

Maker Design Challenge:

Design a Watering System for a School Garden

Overview

This short exercise introduces teachers and students to design thinking. Students are challenged to design a watering system for a school garden that can be sustained with minimal human intervention during summer break. Students will gain an understanding of the needs of various stakeholder groups through empathic interviewing.

Teachers should build prior knowledge with their classes before the design day. Students will work in collaborative pairs and small groups using a placemat worksheet (attached) to scaffold their thinking process.

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Based on a work at <http://blogs.ubc.ca/centre/?p=922>

Area of Learning:

Applied Design, Skills, and Technologies, Grade 8

Big Idea:

Design can be responsive to identified needs.

Content

Drafting:

- Manual and computer-aided drafting techniques
- Elements of technical plans and drawings

Curricular Competencies

Applied Design:

- Engage in research to understand a design issue
- Empathize with potential users to find issues and uncover needs and potential design opportunities

Defining:

- Choose a design opportunity
- Identify key features or potential users and their requirements
- Identify criteria for success and any constraints

Ideating:

- Generate potential ideas and add to others' ideas

Core Competencies

Communication:

- Connect and engage with others (to share and develop ideas)

Personal and Social:

- Contributing to community and caring for the environment

Process

Teachers are expected to take time (preferably the day before) to prepare their students for the design challenge.

As stewards of the school garden, students are encouraged to develop prior knowledge related to the following concepts:

- Identification of school and community stakeholder groups (e.g., parents, students, staff)
- Watering requirements of a typical garden (frequency, duration)
- Principles related to water conservation
- Local watering restrictions
- Maintenance requirements of the garden (performed through human intervention)

Design constraints

- Designs must function without the use of school water and power.
- Designs must sustain the garden without people caring for it on a daily basis.
- Designs must show care and concern for the needs and wants of the stakeholders.

Resources

Suggested background information could include news articles and pictures referring to recent trends in watering restrictions in the local community. Ideally, the design of this content preparation is left to teachers.

Assessment considerations

- What methods did students propose for the collection, storage, and distribution of water to the garden?
- How does the design resolve the need for human intervention on a daily basis?
- How did students demonstrate an understanding of the importance of keeping the garden healthy for stakeholders?

Assessment for learning

- Did students take the design challenge seriously, showing consideration for stakeholder needs and wants?
- Was the design a serious attempt to solve the challenge?

Assessment as learning

- Did the sketch and collected information answer the design challenge (see placemat worksheet)?
- Could a prototype be imagined from the collected information?

Student Sheets

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Design Rationale

Schools that have designed and built school gardens must now meet the challenge of caring for the garden over the summer months when there are very few people around. During the summer months, many communities across BC face heavy watering restrictions to preserve city water sources. You need to design a watering system that can collect, transport, and deliver enough water on an ongoing basis to maintain the health of the plants during the summer months, and throughout the growing season.

Problem scenario

You and your team have been selected to design a watering system for your school garden to maintain its health over the summer months. You cannot use city water to care for your garden. In the spirit of conservation, you cannot use city-provided power to energize your system (however, you are encouraged to find other sources as necessary). Your proposed watering system needs to be able to collect, transport, and distribute water to plants on a regular basis in order to maintain optimal growing conditions for the plants.

Your design should clearly identify the three components of your system (collect, transport, and distribute water). You will need to explain their function, their relationship to the other components, and their relationship to the system as a whole. Use the guiding questions on the placemat to help structure your design thinking.

Parameters

- No city power or water
- No human interaction with gardens
- Electronics can be used

Success will be determined by:

- The degree to which the design was followed to collect, transport, and distribute water
- The degree to which the watering system can work under the restrictions of no city water and no human intervention
- The degree to which students are able to empathize with needs and concerns of stakeholders in maintaining the garden
- The degree to which students incorporated the ideas of others and allowed their thinking to evolve, as shown through their placemat worksheet.

1. Problem Scenario

Your team has been selected to design a prototype of a watering system for a school garden.

Your solution must meet the following criteria:

- Your proposed watering system needs to be able to collect, transport, and distribute water to plants on a regular basis in order to maintain optimal growing conditions over the summer months.
- You cannot use city water to care for your garden. In the spirit of conservation, you cannot use city-provided power to energize your system (however, you are encouraged to find other sources as necessary).

2. Write your Interview Questions

The first step in the design process is to gain empathy so you can better understand how people work to solve a problem. We try to gain empathy through conversations.

You need to consider who is involved in the garden, what you are growing, who is responsible for its care, and who would be most affected by the plants dying from lack of water.

Write 3–5 questions you can ask people to learn more about the design requirements of the watering system in the space below. (*HINT: Ask WHY questions*)

5. Share your Design Ideas

Share your sketches with a partner.

- Ask for their feedback.
- Capture their ideas on your placemat.
- Use this feedback to improve your design ideas

REMEMBER:

- One conversation at a time
- Build on the ideas of others
- Don't judge your partner
- Encourage wild ideas!
- Stay on topic
- Be visual

6. Decide on a Prototype Design

In small groups share your ideas and decide on **ONE** design that your entire table will prototype.

What is a prototype?

You build a physical prototype or version of your ideas to make your ideas better and visual.

Why build?

You build to share your ideas and to test out how your ideas look, feel, and work.

3. Interview

Using your questions, interview someone at your table. Record their answers below. If you need more room you can use the back of this placemat.

Interviewing tips:

- Don't be afraid of silences
- Don't suggest answers to questions





4. Sketch your Design Ideas

Based on your interview, sketch some design ideas on the back of this placemat. Your design must address the criteria described in the Problem Scenario, and the needs of the people that you have interviewed.

7. Share Your Prototype Designs – Gallery Tour

Describe your group's design to others and use the chart below to record their feedback. This feedback will be used to improve the group's prototype design.

- Ask for their feedback.
- Capture their ideas on your placemat.
- Use this feedback to improve your design ideas

 Likes	 Changes
 Questions	 New Ideas

8. Reflection

- a. What did you learn by doing this activity?

- b. Which step of this activity was your favorite? Why?

- c. How has this activity affected your thoughts about the care of a school garden?

- d. What steps would you add to help improve your ideas for the school garden watering design?

CONGRATULATIONS on a job well done!