

# Lessons and Sustainable Gardening in Ypsilanti

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## **Executive Summary**

In this project we communicated with partners at the Ypsilanti District Library (YDL) to curate sustainability and STEM-focused lessons for use in the YDL's summer youth program. The primary deliverables were in the form of pitched lesson plans, with relevant graphic/video material and step-by-step instructions that could help in the teaching process for each lesson; the ultimate goal being to spark curiosity and passion about sustainability in children local to Ypsilanti.

Throughout this project, we were able to extend our scope through recommendations of how the library could extend ideas of sustainability education beyond summer programming events (some of these ideas are further touched upon in <u>Deliverables and Recommendations</u>). We hope that these materials can be adapted and utilized for years to come, and that all visitors of YDL have the opportunity to engage with the many educational opportunities that the library provides to the community

## **Introduction and Background**

This project was in collaboration with the Ypsilanti District Library, which operates three locations and serves three municipalities, including Ypsilanti Township, the City of Ypsilanti, and a large portion of Superior Township. Respective locations include the Whittaker branch, the Michigan branch, and the Superior branch, with each holding events year round to help promote knowledge and provide a safe place for learning for all ages. Each location caters specialized materials and activities to those of all ages, including children, teens, adults, and seniors. With differences in walkability, neighborhood density, and nearby schools, each library also serves a slightly different population demographic. The Ypsilanti District Library system was established with the aim to foster community through discovery and education, and has served the area for over 150 years, helping to bring resources to underserved communities.

Particularly, the Ypsilanti District Library runs a Youth Summer Learning Program each year, at all three of its locations. Youth– elementary to high school ages– have the chance to eat a free lunch Monday through Friday as a part of their summer Meet Up and Eat Up program. This is followed by an ongoing educational program series that gives local children the chance to participate in hands-on activities such as gardening, cooking, and arts and crafts, while reinforcing important STEM knowledge through fun and engaging lesson plans. Through the

Graham Sustainability Institute's partnership with the Ypsilanti District Library, our Graham Scholar Team had the opportunity to create STEM-centered lessons for this summer program.

These lessons are especially important to the community as the material helps to close the learning gap seen between many children that live throughout Washtenaw County. As shown from past research, Washtenaw county maintains a large geographic imbalance in educational opportunity–Choice and Charter school options often magnify existing racial and economic disparities in areas of poverty (*Disparities in Access to Opportunity*, 2017). In combination with the lack of funding and resources to schools in the same area, students in these communities are receiving an inequitable education as compared to their peers. The summer program introduces, reinforces, and emphasizes sustainability education to the youth and their families through effectively allowing them to experience gardening firsthand. Through this program comes many opportunities for learning, as families can enjoy the activities while also benefiting from structured lessons that help supplement important points learned in school and beyond. This programming provides an alternative for low and middle income families who can't afford summer camps, to help retain skills learned during the school year and spark interest in new subjects.

# Methods

During the time that we worked with the Ypsilanti Libraries, we met with Jodi Krahnke (Ypsilanti District Library Head of Youth Services) and the youth staff from the different library branches several times. As we gained more insight into the needs and resources of each branch through meetings with library staff and tours of the YDL system, we researched STEM principles and curriculums and created ten rough drafts of lesson plans that could be used by all three libraries. These lesson outlines contained extensions on key areas of environmental study important to youth education including composting, the water cycle, plants and photosynthesis, pollination, and more. Lesson plans also aimed to foster creativity and community throughout the youth summer program, incorporating themes such as kindness and exploration. We shared these rough drafts with the YDL children's librarians, and revised them using the feedback that we received. The final lesson plans were put in a Google Drive so that they will be accessible and usable for years to come.

As part of our research we visited the Matthaei Botanical Gardens' Gaffield Children's Garden to see how they incorporated STEM principles into their garden. For example, we examined stations like the "pollinator palace" which is a designated design structure for pollinators, namely bees, to inhabit. There was specific signage for children to understand that having this palace is an intentional choice made to foster agro ecological productivity as without pollinators, we cannot have a garden. From this and other elements of the Gaffield Children's Garden like the "Sense-ational garden" and "tool box", we were able to get inspiration for our own lesson plans. We were particularly interested in the activities that students would be able to work on together, and required meaningful engagement with the mind and body.

As a supplement, we also did some research online, to determine what types of activities would be appropriate for the age group we were creating lesson plans for, as well as for the resources that were available.

#### **Deliverables and Recommendations**

Our deliverables for this project consisted of 10 summer lesson plans that the library could implement into a summer curriculum for youth library patrons, with each to be used once a week. Lesson topics consisted of STEM principles like the water cycle, gardening productively, and community engagement and problem solving. Due to differences in physical building locations in the community, YDL receives a different audience of people at each branch of the library. While the ages of youth library patrons varies, the lessons we created are designed for students in the Kindergarten through fifth grade with some adaptations to account for age differences amongst this group.

Due to the timing of the Graham Scholars Program, most of the 10 lesson plans created in the 2022-23 school year were able to be implemented in the summer of 2023. Graham Scholar Summer Interns Olivea Nicholson (from the MDARD Team) and Noah (YDL Team) expanded to 14 lessons and custom fit each one based on the library's needs. YDL had record breaking attendance for summer programming, with numbers higher than before the COVID-19 pandemic. Engagement with our content was therefore quite high, with attendance numbers typically between 30-40 people per program. Lessons were either implemented as a separate activity or in conjunction with another function occurring at the libraries, and most of the lessons were carried out at YDL-Whittaker. YDL has had two previous projects in conjunction with the Graham Scholars program. The 2020-2021 group created online educational lessons for at-home use during the COVID pandemic, while the 2021-2022 Graham team designed take-home STEM kits for families. Therefore, the 2022-23 school year was the first time that a group of five college students in the program created a summer curriculum for the library. Having the team meet with the library staff and go to each physical library location helped the team to generate ideas and learn what was feasible. In addition, weekly meetings with the team, going to Matthaei Botanical Gardens, and the timeline of lesson creation were helpful as well.

Something that Jodi, Noah, and Olivea noticed over the course of the summer was that it helped to be physically present at a library program. The summer interns had this experience, and it helped to plan each lesson in a significant amount of further detail. Another YDL team is working with YDL during the 2023-24 school year, and more teams are likely to follow in future years. We recommend that these groups attend at least one youth program (or other type of activity, depending on the project) and take some notes as to how it is run. Due to the large presence of external visitors (outside organizations giving a guest programming event) at the library, we also recommend that lessons are created with flexibility. This means that future creations should be overprepared with materials, including (at minimum) a worksheet for kids, a handout for parents, and examples of how each step of a lesson is to be run through the usage of videos and photos. This helps the staff to have anything that ranges from a filler activity to an hour long program.

# Impact

Educational engagement programs and events expose members of the community to different ideas, perspectives, and people. At the current moment, sustainability as a framework has been a major pillar in such engagement practices. Our work, then, with the Ypsilanti District Libraries and young students in the community, was an opportunity to bring this framework to their lives through environmental principles, specifically through garden agroecology. Garden creation, maintenance, and productivity requires a substantial amount of inputs (critical thinking, group problem solving, manual labor, creativity, etc), and by giving young community members the knowledge and tools to contribute to such has several impacts. Firstly, many of these children draw great benefits from summer programming that supplements their learning during the academic year. In offering STEM-adjacent lesson plans and activities, the students can engage the technical skills that they may or may not have already and improve upon them. This primes them for the upcoming school year, and/or allows them to more practically apply what they learned in their previous classrooms. Secondarily, this empowers the youth to feel more comfortable and confident in the classroom beyond the YDLs with the knowledge and skills that they received during the summer program.

Next, the activities that we advised left a lot of room for autonomy from the students; we curated the program lessons to require creativity and problem solving from the youth. This allowed for students to claim a sense of place in their solutions– a place where they have a direct stake in what does and doesn't happen which is a core tenet of place based education (*Place-Based Education*, 2023).

Further, claiming such a stake in the place and the work being done to maintain and improve it scales up the principles of agroecology. In other words, activities that teach the youth the importance of all of the abiotic-biotic interactions that are required in a garden are paralleled to the importance of the students themselves and the skills they have that combine to not only make up their community, but also produce change within it. This does a couple of things. For one, it reinforces the sense of place that students feel, creating a positive feedback loop: the more that children are put in positions that allow them to affect their community, the more they can generate a sense of place and belonging, which then empowers them to affect their community positively. It also instills the intuition within the youth to take senses of place and collective ownership for whatever setting they may be in in the future (classrooms, sports teams, clubs, etc.) and apply principles sustainability–specifically as they relate to ecological dynamics– to creative problem solving and decision making.

This lends itself to our intended impacts. By creating sustainability curriculums for the youth of Ypsilanti, we hope to see a more environmentally-aware body of students move throughout their academic careers and continuing to make impacts in their communities with the intention to make it a more resilient network, just as they worked to do and understand with the Ypsilanti District Library gardens. Doing such has great potential for collaboration and communication with other communities that have their own sustainability goals, and an increased likelihood of reaching them.

# Acknowledgments

Thank you to the team at Ypsilanti District Library, including Stephanie Pocsi-Morrison, Mary Garboden, Nicole Russell, and Joy Cichewicz for providing support and feedback throughout the duration of this partnership. Special thanks to Jodi Krahnke for being our partner contact and helping us set benchmarks for the project, as well as dedicating her time to work with us.

# References

- Disparities in Access to Opportunity. Washtenaw County Assessment of Fair Housing. 2017. https://www.washtenaw.org/DocumentCenter/View/2340/Disparities-in-Access-to-Op ortunities-PDF
- Place-Based Education, Michigan Government Labor and Economic Opportunity. 2023. https://www.michigan.gov/leo/boards-comms-councils/mistem/stem-toolbox/place-ba ed-education#WhyPBE

# Appendices

# Appendix A – Water Cycle Lesson

# Lesson Title: Water Cycle

Lesson Objectives:

- Be able to understand how water moves on Earth
- Be able to understand importance of clean water
- https://www.123homeschool4me.com/2-fun-hands-on-water-cycle-activities/

#### Materials:

- Hot Water
- Blue Food Coloring (Optional)
- A Clear Empty Bottle
- Sharpie
- Ice Cubes
- A cup or something to hold the bottle up, because you will turn it upside down.
- Some print out or poster of the water cycle to show (could be handmade or whiteboard or whatever, of course, but here's a link with a lot of beautiful examples: <u>https://www.freepik.com/free-photos-vectors/water-cycle/3</u>)

## Preparation:

• Print out the poster above

Have an example set up ahead of time, make sure ice is stored in a cold area while instructions are being given and until the experiment is ready. Make sure to have enough clean, empty, clear water bottles for kids to use and distribute them to each kid. Hold onto the other materials as you explain, as things can go awry. Decide how you want to heat the water (either the hottest setting on the sink or if you prefer to heat it up with a kettle beforehand). Whichever method you choose, make sure it's not prepared too far in advance so it doesn't cool down.

## Instructions:

Have the kids flip the bottle upside down and draw various parts of the water system so they can visualize the water system (ex: the sun and clouds at the top, waves at the bottom). Possibly have them line up and fill up their bottles with hot water for them- only fill about 1/4th so they can hold the bottle by the top and not burn their hands. Can either have a second station with an adult for them to add the food dye to make the water blue, or have enough to place them at a table (may not be smart to give them free rein to food dye). Place ice cubes on the flat bottom (now top) of the bottle and watch as the condensation forms.



## Talking Points:

- Water has been on earth a long long time and continues to be recycled
- Water makes about ~60% of our body
- Water's role in life, importance of protecting water
  - Maybe make them list 3-5 reasons why water is important
    - Examples: need clean drinking water for our bodies, need it for plants and photosynthesis, sustains ecosystems, necessary for production, etc.
- Water covers 70% of the earth, but only 2.5% is freshwater, most of which is locked in ice or underground
  - Can combine these top two points to talk about water contamination and how pollution affects it.
  - Can mention ways to conserve water at home

# Adapting for different Age Groups (Grades K-1, 2-3, 4-5):

For younger children who we don't want handling hot water or food dye can use a paper plate and draw the water cycle with printed out labels- the water droplet will spin around the cycle.

- Paper Plate
- Colored Pencils
- Printable Labels & Pictures (if you want to use them)
- Scissors
- Glue
- Cardstock (?)
- 1 brad push pin

Would need to print (and possibly cut) the labels ahead of time, and prepare an example. Can also use this method to show pollution.



# Appendix B – Upcycle Lesson

#### Lesson Title: Upcycling

#### Lesson Objectives:

- Learn about waste reduction
- Learn about utilizing the resources you have

#### <u>Materials:</u>

- Old T-shirts
- Scissors

#### Preparation:

- Collect enough shirts that will be necessary (might be best to have a couple extra in case of disaster, unless you have a seamstress on hand)
- Advertise for participants to bring their own old shirt (long sleeve has more versatility), so that their project feels even more personal.

#### Instruction:

- lay shirt flat
- Cut 1-1.5 inch long strips through both layers of fabric across the entire bottom of the shirt
- Tie the strips that are opposite of each other together (tightly) across the entire bottom to make it not a hole anymore
- Different options for straps, but my favorite is just to cut the neckline a little deeper, then tie the sleeves together (works especially well for long-sleeves, but short sleeves will do the trick)
- Now you have a bag

- DIY | NO Sew T-Shirt Bag (SO Easy!!) Here's a video example for more clarity

#### Talking Points:

- Even though it can take some time and be tedious, doesn't it feel good to have something useful you made for yourself?
- What are some other ways you could think of to upcycle something you don't need anymore?

## Adaptation for Different Age Groups:

- Younger kids will need an adult helper
- Have some items pre-made
- Younger kids could make art on scrap paper...they can glue them together to make art or just draw
- Younger kids could also make a snake or bee with toilet paper rolls

## Lesson Title: Planting Lesson

## Materials:

-Seeds for lettuce, radishes, and green beans -compostable planter cups -Soil -watering cans -Paper cut outs of plant life stages.

#### Preparation:

-Know how many seeds will be planted and where -Cutouts of the life stages, with some labeled and some not -Sheet describing life stages to hand out for kids

#### Lesson Objectives:

This lesson can help kids learn about the planting process. It could be done earlier in the summer to ensure that the plants have time to grow before school starts again. The first half of the lesson could include planting the items in the soil. The second half of the lesson can include the steps behind plant growth.

The activity engages the kids with hands-on planting! It also introduces them to the plant life stages. Throughout the summer, kids could see the progress of plant growth.

## Instructions:

-Start the lesson by giving instructions to the kids as to what plants go where. Children can learn facts about the food being grown, along with tools needed for planting.

-Plants could go in small compostable cups or directly in the ground

-Follow the seed packet instructions...guide the kids on what plants will grow in what containers -Go over the life stages of the plant once it starts to grow. Then give kids a paper cutout of a life stage.

-Have the kids join with others in the same group.

-Kids can interact with each other; then the whole group can line up in order based on their group's plant stage

#### OR

-Have the kids find everyone with a different life stage (and make a complete life stage)

\*The activity could be done indoors or outdoors depending on the weather and location. Facilitators could plant out in the garden or with indoor starter pots (compostable and break down in soil) for easier facilitation (and since the activity may be a bit messy)

# Talking Points:

- How to plant seeds
  - Pick an area with sunlight
  - Prepare the soil
    - Make sure to dig a small hole for the seeds (a handful, maybe 2-3) and cover it back up- don't put them too close together or they'll compete for resources!
  - Keep soil moist but not soggy, can use a mister or a watering can
  - Maintenance- keep an eye on your seeds, remove any weeds that may be in its way
- Life stages of the plant
  - This is on the handout sheet
- Nutrition
  - Nutrition is important for strong immune systems and a balanced diet, especially for growing bodies/minds! Growing your own food can connect you more to the environment and teach you how to be patient and respect nature. Teaches responsibility and understanding cause and effect (too little water is bad, but too much water can also hurt). Can create self confidence from enjoying the food you grow.
- Could add some of the photosynthesis lesson materials
- What plants need to grow
  - Light
  - Air
  - Water
  - Food (nutrients)
  - Space to grow
  - All of the above: <u>https://letstalkscience.ca/educational-resources/backgrounders/needs-plants</u>
  - Support (for most plants, this is the ground)

# Adaptation:

- The slips the younger kids have will be labeled so they know which life stage they are, older kids will both identify and find others in different stages



## Lesson Title: Pollinator scavenger hunt and worksheet

#### Lesson Objectives:

- Identify different types of pollinators and learn about the importance of pollination
- Spend some time outdoors identifying animals

## Materials:

- <u>Worksheets</u>
- Pencils/writing utensil

#### Preparation:

- a. Optional: print out some pollinators fun fact sheets (1, 2, 3)
- b. Print out these worksheets

## Instructions:

- a. Distribute worksheets for kids to take outside and check off each pollinator they can find
- b. After 15ish minutes, bring kids back inside (or to somewhere where they can write outside) to complete the fill in the blank portion of the worksheet
- c. Go over the correct answers to the fill in the blank worksheet

## Talking Points:

Talk through the importance of pollination:

Pollinators are extremely important to the world, as we need them to grow our food. Three-fourths of the world's flowering plants depend on animal pollinators to reproduce (or spread their seeds, grow flowers and fruit). Without pollination, the flower will not form any seeds, fruit, or flowers, and will eventually die.

-Explain how each animal on the checklist completes pollination:

Bees: They are attracted to the scent and color of flowers. The pollen and nectar inside the flower are a food source for the bees. Pollen can stick to the bee's fur and be transferred to another flower which helps complete pollination. Bees are loyal to one flower and use dances to communicate with each other.

plantura.garden/uk/insects/bees/bee-pollination

Butterflies: Are not as good at pollinating as bees but are still active and visit a variety of wildflowers. Butterflies can see the color red (unlike bees) and typically visit flowers that are in clusters. <u>Butterfly Pollination (usda.gov)</u> Birds: Pollination carried out by birds is known as ornithophily. An example of a bird that eats nectar is a hummingbird. Pollen can stick to a bird beak or its feathers around the head or back. As the bird visits other flowers, the pollen may rub off and therefore help with reproduction for the flower. <u>Do Birds Pollinate? (All You Need To Know) | Birdfact</u>

Moths: Some (but not all) of these creatures pollinate at night. Nocturnal (night) flowers with pale or white flowers and a strong scent attract moths. Flowers pollinated by moths are typically clustered, provide a landing platform, and may have nectar that is deeply hidden. <u>Moth Pollination (usda.gov)</u>

\*See other lesson plans for more talking points.

Adapting for different Age Groups (Grades K-1, 2-3, 4-5):

Anyone could do this lesson, others are also available!

# Lesson Title: Bee house building

Lesson Objectives:

- Learn how to build a bee house
- Understand why pollinators are important

## Materials:

- bamboo poles (natural; found at stores like Wal-Mart or Home Depot)
- zip-ties
- wood frame of some sort (such as a bird house) (optional for larger bee houses)
- cardboard
- plastic bottles
- Yarn

## Preparation:

- Choose type of design to build
- Collect/purchase materials and put out in activity area

## Instructions:

- a. Have kids collect various sizes of bamboo and zip tie together into their own bundle, or have everyone create a small bundle and combine them to create a large bee home for the library.
- b. Videos of instructions/approaches below
  - i. <u>https://www.youtube.com/watch?v=ZBGsMIDr-XY</u>
  - ii. https://www.youtube.com/watch?v=tYn6Py9OeX8
  - iii. <u>https://www.youtube.com/watch?v=FUI\_XdqNezo</u>

#### Talking Points:

What is the relationship between the pollinators and the flowers? How does this relationship benefit each species?

Mutualism exists between pollinator species and flowers. The pollinator is fed nectar from the flower, and the flower has a better chance of being able to reproduce.

What is the importance of creating a habitat for pollinators in our modern world?

Throughout time, the native habitats of pollinators have been destroyed in favor of human development. With less habitat for bees, there is less pollination. Nature and humans both need pollinators! Therefore, creating a place for bees allows for more pollination to take place.

\*See other lesson plans for more talking points.

# Adapting for different Age Groups (Grades K-1, 2-3, 4-5):

This activity works best for older kids. More adult assistance would be required for younger individuals. For ideas that are adapted to younger kids, see the other lesson plans.

## Lesson Title: Eggshell carton pollinator craft

## Lesson Objectives:

- Reuse egg cartons to be creative and make a pollinator art craft

## Materials:

- egg cartons (cardboard preferred but all work)
- scissors (or pre-cut)
- Markers or paint
- pipe cleaners
- construction paper

#### Preparation:

- Find egg cartons, or collect over a period of a few weeks before planned activity
- Purchase materials needed (pipe cleaners, construction paper)
- Gather scissors and markets/paint
- Optional: pre-cut egg cartons



## Instruction:

- a. Have each child choose a pollinator (butterfly, ant, bee, bird, etc) and craft one out of egg cartons; ex: square of 4 for a butterfly (wings), line of 3 for a bee or ant, etc.
- b. Decorate with the supplies provided.

#### Talking Points:

What is the relationship between the pollinators and the flowers? How does this relationship benefit each species?

Mutualism exists between pollinator species and flowers. The pollinator is fed nectar from the flower, and the flower has a better chance of being able to reproduce.

Why should we reuse egg cartons rather than buying newer materials?

By reusing egg cartons instead of buying other materials, we are using less energy. The energy that would be spent making a new product for this sort of activity can be conserved (which emits less fossil fuels in our environment). Plus, reusing egg cartons saves money!

#### Adapting for different Age Groups (Grades K-1, 2-3, 4-5):

This activity can work for any age group, although an adult helper may be needed for younger individuals (to help with scissors especially). Other pollinator lesson plans are also available.



# Milkweed

Benefits: Attracts and saves the Monarch butterfly population. Where to buy: Home Depot or Amazon



# Yarrow

Benefits: Yarrow is edible and useful for crafts, it attracts pollinators and even has medicinal uses! Where to buy: Lowes or Walmart's Garden Center



# Yellow hyssop

Benefits: Attracts bees, butterflies, and hummingbirds Where to buy: Lowes, Walmart's Garden Center, or Plymouth nursery



# Wild columbine

Benefits: Can self propagate and grow in just about any habitat Where to buy: Lowes or Home Depot



# Smooth aster

Benefits: (as well as other types of aster flowers) Attract butterflies and work well in vegetable gardens by repelling pests Where to buy: Lowes or Walmart's Garden Center



# **Tall bellflower** Benefits: A tall, beautiful flower that's a magnet for pollinators Where to buy: Lowes or Home Depot



**Woodland sunflower** Benefits: A very popular choice, low maintenance and tolerant of Michigan weather Where to buy: Ypsilanti Native Plant Nursery



**Cardinal flower** Benefits: An adaptable flower, produce many seeds to store for following years Where to buy: Lowes or Home Depot



# Sundrops

Benefits: Attractive to pollinators but not larger animals such as deer

Where to buy: Lowes or Kroger

# **Pollinator Scavenger Hunt!**

Can you find the following animals or plants involved in pollination?



fruit or \_\_\_\_\_. Many people know that \_\_\_\_\_s are common pollinators, but

there are so many more! Flying animals such as \_\_\_\_\_s and \_\_\_\_s are also extremely important pollinators, as they spread pollen when they fly from flower to

flower. Other flying insects, such as the \_\_\_\_\_\_ also help with pollination! But, an animal or insect doesn't have to fly to pollinate a plant, insects

such as the \_\_\_\_\_\_ and \_\_\_\_\_ can also pollinate plants as they crawl from one flower to another. However, flowers aren't the only plant that needs

pollination, so do tall \_\_\_\_\_\_s that produce fruit like apples and pears, as well as other plants like blueberry bushes! In fact, many of the fruits and vegetables we eat

need pollination such as \_\_\_\_\_ and \_\_\_\_\_ and \_\_\_\_!

# Appendix E – Plant Anatomy Lesson and Handouts

# Lesson Title: Plant Anatomy Lesson

## Lesson Objectives:

Plants are living organisms that cover much of the land on our planet! There are many different types of plants, and they can do different things. There are flowering plants, which grow flowers or fruit, as well as nonflowering plants, such as ferns and mosses. In this activity we're going to go outside and observe some of the plants here at the library, and then return inside for a plant anatomy activity!

# Materials:

- plant anatomy lesson worksheet, linked here
- coloring pencils, crayons, pencils, etc
- paper

# Optional:

- scissors
- construction paper
- Pot
- Soil
- Seeds

## Preparation:

- Print worksheets and collect materials above
- Compile a list with pictures and names of plants around the library for kids to reference throughout the activity
- Fill out an answer key

## Instructions:

- 1. Let kids go outside to see the various kinds of plants on the property, have them make a list of the different plants they can find.
- 2. After you feel the kids have had ample time to observe the different types of plants, bring them back inside (or to a table somewhere inside?), and hand out the worksheets. Explain that plants have many different parts, and they all have different functions.
- 3. Allow the kids to complete the matching activity.
- 4. After the matching activity is completed, explain the correct answers and point out where each part is on a plant.
- 5. Bring out coloring pencils, crayons, (scissors and construction paper), etc. and allow the kids to make their own plant on the other side of the worksheet.

6. Then, have them label each part of the plant that they drew.

Planting activity (can use, snap pea seeds, common beans, marigold seeds, etc)

7. Give each child some seeds and a small pot, as well as some soil and water.



- 8. Let the kids decorate their small pot (paint, marker, etc)
- 9. Have them plant the seeds in their pot and give them instructions on when to water their plant and how much sunlight to give it
- 10. Tell them to watch it grow and see the different parts of their plant develop!

Talking Points and additional adaptations/extensions/resources:

1. Have a more detailed picture based on age



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- 2. There could be three different stations
  - a. Plant hunting/outdoors search
  - b. Create and color your own plant
  - c. Pot your own plant



# www.rabbitsabc.com

Plant Parts Talking Points:

- 1. How Do Plants Utilize Water? Plants take water from the roots and transport it through the interlude and stem to the leaves, fruit, and flower.
- 2. What is the purpose of plant leaves? To collect sunlight that can be used for photosynthesis.
- 3. Why is the root system underground? Plants need roots to have support for their physical structure and access to resources
- 4. Why is the root system important? It collects water and other nutrients from the soil that help the plant grow.

# Photosynthesis talking points:

- What is photosynthesis?
  - Ex: Photosynthesis is the process that plants use to breathe. As humans we breathe in oxygen and breathe out carbon dioxide, but plants breathe in carbon dioxide and let out oxygen.
- What do plants need for photosynthesis?
  - Ex: For plants to go through photosynthesis they need sunlight, carbon dioxide, water, and chlorophyll, which is what gives plants their green color.
- How does it work?
  - Ex: The chlorophyll in the plants absorbs energy sunlight. Then, they use that energy to change the water and carbon dioxide into oxygen and sugars. The plants use some of these sugars and release the oxygen into the air, which we then breathe in.

absorbs carbon dioxide for the plant to make food
protects the seeds of the plant
roproductive part of
the plant and provides source of food for
poliinators
absorbs water and minerals from the ground
transports water, minerals, and food around the plant
develops into a leaf or flower

Now	draw	and	label	vour	own	plant!
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# **Appendix F – Photosynthesis Lesson**

## Lesson Title: Learning photosynthesis through watering can craft

<u>Lesson Objectives:</u> An understanding of how plants "breathe" and what they need to undergo photosynthesis.

## Materials:

- Clean plastic bottles for each student (ex: plastic soda bottles)
- Plastic wrap
- Rubber bands
- Pushpins
- Paint
- Paintbrushes

#### Preparation:

- Prior to using this lesson plan the facilitator should collect and clean plastic bottles that will be used for the craft
- Collect/purchase materials (plastic wrap, rubber bands, pushpins, paint, and paintbrushes)
- Link to photosynthesis diagram and information
- Link to similar craft
  - This project is aged down to use less tools so that hopefully the students can do it themselves

## Instructions:

- First, provide the students with paint, and allow them to decorate their bottles
- Next, fill the bottles halfway to 3/4 full with water
- Now, rip off a small sheet of plastic wrap and pull it taut over the mouth of the bottle
- Wrap a rubber band around the neck of the bottle to hold the plastic wrap in place
- For each student, have an adult poke holes into the plastic wrap to allow for water to escape
- Once everyone is done, let the students go out to the garden and help water the plants

\*While the students are working on the craft, walk around and explain the process of photosynthesis to them, with an emphasis on the importance of the watering that they are about to do. If it is helpful, print out copies of the attached handout (below) to provide students with, or to use in instruction.

# Talking Points:

- What is photosynthesis?
  - Ex: Photosynthesis is the process that plants use to breathe. As humans we breathe in oxygen and breathe out carbon dioxide, but plants breathe in carbon dioxide and let out oxygen.
- What do plants need for photosynthesis?
  - Ex: For plants to go through photosynthesis they need sunlight, carbon dioxide, water, and chlorophyll, which is what gives plants their green color.
- How does it work?
  - Ex: The chlorophyll in the plants absorbs energy sunlight. Then, they use that energy to change the water and carbon dioxide into oxygen and sugars. The plants use some of these sugars and release the oxygen into the air, which we then breathe in.

<u>Adaptations:</u> Younger kids would need more adult assistance...have a few bottles premade for younger kids that do not have an adult helper (pair with an older kid)

- Aging up: Give more in depth information on photosynthesis, maybe quiz the students
- Aging down: have facilitators and/or parents provide more help with the craft



# Lesson Title: Kindness Rock Garden

# Lesson Objectives:

This activity can be used to promote social sustainability by spreading kindness and intention for your garden, as well as allowing participants to take ownership of its preservation, beauty, and character.

# Materials:

- Craft acrylic paint
- Paint brushes
- Stencils (not necessary) Example from Amazon here
- Stones
- Water
- cups
- Towels
- Old Newspaper/magazines
- Sharpies (optional)





# Preparation:

- Make a Kindness Rock Garden sign (as pictured), or create a station where children help color/design a sign to be laminated and put in garden. Outline for a color-able one here.
- Collect materials (possibly purchase bulk bag of stones to be painted and placed in garden)
- Lay out newspapers/magazines over table/surface paint will be used on
- Fill cups with water for paintbrush rinsing
- Set out materials (paint, sharpies, stencils (optional))
- Maybe print out some inspiration pictures for the kids. Some pictured here

# Instructions:

1. Ask participants to go find a stone in nature that they'd like to use. The larger and smoother, the easier it will be to paint.

\*If larger, smoother rocks are hard to come by, you can find some at home improvement stores since they usually carry pre-tumbled stones.

- 2. Have participants rinse their stones to get rid of dirt, and pat dry with towels. It is okay if they're not completely dry, but they need to be dry enough to paint on.
- 3. Lay out <u>old magazines or newspapers</u> upon the surface that participants will be using to lay their rocks on as they paint in order to avoid mess.
- 4. Ask them to paint inspiring images and/or words onto their stones. Participants can paint multiple if they'd like and if the time permits. Stencils can be useful here to help participants

draw more complicated shapes, and cups full of water will be used to help clean brushes off as participants are switching paint colors.

\*\*\*Sharpies can be used to write words and parents can help write what the children wants on their stone.

# Talking points/adaptation:

This can be adapted however you see fit! Here are some ideas:

- You can utilize a take one leave one principle so that participants have a piece of kindness to bring home with them.
- Painted and unpainted stones can come together to form a stone path in your garden.
- Several stones can be used to create one image or saying (may be best with older kids)
- Examples of images and words
  - Flowers
  - Sunshine
  - Smiles
  - Their favorite TV character or superhero
  - *"Kindness"*
  - "You are loved"
- Why do you think it is important to give kindness?
- What are other ways that you can be kind to others?
- What messages/pictures do you think would lift someone's day? (prompting them for when they make their rocks)
- How do you feel when someone is kind to you?
- Think of a close family member or friend. What would bring joy to their day?

# Adapting for different Age Groups (Grades K-1, 2-3, 4-5):

Older kids can attempt to make more intricate designs, quotes or drawings on larger rocks, some examples are shown below.





# Appendix H – Garden Design Lesson and Handout

#### Lesson Title: Garden Landscape Visioning

#### Lesson Objectives:

This activity is curated to allow participants to think about what would make a garden healthy and

productive while also giving them creative freedom of what they'd want their own to look and feel like. For older participants, this can also introduce them to the disciplines of landscape architecture and/or agroecology.

## Materials:

- Home improvement and gardening magazines
- scissors
- Glue
- Pens, pencils, markers, and colored pencils
- Copy and construction paper

# Preparation:

- Collect materials (magazines, copy and construction paper, scissors, glue sticks, pens/pencils/colored pencils)
  - If preferred, you can pull out desired pages from magazines for kids to choose from rather than putting out the entire magazine.
- Set out materials

## Instructions:

- 1. Ask participants to think about all the things that come to mind when they think of a garden.
  - a. What belongs in a garden?
    - i. Pollinators, sunlight, diverse array of plants and veggies, walkways,etc
  - b. What will make the plants grow?
    - i. Sunlight, water, air, lack of weeds
  - c. What tools are needed in a garden?
    - i. Shovels, gloves, watering systems
- 2. Participants will browse the magazines for images that resonate with them. Ideally, these are flowers, leafy greens, garden beds, pathways, fruits and veggies, the sun, pollinators, etc. Ask participants to cut out the images of what they want in their garden.
- 3. Ask participants to assemble their own garden! Using glue, participants will create their own vision.



# Talking Points:

- Native flowers versus invasive flowers
  - Native plants often need little fertilizer and supplements to keep them happy. This can conserve how much water you use and, they're more resistant to local weather. They also provide valuable habitats for birds, insects, and other wildlife. For example, planting milkweed attracts monarch butterflies to your garden. Planting nonnative flowers is generally benign, but avoid nonnative invasive flowers like purple loosestrife.
  - https://www.backyardgardenlover.com/michigan-native-plants-list/
- Depending on the age group/general knowledge of participants, we could give some guidance

# Tips/adaptations:

- This could be a group activity where several participants collaborate to build an ideal garden together. This would provide a way to practice team and partnership skills, as well as more accurately simulate the idea of a community garden. For this adaptation, large banner paper would be better to give them more space to optimize their visions and allow everyone to contribute an equal amount.
- 2. For images that participants may want but cannot find in the magazines, encourage them to draw in their own additions.



# **Gardening Tools:**

Hand Shovel: Used to dig up dirt and put plants in the ground

Hand Rake: Used to help remove unwanted plants (weeds) and loosening the soil

Garden Hoe: A larger tool that can be used to remove weeds and loosen the soil



Hand Clippers: Used to prune plants or remove unwanted plants <u>Pruning:</u> Clipping off parts of a plant that are no longer living so that the plant can more efficiently distribute resources



Wheelbarrow: Used to transport various (many) substances, such as mulch, plants, or dirt



Watering Can: Used to give plants water

# Appendix I – Field Journal Activity and Handouts

## Lesson Title: Creating and using field journals

Lesson Objectives: Deduction skills, using the senses,

#### creative thinking

• This lesson could also be incorporated into other concepts, like a scavenger hunt

## Materials:

- 5 sheets of printer paper (per student)
- Hole puncher
- Yarn
- Scissors
- Crayons/markers/colored pencils
- List of plants that are in the garden with pictures, for the children to use to identify what they find
- Clipboards

## Preparation:

- Have 10 of the field journals pre-made
- Have materials ready
- Print out instructions/handout
- Prior to using this lesson someone should create a list of the plants that are in the garden for the year that they are being used. This list should include plant names as well as pictures of the plants.



Instructions

• Cut each piece of paper in half, hamburger style



• Fold each piece of paper in half to make two pages



• Unfold each paper and hole punch it three times down the center of the fold



- Cut the yarn and thread it through the holes, tying the ends together against the spine to hold the papers in place
- Decorate the cover and make sure your name is on it
- Now, head out to the garden and draw the different plants that you find. Write down everything that you observe about them, like their color and if they have any scent. Once you're done, head back inside and compare your drawings in your field book to the list of plants in the garden. See if you can identify any of them!

Talking points: Specifics on different plants as kids look at them

- What do they look like in other stages of their life?
- Where would you find them in the wild?
- Are they edible?
- What other plants are similar?
- Encourage future activities with the field journal
  - Go for a walk with a parent or look for more plants in your own backyard
  - See if you can find any of the plants that you drew in the journal in your yard
- If there is extra time...
  - Have students compare findings
  - Go back out to the garden and try to identify plants straight from the list

# Adapting for Different Age Groups:

"Bonus questions" or add (for ages 3+ / for ages 8+)

- Add more complex questions for older kids

Aging up: teach them scientific names, have them research the plants and find "fun facts" Aging down: only do the observation portion of the activity, not the matching

# Instructions

• Cut each piece of paper in half, hamburger style



• Fold each piece of paper in half to make two pages



• Unfold each paper and hole punch it three times down the center of the fold



- Cut the yarn and thread it through the holes, tying the ends together against the spine to hold the papers in place
- Decorate the cover and make sure your name is on it
- Now, head out to the garden and draw the different plants that you find. Write down everything that you observe about them, like their color and if they have any scent. Once you're done, head back inside and compare your drawings in your field book to the list of plants in the garden. See if you can identify any of them!

# **Questions:**

- Are they edible?
- What color is it?
- What does it smell like?
- What part helps give it water?
- What does it feel like?
- Why do plants need the sun?
- What unique features do you see?
- Was the plant seen in the sun or the shade?

# More questions:

- What three things do plants need to grow?
- Why do you think they wait until spring to grow?
- What stage of life does this plant show?
- Where would you find them in the wild?
- What do they look like in other stages of life?

# **Questions:**

- Are they edible?
- What color is it?
- What does it smell like?
- What part helps give it water?
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# Parts of a plant



# Parts of a plant









# Parts of a plant







# Parts of a plant













Color:		Color:			Color:		
Smell: Yes	No	Smell:	Yes	No	Smell:	Yes	No
Name:		Name:			Name:		
Scientific name:		Scientific name:			Scientific name:		
Color:		Color:			Color:		
Smell: Yes	No	Smell:	Yes	No	Smell:	Yes	No
Name:		Name:			Name:		
Scientific name:		Scientific name:			Scientific name:		
Color:		Color:			Color:		
Smell: Yes	No	Smell:	Yes	No	Smell:	Yes	No
Name:		Name:			Name:		
Scientific name:		Scientific name:			Scientific name:		
Color:		Color:			Color:		
Smell: Yes	No	Smell:	Yes	No	Smell:	Yes	No
Name:		Name:			Name:		
Scientific name:		Scientific name:			Scientific name:		
Color:		Color:			Color:		
Smell: Yes	No	Smell:	Yes	No	Smell:	Yes	No
Name:		Name:			Name:		
Scientific name:		Scientific name:			Scientific name:		
Color:		Color:			Color:		
Smell: Yes	No	Smell:	Yes	No	Smell:	Yes	No
Name:		Name:			Name:		
Scientific name:		Scientific name:			Scientific name:		

# Appendix J – Composting Lesson and Handouts

# Lesson Title: Composting Title

<u>Lesson Objectives:</u> This lesson helps kids learn about the importance of composting. Some items must go in the landfill. Yet to save space, most places employ recycling and some even have composting available. Recycling re-uses items while composting allows items to degrade back to the earth naturally. The use of composting is growing, and people are learning which items go where. The first half of the activity can consist of a scavenger hunt where kids collect certain items around the library. The second half of the lesson can consist of sorting the items into the correct bins.

<u>Materials:</u> Three Bins: Red, Blue, and Green Several items that could be included in a waste sort:

-Scrap paper - recyclable -Plastic take out bag - red -banana peel - green -soil/plant scraps - green -cardboard - recyclable -bag of chips - red -empty soda can - recyclable -napkins - green -wood chips - green -newspaper - recyclable -receipts - red -glossy/coated paper - red -cooked food - red -coffee grounds and paper filters - green -glass - recycle -fruit and vegetable scraps - green -MORE (if you would like) -Tupperware for all of the above items

<u>Preparation:</u> Make sure to clearly label the items with a brightly colored tag (and maybe even put each one into a sealed bag). Each item should be clearly identified as part of the activity when kids are walking around the library space.

#### Instructions:

-BEFORE the scavenger hunt, gather kids for 10 min and have them repeat instructions (have fun as long as safety is considered)

-Let children know where they can and cannot go...partly why only certain areas indoors would work better

-Split up into groups with an adult helper if needed

-Give each kid/family a composting facts sheet

-Once all of the items have been found, go through which items go where with a voting activity

-Have kids do a yes/no worksheet of which items belong in a backyard composter and which items do not

-Take kids to the gardens and composting site (if applicable)

# Talking Points:

- 1. Why Do we throw food scraps in a compost bin versus a plastic container? Organic materials are more likely to degrade faster! Think about what happens in the life cycle of a tree. The leaves fall off and the nutrients are put back into the soil to be used again.
- 2. Why can't we recycle a banana peel or apple core? It is much more efficient for these items to decompose naturally as they are not meant to be turned into plastic.
- 3. Are the three R's (reduce, reuse, and recycle) in a particular order for a reason? They are! We want to start by reducing our waste, reusing when possible, and recycling if neither of these works (if possible)

# Adapting for different Age Groups (Grades K-1, 2-3, 4-5):

-Receipts/glossy paper, along with the compostable bag items, would be better for an older crowd -K-1: Simplest description of what colors go where...give a worksheet if needed

-4-5: Might receive a more complex sheet

# Coloring sheet link

https://www.99worksheets.com/2nd-grade/science-2nd-grade/compost-fun-page/

# Talking Points:

- 1. Why Do we throw food scraps in a compost bin versus a plastic container? Organic materials are more likely to degrade faster! Think about what happens in the life cycle of a tree. The leaves fall off and the nutrients are put back into the soil to be used again.
- 2. Why can't we recycle a banana peel or apple core? It is much more efficient for these items to decompose naturally as they are not meant to be turned into plastic.
- 3. Are the three R's (reduce, reuse, and recycle) in a particular order for a reason? They are! We want to start by reducing our waste, reusing when possible, and recycling if neither of these works (if possible)

# Which of the following belong in a home compost pile?

Circle what you think belongs in a home compost pile.



Aggressive weeds



**Treated Wood** 



Eggshells



Vegetable Scraps



Bones and Cooked Meat Scraps



**Diseased Plants** 



Coffee Grounds and Paper Filters



Fats, Oils, and Greases



Pet Waste and Cat Litter



Cooked Food





Fruit Scraps

Wood chips, untreated

Source: <u>Composting At Home | US EPA</u> (https://www.epa.gov/recycle/composting-home)





Plastic Take-out bags



Scrap Paper

Banana peel



Plant and Soil Scraps



Wood Chips



Newspaper



Receipts



Glossy/Coated Paper



Cardboard



Bag of Chips



Empty Soda Can



Napkins



Cooked Food



Glass



Coffee Grounds and Paper Filters



Fruit and Vegetable Scraps