# Module 6: Interdependence and Garden Life

## Organic Gardening

**Objectives**
Students will be able to:
- design an experiment or project;
- identify two plants that can be grown together beneficially

**Oregon Content Standards:**
*K.3 Scientific Inquiry*
*1.3 Scientific Inquiry*
*2.3 Scientific Inquiry*
*3.3 Scientific Inquiry*
*4.2L.1 Describe the interactions of organisms and the environment where they live.*
*4.3 Scientific Inquiry*
*5.2L.1 Explain the interdependence of plants, animals, and environment, and how adaptation influences survival.*
*5.3 Scientific Inquiry*
*6.3 Scientific Inquiry*
*7.3 Scientific Inquiry*
*8.3 Scientific Inquiry*

**Vocabulary**
Organic, ecosystem, monocropping, intercropping, companion planting

### Background

There are many different definitions for what makes an **organic garden**. The easiest definition means that you are gardening without the use of potentially harmful pesticides, herbicides and chemical fertilizers. But there's a lot more that goes into it. Oregon Tilth says that, "Organic food production is based on a system of farming that mimics natural ecosystems and maintains and replenishes the fertility and nutrients of the soil. Organic Production integrates cultural, biological and mechanical practices that foster cycling of resources, promote ecological balance and conserve biodiversity."

This can be boiled down into looking at the garden as a whole ecosystem that you're doing your best to nurture and take care of. Keeping your school garden organic is practical. By avoiding chemicals that could be harmful to students, you know that they can pick anything off the vine and eat it right then and there in the garden. But there are other benefits. An organic garden is an alive garden, full of all sorts of creatures for students to learn about.

Organic gardening is all about balance. You're doing your best to keep your plants healthy as possible because you're not going to be using fertilizers to artificially help them. Healthy plants means making sure that all the plant needs are met, creating and constantly improving the soil, and keeping the garden diverse. Monocropping (growing lots of only one thing) doesn't work well organically. Along with that one crop you will be growing lots and lots of the insects that will eat it. Intercropping (growing more than one type of plant close together) decreases pest insect populations and can benefit the two plants. For example, corn can provide something for runner beans to grow up or shade for other plants.

In organic gardening we try encourage beneficial insects into our garden and discourage those we consider pests. We can do this by understanding the life cycle of insects and knowing what each insect likes to eat. Sometimes avoiding problems with insect pests can be as simple as planting their favorite food before they've hatched out for the season or covering young plants with a floating

row cover (remay) so pests can't get to them. We can grow things that we know will attract beneficial insects or put out traps for pests. Sometimes these traps can be other plants that are either a deterrent or decoy. Usually if we pay attention and are careful, pests don't become a huge problem in our gardens and all the beneficial insects that we've provided great habitat for will help our plants grow healthier!

## Project

### Companion Planting

**Length**- 30 min-1 hour once or twice a week, over multiple weeks (at least 2)
**Materials**- garden books, clipboards, paper, pencils, seeds/starts
**Preparation**- gather materials, review a companion plant list

1) Some plants grow better with other plants than alone. This can be for various reasons. One of the plants might discourage insect pests or attract them- acting as an insect trap, leaving the other plant untouched. Other plants give nutrients to each other, making them both grow better together than they do alone. In this activity, students will design an experiment to test out some companion plantings to see how well they work.

2) First students, in small groups, will need to pick out one plant that they want to grow based on the current season. Then they should look through a garden book or on-line to find companion plant lists and pick another plant to grow with the one they first chose. Most of the companion plant lists will go into some explanation of why the two crops grow well together. As they develop their hypothesis and experimental procedure, they'll want to be sure to have a control group- a space where one or both of their plants are being grown without other plants mixed in.

3) Next, the groups will set up their experiment and plant. They will measure the change over time in their plants. Part of the set up for their experiment will be deciding how they are going to measure this change. Will it be in the size of the plant itself? In how many or how few insect pests are on their plants? In the number or pounds of vegetables/fruit the plants produce? This experiment can be a long one- spanning the whole spring or fall. Or it can be a shorter one where they just notice the changes over a few weeks. If you're wanting to save time with a shorter experiment, you'll need to limit the plants the students can plant to short-lived plants that grow quickly.

4) Lastly, students will use their data to draw conclusions about how well their companion planting experiment really worked. They'll also want to decide if their results were actually based on the plant interactions, or if it was based on the way they set up the experiment. If they were going to do it again, would they change anything?

**STEM Professional Connection:** This would be a good project to have a master gardener come talk to the students about companion planting.

### Cumulating Project

**Length**- depends on the projects
**Materials**- depends on the projects
**Preparation**- depends on the projects

1) In this project, the goal will be for students in small groups to design an end of the year project that will follow organic gardening principals to improve the health of the garden ecosystem. Because of its open-ended nature, it's going to be a better project for older students than younger ones. Start by having the students make a brainstorming map to show what goes into having a healthy organic garden.

2) Using this brainstorming map, the students will get into small groups and come up with something they want to do to improve the garden. They need to be able to explain how their project will improve the garden ecosystem. This could be something simple- making compost for the garden or something more complicated- creating a pollinator hedgerow around the border of the garden. It's their project so it can be anything their interested in. Perhaps their project is more of an experiment- creating different kinds of natural bug repellants and seeing which works best.

3) After they have made a plan for their project, they will implement it. That might be mean setting up an experiment, building or planting something.

4) They will finish by blogging about what they did to share with others how they chose to improve their garden.

**STEM Professional Connection:** This is the sort of project where is could be really useful for students to talk to local STEM professionals but it will depend on what they choose to do.

## Activities

The activities below can be used to introduce or review the project concepts.

### Deadly Links Game

**Length**- 15-20 minutes
**Materials**- deadly links cards, optional armbands, poker chips
**Preparation**- gather materials, set up boundaries for the playing area

In this game, students learn about how pesticides move up the garden food chain, affecting many creatures big and small. Start by explaining the concept of a food chain and producers, consumers, herbivores and carnivores. Have students list a few garden examples of each of these. Then tell them that in this game, they will each have role to play in the garden food chain.

Put the game cards in a hat or some other object. The students will line up and one at a time pick from the hat to figure out what creature they will play in the game. The plants will all go stand in one space. The herbivores will all go stand in another space, the carnivores in another and the top carnivores in another. The numbers of each of these depends on the number of kids. If you have 20 kids playing you would want 10 plants, 5 herbivores, 3 carnivores and 2 top carnivores.

The plants will be going around the playing field trying to pick up poker chips, representing nutrients. Make sure a few of these chips are black or some other odd color. Whenever they get tagged by an herbivore, they have to give up their chips to the herbivore. Carnivores can tag and take chips from the herbivores and the top carnivores can tag both other carnivores and the herbivores. Whenever a player is tagged and has no chips to pass on, they die and freeze, sitting down. You can play a round where most of the players are out and then add in a decomposer who can tag dead frozen animals to put them back in the game.

Once you've been playing for awhile, have all the students freeze and count how many chips they ended up with. Then see who ended up with a black chip. The black chips represent pesticides. If the game has gone on for awhile, you can show how the pesticide moved up the food chain to eventually effect and sicken even the top carnivores.

### Organic Gardening Drawing

**Length**- 15 minutes
**Materials**- paper, pencils, crayons
**Preparation**- gather materials

In groups, have the students use a drawing to explain what it means to have an organic garden. After 10 minutes or so, they can share their drawings with the other groups. This is a god way to finish a discussion about organic gardening.