

## Activity 5: Interior Vegetable Wall as Adaptation

### Summary

In this activity, students implement an adaptation strategy aimed at reducing water consumption and countering the effects of plant diseases and harmful insects that are increasing due to a warmer climate. Together they will rethink the traditional vegetable garden by building an interior vegetable wall that maximizes space, reduces water consumption, and promotes crop diversity while keeping harmful insects out.

**Duration:** Four to five 60-minute sessions

### Learning outcomes

After participating in the activity, students will be able to:

- Describe how vertical gardens can maximize space and reduce water consumption;
- Explain the relationship between a warming climate and the spread of plant diseases and pests;
- Demonstrate basic crop management and planning principles, including choosing plants based on conditions; and
- Explain the proportional relationship between surface area and water evaporation rate.

### Competency outcomes

During this activity, students will develop or improve these abilities:

- Planning and design
- Collaboration
- Research
- Problem-solving

### Set-up and materials

- Laptops, tablets, or computers with Internet access (one per team)
- Projector and screen for videos and visual examples
- Teacher BLM: Vegetable Wall Rubric**
- Student BLM: Design an Interior Vegetable Wall**
- Teacher BLM: Advantages and Disadvantages of Vertical Vegetable Gardens**
- Materials from home, based on student designs or materials specific to garden pockets/garden bottles below

#### Materials for vegetable garden pockets

- Hanging shoe organizer or other solid/fabric pocket or bag stand (Home Depot, Ikea, Staples, Canadian Tire, etc.)
- Wall hooks and/or hanging bar
- Various seeds: lettuce, peas, parsley, herbs, cherry tomatoes, arugula, spinach, collards, etc.
- Gardening soil, compost
- Other materials from home (as needed)

#### Materials for vegetable garden bottles

- 6 to 15 plastic bottles with caps
- 1 to 3 pairs scissors or cutter knives
- Roll of fishing line or wire
- Hot glue (as needed)
- Ceiling hooks or hanging bar
- Various seeds: lettuce, peas, parsley, herbs, cherry tomatoes, arugula, spinach, collards, etc.
- Gardening soil, compost
- Other materials from home (as needed)

## What to do

1. Launch the lesson by showing this video on a topic that affects everyone — our food supply:  
Some bugs like it hot: Climate change & agricultural pests (KQED Science)  
[www.youtube.com/watch?v=1qaRQ0MoEmY](http://www.youtube.com/watch?v=1qaRQ0MoEmY)
2. Discuss measures that could be put into place to adapt to the repercussions of climate change with respect to agricultural pests (e.g., plant indoors or in a greenhouse; rotate crops so that disease and pests do not persist from one generation of crops to another). Ask students about ways to reduce water evaporation and water consumption.
3. Ask students if they have vegetable gardens or if they know people who grow their own fruits and vegetables. Explain that over the next several lessons, they will be building their own vegetable wall. Discuss whether building a vertical garden counts as an adaptation measure.
4. Play these videos on the innovative, cost-effective, and ecologically friendly methods of growing vegetables:
  - Bottle Towers at [www.youtube.com/watch?v=JtbOREs2klo](http://www.youtube.com/watch?v=JtbOREs2klo)
  - Laundry Basket Turned Strawberry Planter at [www.youtube.com/watch?v=a2QcU0wYuac](http://www.youtube.com/watch?v=a2QcU0wYuac)
  - The Green Wall — Vertical Educational Garden Bottle Project at [www.youtube.com/watch?v=UCtAQOP3xuk](http://www.youtube.com/watch?v=UCtAQOP3xuk)
  - Le Jardin en bouteilles - cultivez un jardin comestible chez vous, même en hiver!* (Bottle gardens: Grow an edible garden at home, even in winter!), in French only, at [www.youtube.com/watch?v=LS7exuPuj1I](http://www.youtube.com/watch?v=LS7exuPuj1I)
5. Show examples of vertical vegetable gardens (see p. 43).
6. Ask students to search the web to explore other vertical vegetable garden options.
7. In teams of three students, ask students to choose a vertical vegetable garden model they would like to build. In the student BLM **Design an Interior Vegetable Wall**, ask students to list the materials needed and sketch their design with clear labels. They should also list the type of seeds they plan to use depending on the model they have chosen, and be able to justify their choice.
8. Build the various vertical vegetable gardens and tend to them regularly. This stage is very important since students will have to give special attention to the plants throughout the school year. In order to make this environmentally friendly project a success and avoid loss of healthy seedlings, distribute the plants among the students at the end of the school year so that they can take them home and replant them outside during the summer.
9. In pairs, ask students to come up with a list of advantages and disadvantages of vertical gardening in the student BLM. Debrief with the class using the suggestions listed on the **Teacher BLM: Advantages and Disadvantages of Vertical Vegetable Gardens** on p. 48.

## Extension

With the students, co-construct parameters for the garden. For example, the vertical vegetable garden must:

- Include a stand that can support a certain weight;
- Use as much recycled material as possible;

- Have an irrigation system that reduces water use (hint: reuse water or have a smaller exposed surface area so that the soil takes longer to dry out); and/or
- Have an automatic watering system (or one that requires less maintenance).

Perform an experiment to measure evaporation rate in relation to surface area exposure. Using two containers that start off with the same volume of water at the beginning of the week —but have different size openings — measure the amount of water at the end of the week to see which container retained the most water.

We'd love to see your creations! Send us photographs or short videos of your creations to the following email address:

[jarmstrong@techno-science.ca](mailto:jarmstrong@techno-science.ca)

## Activity 5—Examples of vertical vegetable gardens

Pockets



[www.lecoinpotager.fr/jardin-potager-vertical-crop-ideale/](http://www.lecoinpotager.fr/jardin-potager-vertical-crop-ideale/)

Bottles (vertical)



[www.lecoinpotager.fr/realiser-jardin-vertical-exterieur-bouteilles-plastiques/](http://www.lecoinpotager.fr/realiser-jardin-vertical-exterieur-bouteilles-plastiques/)

Pipes



[www.ecole-enfants-precoces.fr/2012/10/le-potager-vertical.html](http://www.ecole-enfants-precoces.fr/2012/10/le-potager-vertical.html)

Bottles (horizontal)



[designmag.fr/jardins-et-terrasses/jardin-vertical.html](http://designmag.fr/jardins-et-terrasses/jardin-vertical.html)



[www.aménagementdujardin.net/7-idees-pour-realiser-un-potager-vertical/](http://www.aménagementdujardin.net/7-idees-pour-realiser-un-potager-vertical/)

Name: \_\_\_\_\_

Date: \_\_\_\_\_

### Activity 5—Student BLM: Design an Interior Vegetable Wall

1. Make a list of the materials you will need to build your vertical vegetable garden and make a sketch of the garden you intend to build.

**Materials needed:**

**Seeds to plant:**

**Sketch of my vegetable garden**

2. In what way(s) is building a vertical garden an **adaptation measure** to address climate change?

3. In what way(s) is building a vertical garden a **mitigation measure** to reduce greenhouse gas emissions?

4. In your opinion, what are the advantages and disadvantages of an interior vertical vegetable garden? Hint: water consumption, harmful insects, surface area, plant types, dependence on fossil fuels, maintenance.

<u>Advantages of a vegetable wall</u>	<u>Disadvantages of a vegetable wall</u>

5. What did you learn while designing your vegetable wall?

6. What did you enjoy most about this project?

7. What advice would you give next year's class?

## Activity 5–Teacher BLM: Advantages and Disadvantages of Vertical Vegetable Gardens

Advantages	Disadvantages
<p><b>You save space</b></p> <ul style="list-style-type: none"> <li>You can add in X times as many levels but occupy the same ground space: do the math!</li> </ul> <p><b>You save water</b></p> <ul style="list-style-type: none"> <li>Top-to-bottom irrigation means a water surplus benefits plants in the lower levels</li> <li>Unused water can be recovered by plants in the lower levels</li> </ul> <p><b>You provide a better nutrient supply</b></p> <ul style="list-style-type: none"> <li>Less space needs fertilizing</li> <li>Less time is spent fertilizing</li> </ul> <p><b>You limit nuisances</b></p> <ul style="list-style-type: none"> <li>There are few or no weeds</li> <li>Less time is spent getting rid of weeds</li> <li>Only the lower levels are affected by pests (e.g., earwigs and snails) and small rodents (e.g., rabbits)</li> </ul> <p><b>Your soil is less dry</b></p> <ul style="list-style-type: none"> <li>The soil is less dry as you can place the vertical garden in an area protected from the sun</li> </ul> <p><b>You save money</b></p> <ul style="list-style-type: none"> <li>As consumers, we are adapting to increasing prices of fruits and vegetables in shops</li> </ul> <p><b>You reduce the ecological footprint</b></p> <ul style="list-style-type: none"> <li>Food produced in the vegetable garden needs no transporting</li> <li>Deforestation is reduced</li> </ul>	<p><b>You can't grow all types of plants</b></p> <ul style="list-style-type: none"> <li>Ideal types are: leafy vegetables that don't grow very tall</li> <li>Unsuitable crops are: vegetables with long roots (potatoes); plants that require pollinators to produce fruit</li> <li>The stand has limited space: vegetables (e.g., tomatoes and broad beans) can grow on top of each other may be limited</li> </ul> <p><b>Your costs may be high</b></p> <ul style="list-style-type: none"> <li>Reasonable initial investment</li> <li>An automated irrigation system is expensive</li> </ul>

## Activity 5–Teacher BLM: Vegetable Wall Rubric

Names:					Date:
Criteria	Exemplary	Proficient	Satisfactory	Unsatisfactory	Comments
<b>Initiating and planning</b> The sketch clearly illustrates the design and materials required to carry out the project. Carries out research on seed possibilities and provides reasons for seed choice and layout.					
<b>Performing and recording</b> Builds and tests the device according to the predetermined plan and makes adjustments to the original sketch to indicate changes and improvements.					
<b>Design and function</b> The vegetable garden construction is solid, well assembled and properly secured in place. Design reflects clear strategies for adaptation to climate change.					
<b>Collaboration</b> Team shows good organization and collaboration skills.					
<b>Analysis</b> Identifies and explains what changes could be made to improve the design to lessen or eliminate undesirable effects. Analyzes the efficiency of the device based on predetermined criteria as well as cost, materials, time, and space.					
<b>Communication</b> The students provide reasons for the choices made in the design of the wall that take into account functional, aesthetic, and environmental perspectives. All team members are able to clearly explain how the technology works and use grade-appropriate science and technology vocabulary correctly.					