you assess how the project went, what they enjoyed, and what changes they recommend for next time the class does a similar activity. Ask students to help you set goals for the next activity. Regardless of the subject matter, how could designing card games help them improve their inquiry, collaboration, visual communication, and presentation skills?