

See how a teacher uses the food chain to extend students' learning beyond independent practice.

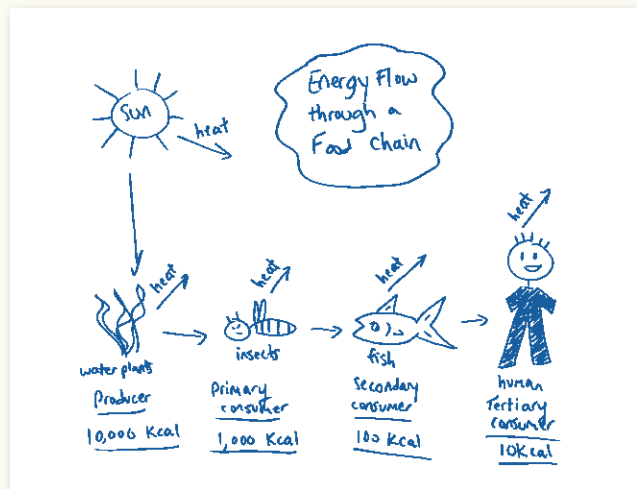
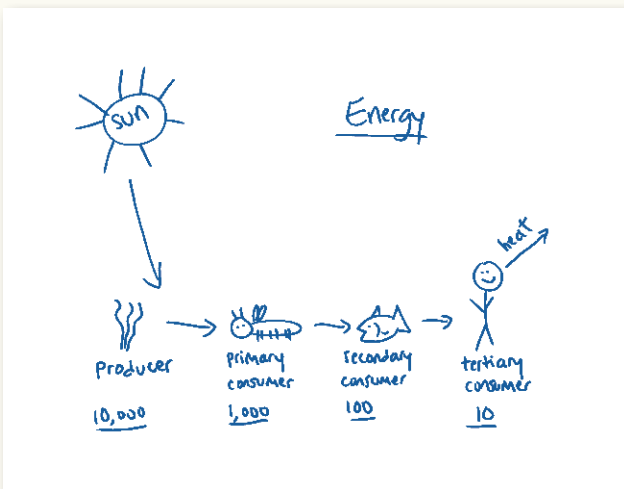
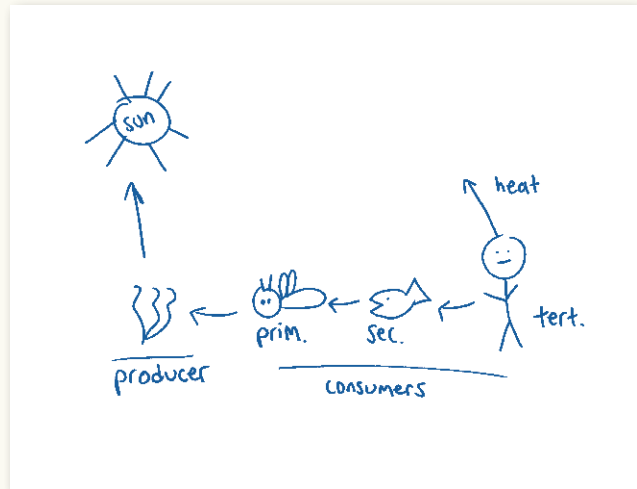
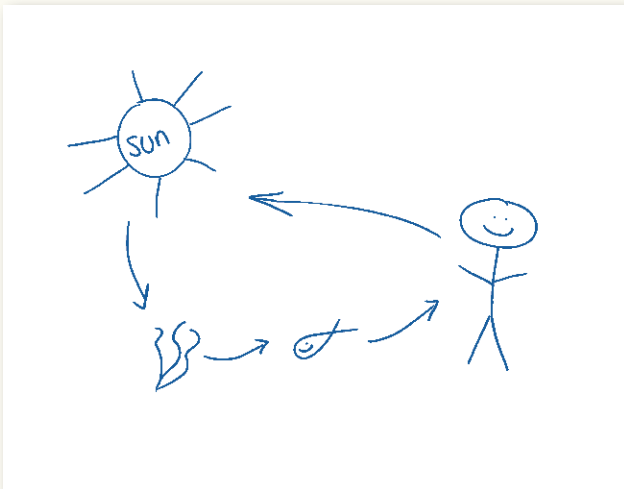
Extending the Learning

Independent practice can be structured as part of a lesson. For example, a lesson on energy and the food chain begins with the sun as the original source; then energy that is captured by plants to produce food—photosynthesis; the plants grow and are eaten by consumers, which are then eaten by other consumers, and so on.

To show understanding and to internalize the learning, have students draw a simple food chain.

- ♦ They label the sun; a producer; a primary consumer; a secondary consumer; and a tertiary consumer.
- ♦ They draw arrows to show energy flow, including the heat energy.
- ♦ They use numbers (with units) to show that 10 percent of the energy is transferred to each level.
- ♦ They give their drawing a title.

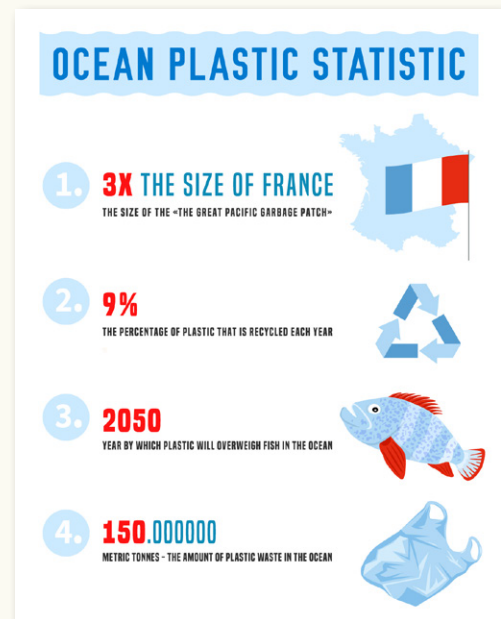
You may want students to work in groups to research what they need to know before drawing the food chain individually. Here are four examples of drawings students might produce arranged from low proficiency to high proficiency.



Extending the Learning (continued)

A guided practice lesson culminating with an independent practice activity in the classroom—in this instance, drawing a food chain—need not end there. The teacher can use the pictures of the food chain, for example, to launch research projects that will raise awareness of environmental issues. The awareness students acquire as they work on their research projects will be translated into independent practice outside of school, which is the ultimate aim of independent practice. **This is when knowledge is power and guides students to make the right choices and decisions in life.**

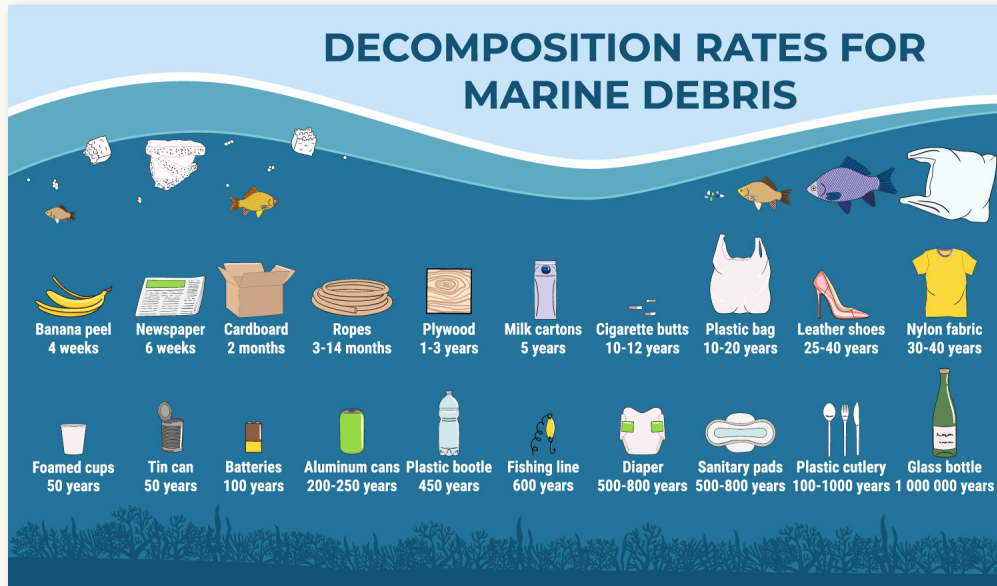
You might begin with pictures of plastic garbage in the ocean and the impact it will have as it continues to mount.



Continue with facts and pictures of dead whales being found worldwide with their stomachs filled with plastic bags. Fish, seabirds, turtles and many other marine creatures are also choking on the eight million metric tons of plastic garbage that enters our oceans every year.



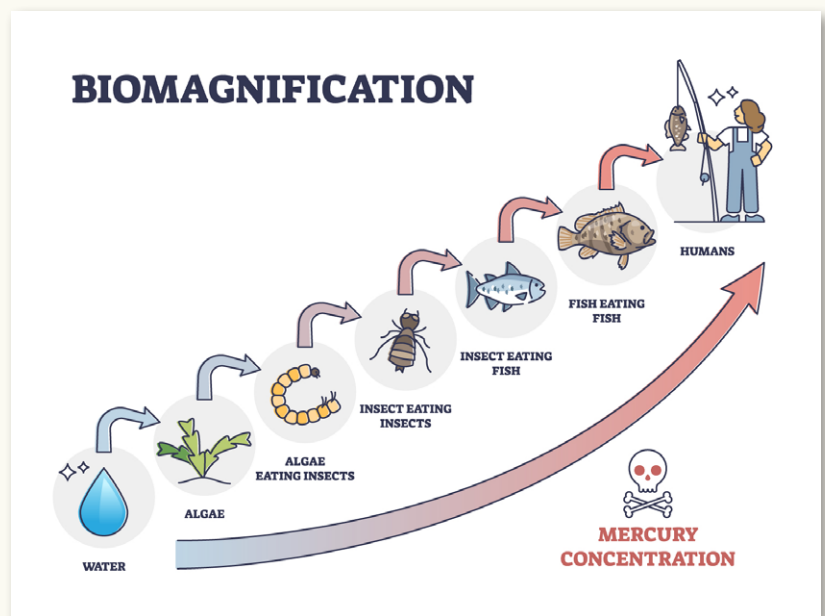
Extending the Learning (continued)



Then bring these facts back to the food chain. Ask students to imagine what happens when fish ingest plastic particles. Toxic chemicals enter their bodies and tissues—and when other fish eat those fish, they absorb the plastic particles, too. The plastic works its way through the food chain. When humans eat the fish, the PCBs in the plastic cause a wide range of health problems. You could mention that the presence of mercury in fish is also a health concern and challenge students to research why.

When students have researched these kinds of issues further and acquired information on the implications for the food chain, have them review their food chain drawings. Ask them to write or draw their thoughts and understandings.

You have guided students to the point when they can be directed to research other environmental problems for independent practice. With the food chain example, you have prepared them to show their understanding of the interconnectivity of all things—that each problem is the result of many issues, and each problem has many serious ramifications. There are any number of ways that they can present their findings, limited only by their imaginations.



Here is a list of environmental problems for class discussion, research and individual projects. An example and some solutions to initiate inquiry are shown for five of them. Use these and others for guided and independent practice inquiry.



Extending the Learning (continued)

Environmental Problem	Example	Solution
Pollution	Damages coral reefs, rivers, lakes, air, soil. All living organisms affected.	Stop pollution from entering environment. Don't dump chemicals (paint, fertilizer, detergents) into storm drains. Switch to alternative energies.
Pesticides	Kills insects, including the good ones, like bees. Harms animals that eat insects like mice, frogs, and fish. Causes health problems in humans.	Reduce the use of pesticides. Use natural alternatives when possible. Limit exposure to pesticides. Wear gloves when using flea killer or bug spray.
Fossil Fuels	Increases carbon dioxide, traps solar heat, warms the Earth. Affects animals like polar bears that keep the seal population in check. Too many seals, fewer fish.	Reduce the use of gas, coal, and oil. Carpool. Fund and support research for alternative energy sources like wind, water, and solar power.
Invasive Species	Kudzu vine—imported to the US to control erosion. Grows rapidly and chokes out native plants, harming animals that depend on them. Costs humans millions of dollars a year on damage to crops and utility lines.	Cut kudzu vines. Let livestock such as goats and cattle eat them.
Wasted Food	\$2,275—Cost of food discarded by the average American family each year. Produce—48% eaten; 52% thrown away. Meats—78% eaten; 22% thrown away. 95% of food thrown away goes to landfills, produces methane gas that contributes to climate change.	Redirecting unspoiled and non-perishable food to people in need.

Additional topics include Over Hunting and Fishing; Habitat Destruction; Deforestation; Biomagnification; Eutrophication; Loss of Biodiversity; Increase in Harmful Organisms; Decrease in Beneficial Pollinators; Mass Extinction; Fertilizers; Microfibers and Microbeads; Climate Change.

You could also add relevance to students' lives by having them research careers in environmental policy and environmental planning by simply asking, "What do people with a career in environmental policy or environmental planning do?"

A well-crafted lesson will stimulate curiosity and lead to paths of further exploration beyond the lesson objective.