# From Apples to Zucchini: Creating a Context for STEM in the Garden

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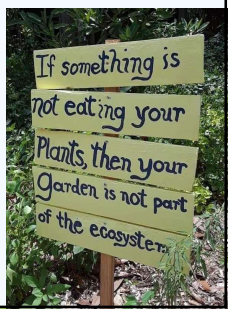
## True or False?

- Staying indoors is not the healthiest way to spend an entire day.
- Teaching outdoors provides real-world connections.
- Children are naturally curious, so learning new things brings a sense of accomplishment.
- I want children to have increased self-confidence, a better body image, empathy, and a way to increase their cognitive skills.



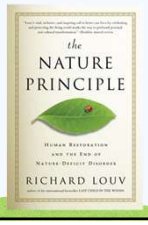

## Why Focus on Getting Students Outdoors?

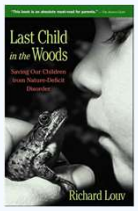
Students spend less time outdoors, and show signs of:

- increased behavior problems
- obesity
- lack of self-esteem
- stress and depression
- less affinity for the natural world
- less ability to make real-world connections

## Last Child in the Woods: Saving Our Children from Nature Deficit Disorder

We all require regular contact with nature to maintain physical and emotional health.




## What is Nature Deficit Disorder?

Symptoms include:

- increased feelings of stress
- trouble paying attention
- feelings of not being rooted in the world

## The Benefits of Outdoor Time

- Improves physical and mental health;
- Students are more active, more creative, less aggressive and show better concentration;
- Daily exposure to natural settings helps with focus and enhances cognitive abilities.

## Additional Benefits

- Provides concrete experiences to clarify abstract concepts
- Provides motivations for reluctant learners
- Adds variety to teaching and inquiry-based learning
- Helps achieve student achievement

## What Are They Really Learning…

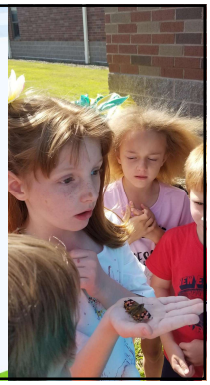
- Curiosity
- Patience
- Eye-hand coordination
- Classification
- Budding scientists
- Observation
- Tracking
- Sorting and counting

## Why Outdoor Learning Centers?

- Provides an alternative classroom setting
- Introduces students to nature and the outdoors
- Provides opportunities for multi-disciplinary teaching/learning
- Provide habitat for native wildlife
- Helps beautify the campus
- Engages students in hands-on/minds-on learning
- Provides real world learning experiences in a living laboratory
- Creates fun and exciting learning environments
- Helps connect students to their community and their environment
- Provides students with an opportunity to work as a team
- Helps teachers reach out to at-risk students
- Provides service-learning projects
- Helps combat childhood obesity
- Provides an alternative to costly fieldtrips
- Motivates students to learn

## Why STEM in the Garden?

Extends the classroom beyond the traditional 4 walls, 25 desks, and 25 books…

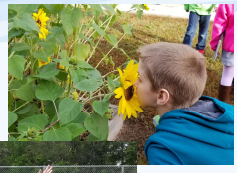


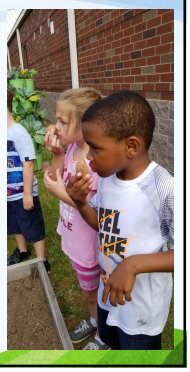
To provide hands-on, inquiry-based outdoor learning opportunities while utilizing multiple-disciplinary skills

- To capture kids' interest
- Teach them nurturing skills
- Give them a sense of pride in their accomplishments
- Introduce them to healthful foods
- Provide a way to improve and give back to the community.

And to help students gain a greater appreciation for our wildlife and natural resources…

…in a FUN and EXCITING environment!





## How Can the Outdoors Motivate

stimulate the imagination

spark intellectual curiosity

inspire inquisitiveness

bridge real-world connections

fuel children's interest in interacting with the natural world

## Why Teach Observational Skills?

## Essential to the Development of the Other Process Skills

- Communicating
- Classifying
- Measuring
- Inferring
- Predicting

## Qualitative Observations

Uses only the senses

## Quantitative Observations

Involve a measurement or quantity

## Look Carefully. You Have 15 seconds!

1. Briefly describe what you saw in the picture.
2. What color was the building?
3. What color were the flowers?
4. What two words would you use to describe the picture to a friend?

## The Stumbling Blocks

- Classroom management fears
- Snakes, bees, poison ivy, etc.
- Fear of the "not knowing the answers"
- Administrative concerns
- Continued upkeep

## Before Going Outdoors

- Avoid a "recess" mind-set
- Arrange work groups
- Define vocabulary
- Provide an overview of what will be done outside
- Sort equipment or materials

## When You are Outside

- Define boundaries
- Circle time
- Circulate constantly
- Encourage respect for nature
- View the unexpected as a bonus
- Use field guides
- To gather or not to gather
- Collect data and journal

## School Garden Expectations


## Science

- Older students can study plants and insects, learn nutrition skills, observe the effects of weather, and learn about more advanced science topics.
- Young students can feel the textures of different plant leaves, help water plants, and learn a variety of basic science concepts.

## Technology

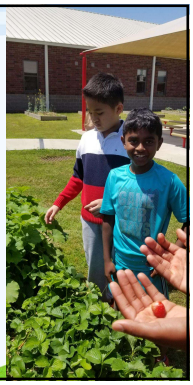
- Weather and soil tools often used in gardens are a great way to discuss technology with older kids. You can also discuss machines and technology used in larger gardens or in farming.
- For younger students, its best to remember that technology is really anything made by humans. Garden tools and other basic items are great conversation starters for how technology is used in gardens.

## Engineering

Building and planting a garden is great engineering and design practice.

## Mathematics

Gardening is a great way to promote a variety of math concepts. Counting, size, shape, proportion, fractions, multiplication, etc. are all math topics that children can learn while gardening.



## Growing the Standards

Kindergarten—Bird feeders and bird baths, growing bird-friendly foods

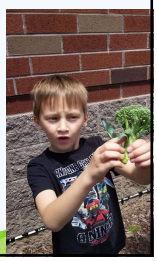
First—Parts of a plant investigation with seasonal produce

Second—Lifecycle of plants with seasonal produce

Third—Habitat requirements needed with seasonal produce and STEM challenge to design a structure to keep vegetables warmer in winter

Fourth—Ecosystem investigation with seasonal produce and vermicomposting

Fifth—Classification of plants with seasonal produce



## Let the Learning Grow!

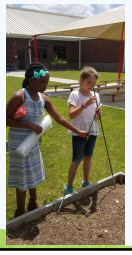
- Create the best soil recipe to grow the healthiest plants.
- Plan and design a soil sifter that can remove small, medium, and large rocks.
- Investigate and design weather tools to collect data.
- Explore and create a tool that can be used to space seeds/plants.
- Design a tool that can be used as a cultivator.
- Measure and design an enclosure that can extend the growing season of plants.
- Create a flower that is pollinated by a bee, butterfly, hummingbird, or bat.
- Construct a ladybug catcher or cricket keeper.
- Extend the garden season by creating a greenhouse structure.

## How Tall Will My Plant Grow?

- S—Habitat of the plant, plant needs, parts of a plant
- T—Collect data to submit to Citizen Science project such as Project Budburst. Take weekly photographs of plants to track plant growth. (https://scistarter.com/)
- E—Create something to 'hold up' your plant as it grows.
- M-Using a ruler, measure your plant, graphing the data.

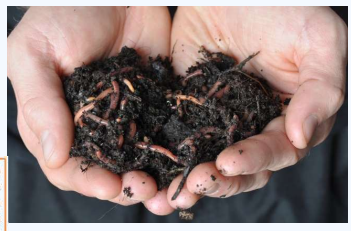
## How Can We Extend the Growing Season?

- 3rd Grade—Integrating Heat and Habitat Standards and Area and Perimeter Math Standards



## Matter Matters! Building soil with decomposers

How can I increase the number of earthworms in the garden?



Define the problem
Imagine/brainstorm
Plan a design
Create
Test
Improve
Present solution

## Growing Strawberries

**Science:** Students will be able to identify and label parts of a strawberry plant. Additionally, they will be observing changes in living things over time.

**Technology**: Students will use digital cameras to photograph their final structure. They will use the printed image to reflect on what was successful or what needed improvement.

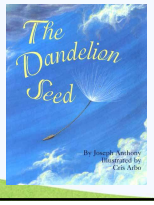
**Engineering:** Students will be building a structure with recyclables and available materials to protect the strawberry plant from predators. while still allowing sun and rain to reach the plants.

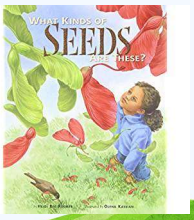
**Art**: Students will paint rocks in the different stages of strawberry growth to be used as plant markers in the garden.

**Math**: Students will measure the parts of the strawberry plant at the beginning and end of the challenge. How many strawberries were harvested? They will record and analyze the data.

## Seed Dispersal

How do seeds move from one place to another? Why?



**Students will use built knowledge to design, test and evaluate a simple model which mimics how seeds move away from plants to improve survival rates.**

Define the problem
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Present solution

## Criteria

- Float in water for at least five minutes
- Attract an animal to carry them away
- Glide, fly or soar in air at least 5 feet
- Stick to an animal and be carried at least 10 feet
- Be thrown at least 2 feet away from the parent plant
- How do these challenges relate to engineering processes used for human travel including air, land and water?

# Create an Exploding Seed Pod

Why and how do plants seem to explode?


https://youtu.be/FvCaDK_rlCk

## Using only these supplies how can you design a seed pod?

Supplies available:
Balloon
Seeds
Funnel
Pencil

Constraints:
Use only materials given within the time limit

How does your model represent the building tension in a seed pod before it bursts?

Test your model outside. How did you make your pod explode?

What did you observe when your pod exploded? Draw and label your drawing.

Measure the distance your seed traveled from the pod. Label your drawing with the distance.

For each statement list a score for your effort.
1= Unsatisfactory 2= Needs to Improve 3= Good Effort 4= Outstanding Effort

| Personal Description | Score |
|---|---|
| I talked with my team and then wrote about our method of seed dispersal. I listed ways we could use materials to build the method we were assigned. | |
| I sketched my idea for the model and then made a list of the materials we would need. I shared my ideas with my team and listened to all the other ideas. | |
| I helped build and test our model. This includes the improving we had to do. My job in the building was _____. | |
| I completed my lab sheet with thorough and detailed responses. I worked with my team and did my part in the challenge. | |

| Team Description | Score |
|---|---|
| We talked together about the method of seed dispersal we were assigned. We all sketched and then shared ideas. We listened to all teammates. | |
| We decided on a plan and talked together to determine which materials we would need. We gathered those materials and assigned everyone a job. | |
| We worked together to build and test our model. We improved it as we needed to after testing it. | |
| Our Seed Dispersal Model was very successful. The seed dispersal worked great and we were able to demonstrate it to the class. We were a great team. | |

# Pumpkin Picker Challenge

*Can you build a device that can quickly and efficiently harvest pumpkins?*

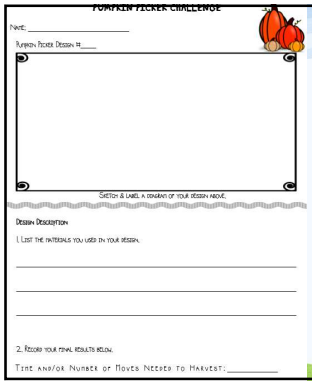
*Suggested supplies:*

| | |
|---|---|
| Pipe cleaners<br>Popsicle sticks<br>Plastic spoons<br>Straws<br>Yarn<br>Rubber bands | Bowls<br>Scissors<br>Tape<br>Green construction paper<br>Candy pumpkins, candy corn, or Rolos |

Design and build a device to harvest pumpkins using the following criteria and constraints.

| CRITERIA (requirements) | CONSTRAINTS (limitations) |
|---|---|
| Device(s) must remove pumpkins from their patch and deposit them in a container. | Use only the materials provided. |
| | Build Time: 30 minutes |
| Harvest the pumpkins as efficiently as possible. Efficiency measured in: Time and/or # of moves. | Device must not damage the pumpkins; no marks, dents, or punctures should occur. |
| | You may operate the device, but you may not directly contact the pumpkins. |


Prize Pumpkins: harvesting and washing
https://www.youtube.com/watch?v=_Ya27X7WhSY


PUMPKIN PICKER CHALLENGE

Name: _____

Pumpkin Picker Design #____

Sketch & label a rendering of your design above.

Design Description

1. List the materials you used in your design.

_____

_____

_____

2. Record your final results below.

Time and/or Number of Moves Needed to Harvest: _____

1. What was successful about your design?
2. If you were able to create a new pumpkin picker what would you change and why?
3. What information might help you improve your design?
4. Looking at your design and that of others what did you notice worked well?
5. If you could add one new material in a future design what would it be?

## Design a Container to Carry Apples

Suggested supplies:

- Paper plates
- Index cards
- Aluminum foil
- Saran Wrap
- Wax paper
- Craft Sticks
- Straws
- Yarn
- Masking tape

Constraints:
Use only materials given within the time limit

Define the problem
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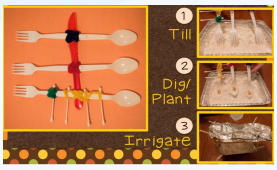
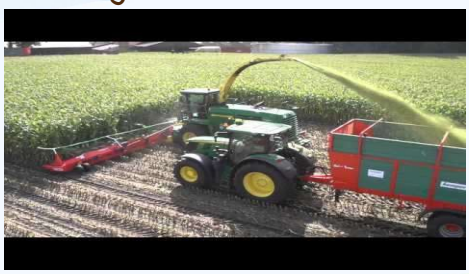
## Design a Corn Cultivator




*Suggested supplies:*

| | |
|---|---|
| Popcorn kernels | Q-tips |
| Foil container | Clothespins |
| Soil | Small cups |
| Straws | Yarn |
| Pipe cleaners | Masking tape |
| Popsicle sticks | Binder Clips |
| Aluminum Foil | Scissors |
| Toothpicks | |

## Harvesting 20 rows of corn video



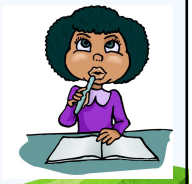
https://youtu.be/nj19SrPcoKM

Design and build one or more farming tools using the following criteria and constraints.

| CRITERIA (requirements) | CONSTRAINTS (limitations) |
|---|---|
| Tool(s) must till and even out the land. | Use only the materials provided. |
| Tool(s) must dig holes, plant, and cover 12 seed mounds. | Build Time: 30 minutes |
| Tool(s) must irrigate lightly and evenly without exposing the seeds. | Irrigation cannot expose the seeds. If seeds are exposed, they must be re-covered. |

## Reflection

- Critical thinking: What did you learn from the other team's solutions and/or process?
- Collaboration: How did you contribute to your group working together?
- Communication: What did you do to help the communication of your group go more smoothly?
- Creativity: What do you think was the most original part of your design and why?



## Questions?

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Thank you for participating today!