

LESSON: CHINAMPAS

OVERVIEW:

During this 2-day lesson, students will learn about the ancient Aztec agricultural method using chinampas, specifically focusing on how they are made and what purposes they serve today. Growing food in this way is sustainable and productive, and has had important cultural implications on the societies that succeeded the Aztec Empire.

OBJECTIVES:

After this lesson, students will be able to:

- **Describe** what chinampas are and how they work.
- **Identify** the advantages of chinampas-based agriculture.

ASSESSMENTS:

During this lesson, students will:

- Learn about the history of chinampas.
- Apply what they have learned to build their own chinampa.

MATERIALS:

- Clear straw, pen, and a glass of water
- Chinampas materials (clay, hay, popsicle sticks, etc.)

PREPARATION:

- Obtain a glass of water for the warm-up.

LEARNING ACTIVITIES:

Day 1:

1. Presentation (15-20 min)
 - a. Define chinampas.
 - i. A *chinampa* is an ancient agricultural system that consists of man-made plots of land “floating” in a body of water.
 - ii. In reality, they are anchored to the bottom of the body of water (usually a lake) and are not actually floating.
 - b. Review the history of chinampas.
 - i. Chinampas were used by the Aztecs to support their growing population.
 1. At the height of the Aztec Empire, thousands of chinampas surrounded the cities.

- ii. The land available for farming was limited, so chinampas were ways that they could grow more food without taking up more land.
 - iii. Chinampas have remained an important part of the culture of people who are descended from the Aztecs.
 - 1. To build a chinampa, one must have extensive knowledge about agriculture, the environment, and the history.
 - iv. They have allowed for the diversification of agriculture by supporting a variety of crops.
- c. Describe the features of chinampas and how they are built.
- i. Chinampas are essentially raised beds built in a body of freshwater.
 - 1. Initially, stakes are placed in the shallows in the shape of what will become the chinampa.
 - 2. Then, a mat is woven out of weeds and sticks that can float on the water's surface. The mat is tied to the stakes so it is anchored in place.
 - 3. Mud from the bottom of the lake is added on the mat along with vegetation until the chinampa is above the water's surface.
 - a. The mud contains nutrients that will support plant growth. It's like a natural fertilizer!
 - 4. Willow trees are often planted to help anchor the chinampa, but also perform several other functions.
 - a. They serve as fences that keep the soil in place once the stakes rot away.
 - b. They protect the chinampa from harsh wind, pests, and *erosion* that may occur over time.
 - c. They serve as habitats for birds.
 - ii. Chinampas are used for gardening, cultivating flowers, and growing crops.
 - iii. They support *biodiversity* by providing an environment for plants and aquatic animals (fish and water birds). They can also be used to raise livestock.
 - iv. The canals between the chinampas serve as both irrigation and waterways.
 - 1. The water typically supports aquatic animals, such as fish and waterfowl.
 - v. Chinampas are extremely productive and can grow, on average, five crops per year.
- d. Watch the [video](#) to summarize what has been discussed about chinampas thus far.

2. Activity (5 min)

- a. Purpose: Students will be introduced to the idea of *capillary action*, a scientific phenomenon that allows the vegetation growing on chinampas to be continuously supplied with water.
- b. Break the students up into small groups (can also be done as a whole class activity).
- c. Each group has a clear straw, a pen, and a cup of water.
- d. Have each group work together to complete the tasks. Reconvene as a class to discuss their answers.
 - i. Mark the water level outside of the cup of water with the pen.
 1. What do you think will happen to the water level when you put a straw in the cup?
 - ii. Mark the water level on the cup of water after the straw is placed in the cup (have one person hold the straw in place).
 1. What happened to the water level?
 - iii. Mark the place on the straw where the water in the cup reaches and mark the place on the straw where the water inside of the straw reaches.
 1. What is the difference?
- e. The water inside of the straw is higher than the water level in the cup. Explain that this is due to *capillary action*.
 - i. Water molecules are attracted to the straw, and climb up the sides.
 - ii. Water molecules are also attracted to one another, and as some molecules move up the straw, they pull other water molecules with them
- f. Explain that the chinampas are sustainable because they use capillary action to take in water!
 - i. The water is directly delivered to the plants, so less water is used than traditional agricultural methods.
 - ii. Once the plant's roots are in the water, the chinampa never has to be watered again!
 - iii. Water is always available to the chinampa because as water evaporates from the surface of the chinampa, it is replaced by *capillary action*.

Day 2:

1. Warm-up (5 min)

- a. Review the previous day's lesson with a game.
- b. Break students up into small groups.
- c. Review the previous day's lesson by asking the class:
 - i. What is a chinampa?

1. A man-made raised bed in a body of water used to grow crops and flowers.
 - ii. What are some benefits of a chinampa?
 1. They support biodiversity, self-water, and are extremely productive.
 - d. Have each group sketch what they think a chinampa looks like based on what they recall from the previous day's lesson. The group that is most accurate gets an incentive.
2. Garden Activities (15 min) - Doesn't need to be in the garden, but should test chinampas outside because of the water and soil.
 - a. Build your own chinampa! Give each student the supplies to build their own chinampa (clay, straw/hay, bamboo, etc).
 - b. (Detailed instructions on how to construct the chinampa to come.)
 - c. Test the chinampas. Have students discuss what works, what doesn't, and why.
3. Presentation (15-20 min)
 - a. Discuss the benefits and advantages of chinampas.
 - i. Chinampas are extremely productive and can grow, on average, five crops per year.
 - ii. The water is directly delivered to the plants, so less water is used than traditional agricultural methods.
 - iii. They support biodiversity.
 - iv. They capture and store *greenhouse gases* that can contribute to global warming.
 - v. The soil is productive and mostly self-sustaining.
 1. There is increased nutrient uptake by the plants.
 - vi. Unusable low-ground is converted into a productive food system.
 - vii. Nowadays, they have recreational benefits, and attract tourists.
 - b. Describe how modern chinampas are used.
 - i. Chinampas continue to be one of the most agriculturally productive methods for growing vegetables in Mexico City.
 - ii. Today, chinampas are used to grow vegetables and flowers.
 - iii. Modern-day chinampas can solve several problems:
 1. They would reduce the amount of land used for agriculture.
 2. The incidence of pests and crop disease would be reduced, lowering the need for pesticides.
 3. Agricultural water use would be reduced.
 4. Less susceptibility to weather conditions, such as frost and drought, which are becoming more extreme with climate change.
 - c. Watch the video: [Fighting to Keep Mexico's Floating Farms Alive](#)

- i. Ask: What is the difficulty of managing chinampas?
 1. Answer: They require workers and money. Farmers will move to the city in search of better paying jobs.
- ii. Ask: What is a way that chinampas can be preserved?
 1. Answer: If restaurants purchase the produce from the chinampas, then the farmers will have money to pay workers and they won't have to leave their chinampas.

4. Reflection

- a. What are some benefits of chinampas?

Everything is natural. Instead of chemicals, organic matter from the canals is used. Chinampas are also extremely productive and can grow, on average, five crops per year. Additionally, chinampas use less water than traditional agricultural methods, support biodiversity, and capture and store greenhouse gases.

VOCABULARY:

- Aztecs
- Biodiversity
- Capillary action
- Chinampas
- Erosion
- Greenhouse gases
- Sustainability

TEACHING NOTES:

- Capillary action is the movement of water (and everything that is dissolved in it) within a porous material.
 - It occurs because water molecules are attracted to each other and to other substances.
 - It helps bring water up into the roots of plants and into the branches and leaves.
 - Water contains dissolved nutrients, so capillary action is important for plant survival.
 - Capillary action can only pull water up a small distance until the force of gravity is too strong. This is why the plant's xylem is important to keep moving the water throughout the plant.
- Chinampas were used by the Aztecs to support their growing population.
 - The Aztec Empire made up a large part of what is now Mexico during the 15th and 16th centuries.

- Their capital was called Tenochtitlan, which was a city in the middle of a lake. Because of the unique location, there wasn't a lot of room to grow crops. Thus, the chinampas were created.
- At the height of the Aztec Empire, thousands of chinampas surrounded the cities.

REFERENCES:

- [FAO Report](#)
- [Aztec History](#)
- [History.com](#)
- [History on the Net](#)
- [Sustainability Times](#)
- [Ez Gro Garden](#) (Aztec Chinampas of Central America)
- [Ez Gro Garden](#) (Modern Day Chinampas)
- [Midwest Permaculture](#)
- [USGS](#)