PURDUE UNIVERSITY | Extension

Horticulture and Landscape Architecture
ag.purdue.edu/hla

HO-345-W

Author:

Krishna Nemali
Associate professor
Horticulture and Landscape Architecture
Purdue University

Shifting Attitudes Toward Healthy Food Choices in Schoolchildren

Introduction

Obesity is one of the most pressing public health problems in Indiana schoolchildren. Nearly 34% of children (10-17 years of age) in Indiana are overweight or obese, and this places them at an elevated risk for other health complications. The costs are staggering in terms of the burden on the health care system, lost productivity and quality of life. Poor food choices lead to excess energy consumption, specific nutrient excesses (e.g., salt) and deficiencies (e.g., fiber, folate, magnesium, calcium, iron). Collectively, these are associated with an array of chronic health disorders, such as hypertension, cancer and osteoporosis with age.

Although the issue of childhood obesity is amendable, it has not attracted sufficient resources, creativity and commitment to correct. Interventions that target younger populations to educate them about healthier food choices are limited at best. Gardening fosters greater familiarity with foods, particularly those more nutrient-rich and of lower energy density. Continuous engagement in gardening or growing food is necessary to change preferences, but outdoor gardening is seasonal in Indiana. An ideal approach would be to include experiential learning as a curriculum in schools.

We developed a program for schools using experiential learning method coupled with plant science curriculum to shift schoolchildren's preferences from a less favorable to a more favorable view of leafy greens and to establish appreciation for healthy food.

Prior to developing content, we conducted meetings with schoolteachers and the principal to understand and develop the best delivery methods for children. Based on their suggestions, we determined that the most impactful delivery methods are interactive training using demonstration, and experiential learning by engaging children with activities.

To achieve this, we established four indoor leafy green production units at STEM-certified Tri-County Intermediate School in rural Wolcott, Indiana, to provide experiential learning to children in grades 3 to 6 (Figure 1). In addition, we developed a

plant science curriculum related to the program.

The curriculum included four modules with these titles: (1)

Figure 1. *Indoor production units established at the school.*

Germination of seeds., (2) What do plants need to grow? (3) Learn hydroponics, and (4) Salads are superfoods. Each module contained background information provided by the instructor, objectives, activities with materials, and an activity project. These modules were tailored to utilize the custom-built indoor production units. Each module was for a duration of one week. They were introduced at the beginning of the week, and activities and projects associated with each module were continued for the reminder of the week. We trained schoolchildren with the developed curriculum by organizing the classroom and hands-on training sessions at the school (Figure 2).

The program was successfully launched in 2019. The

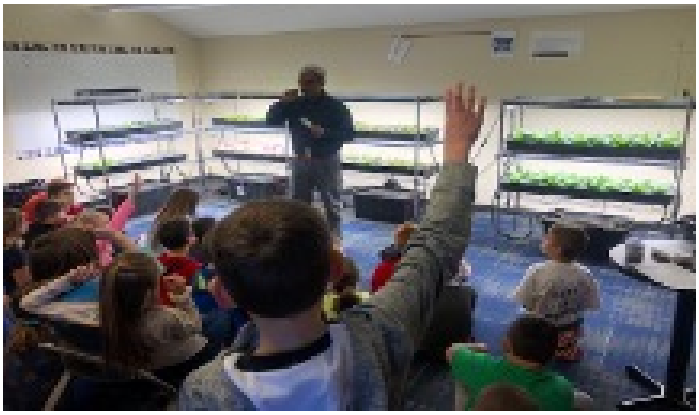


Figure 2. *Interactive plant science teaching to schoolchildren based on developed curriculum.*

program consisted of more than 100 children from third and fourth grades. They showed immense interest in growing plants inside schools, produced high-quality lettuce plants using the indoor production system (Figure 3) and actively participated in several hands-on activities (Figure 4).

Tri-County Intermediate School assessed the impact of

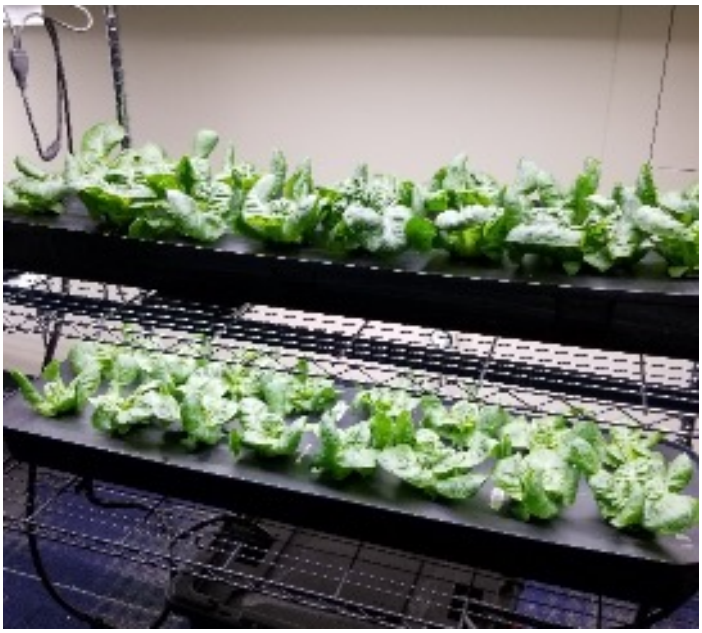


Figure 3. *Lettuce plants grown by schoolchildren using the indoor production units.*

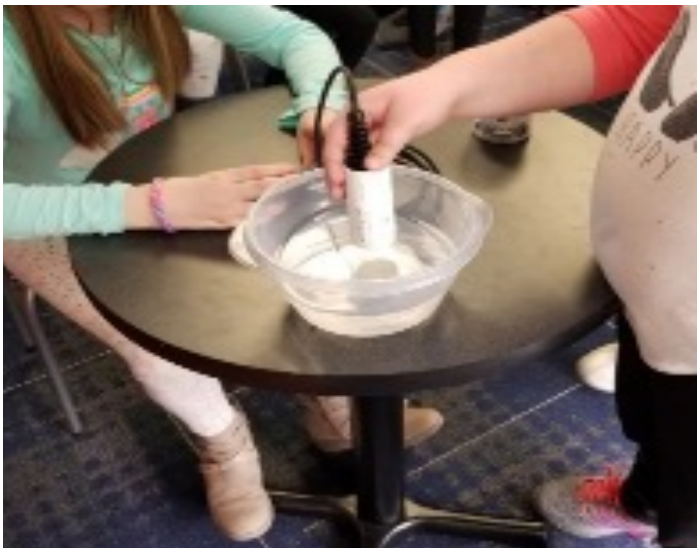


Figure 4. *Hands-on activity in progress at Tri-county Intermediate School.*

the program during six weeks in October and November 2019. The school concluded that the number of students who changed their preference for a salad lunch doubled by participating in the program. With this success, the school tried new items in the menu, adding more vegetables, such as banana peppers, black olives, sweet peppers, cucumbers and tomatoes in the salad bar. Students involved in the program showed interest in trying new fruits and vegetables.

Here are the modules developed for the curriculum:

Module 1: Germination

Target audience: Grades 3-6

Time needed for lesson: 30 minutes
Volunteers needed for support: 1-2

Background

Discuss different types of seeds, what seed germination means, what is required for germination, what environmental factors influence seed germination, and why some seeds fail to germinate. Show an online video on time-lapse of germination process.

Objectives

Participants will be able to learn how to sow seeds and ensure proper environment for successful seed germination.

Materials needed

- 200 cell rockwool slab
- Tray
- Seeds
- Water
- Gloves
- Watering can

Procedure (Figure 5)

- Each class will be provided with 100 rockwool cubes and a watertight tray.
- Participants will moisten the rockwool.
- Participants will sow one seed carefully at the center of each cell.
- After sowing, participants will place the rockwool cubes on the tray and add water to the tray.
- About 10 rockwool cubes with seeds will be placed in a dark location.

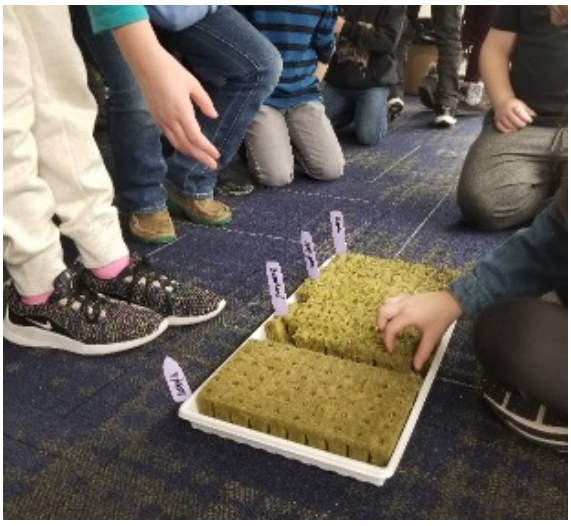


Figure 5. *Sowing seeds for the germination module at Tri-county Intermediate School.*

- The other rockwool cubes will be placed on hydroponic racks, and lights above the trays will be turned on.
- Participants will add water regularly to the trays to keep the substrate moist for the entire week.

Activity

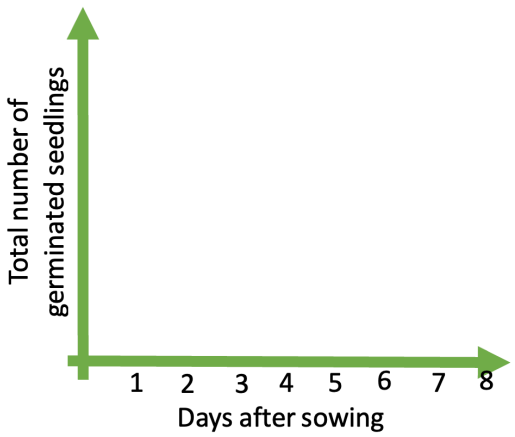
Participants will count the number of seeds germinated every day for one week. They will record the data as follows:

Day after sowing	No. of cells with germinated seeds	No. of cells showing no germination

Project: Target Audience: Grades 3-6

Question: *Will all the seeds germinate at the same time?*

- Investigate by making observations on seed germination in the tray.
- Analyze how germination changed day by day.
- Calculate percentage of seeds germinated in each tray.
- Reason and argue why some seeds germinated early and why others did not germinate.
- Was there any difference in germination and seedling shape/color in the seeds sown in the dark?
- Use the following graph to show how germination progressed with time:



Module 2: What do plants need to grow?

Target audience: Grades 3-6

Time needed for lesson: 30 minutes
Volunteers needed for support: 1-2

Background

Discuss environmental factors influencing plant growth, such as water, nutrients, light, temperature and carbon dioxide, and how extremes of each environmental factor influence plant growth.

Objective

Using sensors, participants will measure the level of nutrients in the reservoir, and light and temperature levels in the grow area.

Materials needed

- Light sensor
- Leaf temperature sensor
- Nutrient sensor

Procedure (Figure 6)

- Participants will measure and record environmental factors in the grow area.
- They will use the nutrient sensor to measure the nutrient index of plain water and fertilizer water to appreciate the extent of nutrients provided to plants.
- The nutrient sensor will be used to measure the temperature of solution in the reservoirs.
- Participants will measure leaf temperature using a sensor.
- Light level in the grow area and in the room will be measured.

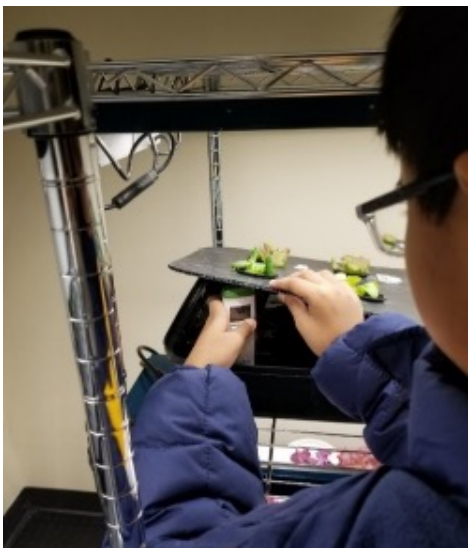


Figure 6. *Student measuring nutrient level of water used in hydroponic production.*

Activity

Participants from all grades will record the environmental data as follows:

Measurement	Value
Nutrients in water	
Nutrients in the reservoir	
Temperature of solution in the reservoir	
Plant temperature	
Light level in the room	
Light level above plants	

Project: Target Audience: Grades 3-6

Question: *How does light affect plant growth?*

- Investigate by moving one or two pots away from the grow area and keeping them in a shady corner.
- Analyze how plant shape and color changed after one week.
- Measure plant width and height with a ruler to determine the effect of low light on growth.
- Reason and argue why growth differed under low light conditions.

Module 3: Learn about hydroponics

Target audience: Grades 3-6

Time needed for lesson: 30 minutes
Volunteers needed for support: 1-2

Background

Discuss growing plants in hydroponics, what is needed to grow plants in hydroponics, what are the benefits of hydroponics, and why hydroponics is important for the future.

Objectives

Participants will learn about a basic hydroponic system and will transplant plants, measure what is in the water used to grow plants, and learn about how roots and shoots grow in a hydroponic system.

Materials needed

- Balance/scale
- Nutrient sensor
- Oxygen sensor
- Paper cups
- Knife to cut lettuce (should be performed by an adult)

Procedure (Figure 7)

- Use the nutrient sensor and measure nutrients in the solution.
- Measure the temperature of the solution.
- Use oxygen sensor to measure the amount of oxygen in the solution.
- Take a plant from hydroponic system to examine shoot and root system.
- Separate shoot and root system and weigh them separately.
- Record data in the following table.

Measurement	Value
Nutrients in the reservoir	
Temperature of the solution in the reservoir	
Oxygen level in the water	
Shoot weight	
Root weight	
Percentage of root weight	

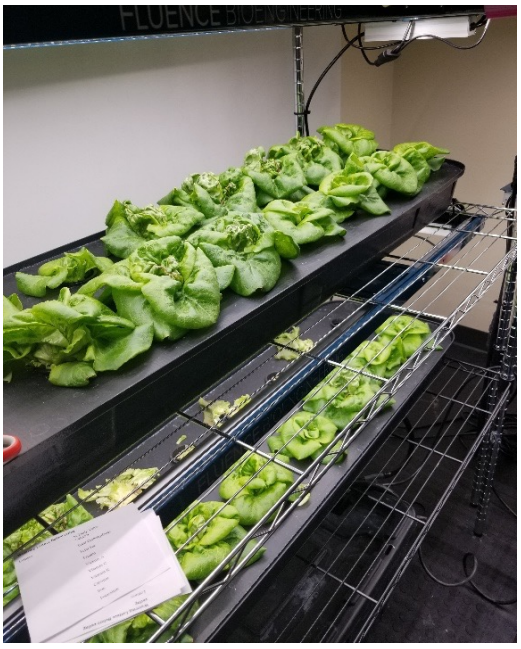


Figure 7. *Lettuce production in a hydroponic system.*

Project*: *Target Audience: Grades 3-6
Question: *What do plants need to grow well in hydroponics?*

- Investigate plant needs using measurements in the above table.
- Reason and argue how above measurements help plant growth.
- How can you grow plants using hydroponics in your home? Be creative and draw your ideas.

Module 4: Salads are super foods

Target audience: Grades 3-6

Time needed for lesson: 30 minutes
Volunteers needed for support: 1-2

Background

Discuss vitamins and minerals in leafy greens, why vitamins and minerals are important for human health, and nutritive value of different vegetables and leafy greens.

Objective

Participants will learn about different parts of vegetable plants that are consumed as food.

Participants will calculate the quantity of vitamins and minerals in a bowl of salad.

Materials

- Balance/scale
- Paper cups
- Knife to cut lettuce (should be performed by an adult)
- Clean kitchen board to chop lettuce.

Procedure (Figure 8)

- An adult volunteer will cut and chop lettuce to make salad using lettuce produced by students in the project.
- Each participant will visually determine the amount of salad they want to consume.
- They will fill a paper bowl with the quantity they want to consume and weigh the salad.
- Participants will be provided with information on the quantity of vitamins and minerals in a unit weight of salad.
- Using this information, participants will calculate the quantity of vitamins and minerals they will get from consuming the selected salad bowl.
- Participants will compare this with the daily recommended values of vitamins and minerals.

Activity

Participants will record the following information based on the weight of salad in their cups, the information sheet on vitamin and mineral levels provided to them, and calculating values by multiplication and division methods.

Measure	Quantity/ 100g	Quantity consumed
Calories		
Carbohydrates		
Protein		
Fats		
Fiber		
Vitamin A		
Vitamin K		
Calcium		
Iron		
Zinc		

Project: Target Audience: Grades 3-6

Question: Should I get vitamins and minerals from supplements or plant-based products?

- Investigate the benefits of plant-based foods rich in vitamins and minerals by researching on the internet (school library or with parent supervision at home).
- Compare the benefits of plant-based vitamins versus minerals and supplements from a store.
- Reason and argue among your group members why vitamins and minerals are important.

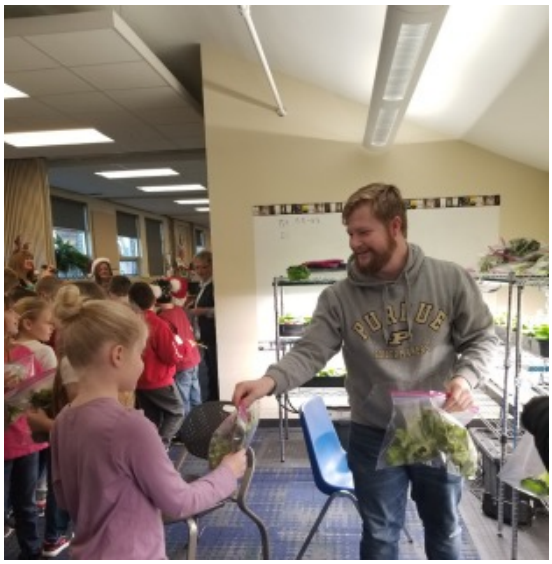


Figure 8. *Lettuce harvested by an adult for salad preparation by each student.*