STEM and Bloom: Hybrid Explorations in Early Childhood

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Please put name and email in the chat if you would like copies of a more extended list of trade books.
STEM in early childhood is challenging…and more so in a hybrid environment. Come play and explore a progressive series of STEM experiences focused on habits of mind.
NSTA and six other national groups joined together in 2016 to redefine what STEM literature was. In the process, they redefined STEM in the early years.

Not four subjects, no matter how integrated.

Not content at all.
But a state of mind—habits of mind that encourage
• Creativity
• Persistence
• Questioning
• Observation
• Cooperation

STEM habits of mind support agency—the confidence to solve problems, and so they are important components of equity.
Example: Early Childhood STEM--Life Science

Build a progressive program based on a big idea: The needs of living things

- Space
- Water
- Sunlight
- Soil

From these building blocks, children can collect data which will enable them to engineer a garden plot for home or school.

Not independent activities but a sequential storyline investigation. As children gather data they learn the *practices of science and engineering*:

- Asking questions and defining problems
- Planning and carrying out investigations
- Using math and computational thinking.
- Constructing explanations, designing a solution (Claim, evidence, reasoning)
Gardens Are Engineering Projects:
- How much space?
- How much sunlight?
- How much water?
- What kind of soil?

Gardens can also express ideas:
- Build a garden around your favorite book
- Build a garden to provide your favorite meal
- Build a garden around the alphabet, or sizes
- Build a garden with plants that show what you like to do

Your Turn
Suggest a new garden theme in the chat window
Plants compete for space.
1. Look at how plants compete for space. In the “quadrat analysis” above compare the occurrence of Pusley (a lawn weed) in shade (left) or sunlight (right). In northern states, use dandelions.
2. Use a tool called a quadrat (square meter). For early childhood use a hula hoop or bicycle tire. Which plant is competing best?
3. Later, they will look at how much sun each area gets.
Everything needs its own space.

Look at the photos in the picture.

What could live there? Could the spaces contain food?

Number the spaces clockwise 1-5 beginning with the old tree.

On a scrap sheet, guess what lives in these Spaces.

I’ll call on someone at random to give your answers.
Plan from Your Data

How much space will the plants in your garden take up when they are large?

If it’s a pot garden, how big will the pot have to be? If it’s a dirt garden, how can you plan?

Hint: Send children out with the top to a big frying pan to mark off the space for a tomato plant. Use an 8 inch pan to mark a pepper’s needs (or an herb like basil).

Use a big coffee cup to mark off the space for a smaller herb or carrots.
Spoiler Alert:

If you have some flower petals and some water, take time to mush them up in the water. (You don’t need more than 2 tbsp water for half a dozen petals.)

You can use a fork, a mortar and pestle, or your fingers

Then they will soak and be ready for later.

*Meanwhile let me turn it over to Ruth...*
What Is Water?
How will it get to our plants?

Begin by *observing* the properties of water. Then *take a water walk* and gather evidence to identify what we see. (No tasting, of course!)

You will need a small cup of water, a very smooth surface like wax paper or a sheet protector, and an eye dropper.

- Hold the dropper horizontally
- Very, very gently let a drop fall from the dropper onto the paper. *Don’t squirt!*
- Do it again and again.

- What is the shape of a water drop?
- Are all the drops the same size?
- What happens when two drops touch one another?
- What happens if the water has a tiny bit of soap in it?
Share! If your computer or doc cam can catch your drops, raise your hand and we can “pin” your images to share.
Read and play: Water

Vicki Cobb’s book *I Get Wet* is full of facts and small explorations to help students think about the properties of water.
April Pulley Sayre’s book is ideal to continue observations.

- Water
- Droppers
- Natural materials like leaves

Book: Raindrops Roll

“Can you create drops that look like the pictures in the book?”
What will happen if there is not enough water? Janet Wong has a poem for that.

THE CLASS PLANT
by Janet Wong

The plant on our bookshelf is turning yellow, drooping and dropping leaves.

We talk about what it might need. I feel like a doctor in a hospital talking about a sick patient.

Jack wants to give it more water. Kayla says the soil smells moldy and feels soggy—too much water.

Chris asks: How about more light? We move the plant to a bigger pot. I place it carefully near the window.

I have a prediction: "Tomorrow our plant will be dancing!" They laugh but they will see.

The next day the weather is very hot. The air conditioning is blowing hard right down on the leaves of our plant.

Hot weather + air conditioning = Dancing Plant!
More Data: Sun and Shadows

Experiment!

What direction is the sun coming from?

You can make a sundial from a T Ball T

Mark the times around the circle.
Survey Your School Yard with Sun Beads

Where are the sunny areas?
Where are the shady areas?
Where should you plant your garden?

Remember the pulseey or dandelions?
How Will the Plants Attract Pollinators?

Color in plants is an important part of the ecology.

Explore how color can change in a plant. That would mean different pollinators!
Color Can Change:

Play with colors.
Take some flower petals of any deep color.
Mash them with a fork or fingers and a little water.
Put them in small “wells” -- cups, bubble pack wells, clear egg carton Sections. Add a little vinegar or lemon juice to one well, a little baking soda to another.

Safety: In STEM these are chemicals. Treat them that way. Wear safety goggles if available. Provide very tiny quantities in labeled containers and talk to the children about how we use chemicals.
Periwinkle (vinegar left, baking soda right)  Rose (Baking soda left, vinegar right.)
Share! If your computer or doc cam can catch your colors, raise your hand and we can “pin” your images to share.
Why is there color?

Bees like blue and violet. (Bees also like ultraviolet. This could be a mystery investigation if you have a UV flashlight.)

Butterflies like white, pink, purple, red, yellow, and orange.

The flowers at the left have “targets” for pollinators.

The flower below looks blue to humans, but to a bee it looks red.
Experiment with Soil

Soil is a system
What’s inside?
How does water pass through soil?
Gather Data on Soil

Test the soil in your proposed garden area

Put a tablespoon into a water bottle. Shake it like a snow globe.

Bits of sand and rock will sink to the bottom.

Bits of plants will float on top.

How much “loamy” soil is in the middle?

Note: The sample I’ve tossed today is commercial and contains white bits of “perlite.” That’s not ideal. Use “real” soil.
Now Design Your Garden

It should have a theme:

- Pizzas
- Colors
- Favorite books
- Shapes

Put your idea for a theme garden in the chat window
Engineering requires iterative design

Recheck your garden.

Is it a success?

Then think about the future.

How will your garden plants survive?

How do seeds carry plants to new spaces.

The unit ends as it began, thinking about space.
Engineering: Create and improve ways for plants to “fly to new homes.”
Look at other ways to find new spaces.

Emphasize continuity…back to the beginning.

And think about how the garden might survive another year.

(To an extent this depends on your area.)

In Engineering, this is a sort of iterative design, since you are testing and renewing.
How do we assess improvements in STEM habits of mind?

It’s not as easy as assessing literacy.

A great informal “rubric” to share with parents and community:

A Rubric Can Help You Share Ideas

More Great Books to Share
Connections

Social Studies:

*First Garden* by Robbin Gourley (2011) combines history and gardening.

Technology

- Measuring light with light sensitive materials
- Measuring space with rulers, easy measure APP
- Measuring temperature with thermometers
- Use of tools for construction
- Use of photography to collect data

Websites to identify plants and animals
- [http://plants.usda.gov/](http://plants.usda.gov/)
- [http://identifythatplant.com/plant-id-resources/plant-id-websites](http://identifythatplant.com/plant-id-resources/plant-id-websites)
Connections

Mathematics
Collecting Data: Population counts
  Garden geometry--Size and shape
  Volume and size of plants

Arts
Colors: Rainbows and art projects

The Bean Dance  https://www.youtube.com/watch?v=LCKEdDEr82k
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Books about Gardening for Kids


Curricula and videos: JASON Learning www.Jason.org
Communicating within the Community:

A crisis has occurred. For an undefined period of time, children will not be able to attend school in the normal setting. You must communicate your goals and how you measure them to parents and guides in informal settings so they can take over.

Communicate! Post something in the chat that condenses the most important thing that you can share about your own goals for your students.
Thank You

Thank you for attending the presentation.

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Email us for some PDF Picture Play activities and a longer bibliography