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Plant, Grow, & Learn: A Garden-Based Kindergarten – 5th Grade Nutrition Curriculum

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Plant, Grow, & Learn: A Garden-Based Kindergarten – 5th Grade Nutrition Curriculum

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Howard University

2015

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An abstract of
A thesis submitted to the Faculty of the
Rollins School of Public Health of Emory University
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Abstract

Plant, Grow, & Learn: A Garden-Based Kindergarten – 5th Grade Nutrition Curriculum
By Micah Ernst Beasley

Background: Childhood obesity has become a global epidemic and worsening problem in America and many countries around the world that foster environments which increase the likelihood of obesity at an early age. Creating environments that promote healthy choices and behaviors for children is essential to combat childhood obesity. According to the CDC (2015), "Schools play a particularly critical role by establishing a safe and supportive environment with policies and practices that support healthy behaviors." Thus, a school-wide intervention in which a nutrition curriculum was integrated into subject matter taught in each grade and complimentary gardens built to engage students through hands-on activities were used as tools to promote a healthy environment for children. This garden-based behavior change curriculum aimed at increasing consumption of nutritious foods and building gardening skills to help cultivate healthy communities and positive nutrition attitudes in elementary school-aged children was used as a strategy to reduce childhood obesity.
Curriculum: *Plant, Grow, & Learn* is a garden-based, kindergarten through 5th grade nutrition curriculum that was created through the Georgia Campaign for Adolescent Power & Potential (GCAPP) for partner schools in the metropolitan Atlanta area, which include: Hamilton (H.E.) Holmes Elementary School, Garden Hills Elementary School, William W. Boyd Elementary School and Perkerson Elementary School. This curriculum includes five weeks of two 30-minute lessons, totaling 10 lessons per grade. It was piloted in Spring 2016 at H.E. Holmes Elementary School to evaluate changes in students' attitudes towards fruits and vegetables and acceptability of the curriculum amongst teachers. Evaluation data revealed positive changes in attitudes and high acceptability from teachers with suggestions for improvement. There were significant revisions from Summer 2016 through Spring 2017, which included: theoretical frameworks, a logic model incorporating modified goal and objectives, intentional scope and sequence, as well as new and rewritten lessons.
Discussion: The revised curriculum aims to reduce childhood obesity among K – 5th grade students in Georgia by developing their ability to apply knowledge of gardening skills to grow and harvest nutritious foods, explain ways gardens yield fruits and vegetables, select healthy food options, and express positive attitudes towards eating fruit and vegetables.

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INTRODUCTION

Child obesity has become a global epidemic and worsening problem in America, as well as in the state of Georgia. Obesity is defined as having excess body fat, and overweight is defined as having excess body weight for height from fat, muscle, bone, water, or a combination of these factors. These are both the result of a "caloric imbalance"—too few calories expended for the number of calories consumed (CDC, 2017). "In 2012, more than one third of children and adolescents were overweight or obese…and are affected by various genetic, behavioral, and environmental factors" (CDC, 2017). Similarly, more than 1 in 3 children in Georgia are considered overweight or obese (Trust for America's Health, 2014).

It is imperative that the health equity of our youth is a public health priority to reduce the risk of negative health outcomes later in life. Our society has created environments that increase the likelihood of early-onset obesity, and schools have been identified by the CDC for their fundamental role in controlling the setting where children make food choices (Bauer, 2011). Thus, this special studies project has targeted schools as an entry point for modifying behaviors and attitudes on nutritious foods among children.

Plant, Grow, & Learn is a garden-based curriculum for kindergarten – 5th grade students that was developed for partner schools of the Georgia Campaign for Adolescent Power & Potential (GCAPP), as an innovative method to reduce the rate of childhood obesity in Georgia by improving decision-making behavior on choosing healthy food options. In addition, GCAPP provided implementing schools with raised garden-beds as a complementary component to the curriculum, although the lessons can stand alone, to equip students with transferrable skills of building and maintaining home and community gardens. The curriculum and garden builds are a part of GCAPP's newest program, PowerMoves!, which houses the organization's nutrition and

physical activity-focused initiatives. This project aims to foster environments that promote healthy choices and behaviors for youth to ultimately help reduce childhood obesity in Georgia.

Comprehensive Review of the Literature

Childhood Obesity

Notwithstanding natural biology and genetics, unhealthy lifestyles, diets, and environments are all major contributors to the risk of obesity. Consequently, obesity increases risk for the development of dietary associated chronic diseases, such as high blood pressure, high cholesterol, and Type 2 diabetes, which contribute to the leading causes of death in America (Kraak et al., 2006). Furthermore, childhood obesity increases the risk of becoming an obese adult. Research from the Institute of Medicine (IOM) (2006) reveals, when comparing a two to five-year-old child who is below the 50th percentile of the CDC body mass index (BMI) charts to an obese child, the latter is more than four times as likely to become an obese adult (Anderson & Butcher, 2006). Therefore, it is necessary to focus on the health of children because early risk factors can become determinants for future health complications.

Health choices begin to characterize the wellbeing of individuals in childhood. IOM (2006) further connects early health with adult life by explaining, “Additionally, concerns about childhood-onset obesity are supported by documented associations between childhood obesity and increased cardiovascular disease risk and mortality in adulthood” (Anderson & Butcher, 2006). Societal norms, school environments, and an increased exposure and accessibility of unhealthy dietary choices that surround children increase the chances of youth developing early-onset obesity and many other negative health outcomes. Therefore, it is imperative that the health equity of children is prioritized.

Research by Anderson and Butcher (2006) further explains, “Among the changes that

affect children's energy intake are the increasing availability of energy-dense, high-calorie foods and drinks through schools" (Anderson & Butcher, 2006). These findings demonstrate that schools are fundamental in controlling the environment in which food choices are propagated to children. CDC (2015) further justifies the significance of an intervention in this setting to promote positive eating behaviors by explaining, "Schools play a particularly critical role by establishing a safe and supportive environment with policies and practices that support healthy behaviors" (CDC, 2015).

Food Deserts

Obesity risk factors can be modified according to diet and physical activity. Eating the recommended amount of fruits and vegetables each day can help to reduce the risk of obesity. However, it is very difficult to consume an adequate amount of these nutritious foods for communities that are in food deserts. "Food deserts are defined by the U.S. Department of Agriculture (USDA) as low-income communities located more than one mile from a reliable source of fresh produce and other healthy whole foods" (AJC, 2015). In Georgia, approximately 2 million people, which includes nearly 500,000 children live in food deserts.

All the target schools for the *Plant, Grow, & Learn* curriculum and school gardens are either in zones with substantial portions that have food deserts or are completely within a food desert. Many of the families that these schools serve do not have vehicles and utilize public transportation or they must walk, which presents considerable barriers to the amount and types of foods that they are able to purchase at grocery stores and carry back to their neighborhoods. Such obstacles can particularly limit the amount of fresh produce that is bought.

Furthermore, households that have many children and other adults within the house require more food to be bought. So, if there is a concern with cost and distance, parents or

caregivers are more likely to purchase the most calorically dense foods that are available for lower costs through fast food restaurants or corner stores that may be closer in proximity than a grocery store (McClintic, 2016). Thus, these populations face a higher risk of obesity due to these obstacles to obtain affordable, healthy, high-nutrient food options on a daily basis. The lack of access to these healthy options can also begin to affect preferences and acceptability of nutritious foods, which can create behavior patterns that can become difficult to overcome, especially in communities that live in food deserts. (McClintic, pg. 10).

Food Insecurity

Additionally, 'food insecurity,' the concept that describes having limited access to adequate food and nutrition due to lack of money and other resources, affects about 15.8 million households in the U.S. (Coleman-Jensen et al., 2016). The USDA also states that 6.3 million households in this country were considered to have very low food security, which is a more severe scope of food insecurity where some members of a household had a reduced amount of food due to limited resources; and, in 2015, approximately three million households at times were unable to provide a sufficient amount of healthy foods to their children (Coleman-Jensen et al., 2016). "According to Feeding America, the nation's largest domestic hunger-relief organization, 19 percent of all households in Georgia are food insecure" (AJC, 2015). The issue of food insecurity is burdensome to many populations globally, nationwide, and within the state of Georgia. However, this problem can be mitigated, particularly for children that are affected, with the opportunity for increased access to free, nutritious foods from a school garden.

Moreover, gardens in schools, especially in low income neighborhoods, and a complementary garden-based curriculum will improve children's everyday access to nutritious foods and will also promote healthy eating habits in these youths. Evidence shows, "Gardening

has been associated with a healthier diet and lower BMIs" (Algert et al. 2016). Thus, building these skills will be important to advance the health of the target population. In addition, gardens in a school environment can help contribute to food security for students that might not otherwise have access to fresh fruits and vegetables, which ultimately would promote a more nutritious diet. School gardens are comparable to community gardens, which studies have shown to be an effective intervention to improve nutrition and food security (Algert et al. 2016).

There is additional research on the nutritional impacts of gardening, but there seems to be limited evidence on best practices of school gardens and garden-based curricula. A study that examined the use of a systematic approach and theoretical framework to develop a similar garden-enhanced nutrition curriculum for the Shaping Healthy Choices Program concluded that design, theory, learning objectives, and pedagogy that are applied to nutrition curricula need to be further investigated to develop effective approaches that can be replicated (Linnell et al. 2016). The development and design of the *Plant, Grow, & Learn* curriculum presents a viable approach that can be replicated to help build the evidence base for nutrition curricula. This curriculum aims to reduce obesity and teach healthy eating habits to students through lessons that intend to improve decision-making behavior around choosing healthy food options and offering interactive lessons with the school garden where children have access to fresh, nutritious produce.

School Environment and Food

The school food environments have been proven to affect the dietary behaviors of US public school children in 1^{st} – 12^{th} grade (Briefel et al 2009). This study concluded that the school food environment, as well as food practices require further changes to improve the diet of children and adolescents and to reduce obesity. Moreover, there is a need for interventions, such

as *Plant, Grow, & Learn* garden curriculum and school gardens to be implemented in US public schools and other school systems with similar food environments. A process evaluation of a primary school garden-enhanced nutrition curriculum that used a quasi-experimental trial design with self-reported questionnaires and interview data from students, parents, and teachers demonstrated an increase in positive attitudes on vegetables and increased interest in fruit and vegetables among children (Quick et al. 2010). Although there is not an explicit best-practices evaluation on curriculum design, this study affirms that this curriculum which incorporates school gardens, would be successful in improving students' access to fresh fruits and vegetables and promoting positive attitudes towards eating these healthy foods.

There is also evidence that affirms school gardens can successfully improve the food choices of children and adolescents by increasing their nutritional knowledge and preference for healthy foods (Graham et al. 2005). This study also demonstrates that an intervention, such as *Plant, Grow, & Learn* with a school garden component would be successful in facilitating students' ability to apply knowledge of gardening skills to grow and harvest fruits and vegetables, as well as ultimately helping them to choose these healthy foods instead of unhealthy food options.

Theory

The Social Cognitive Theory, Experiential Learning Theory, and Social Learning Theory (Bandura, 2002) serve as frameworks for the conceptual pathway in which an interactive garden-based nutrition curriculum will promote behavior change. Constructs from each theory were addressed through subject matter and hands-on activities included in lessons, as well as through changes in the school environment, interactions between students, and encouragement from teachers.

Social Cognitive Theory

Glanz and noted authors in Health Behavior & Health Education (2008) explain that the Social Cognitive Theory is made up of the following six constructs: reciprocal determinism, behavioral capability, expectations, self-efficacy, observational learning, and reinforcements. *Reciprocal determinism* is the concept that environment influences individuals and groups, but individuals or groups can also have a similar influence on their environment and control their own behavior (Glanz et al., 2008). This construct is satisfied through the interaction of students, a positive change in decision-making behavior to choose healthy foods, and their school environment. For example, students are in their classroom or school garden learning about the importance of a healthy diet and different types of fruits and vegetables, while having the opportunity to taste-test the food that they are learning about and growing in the garden. These components work together to facilitate the students' decision to select nutritious foods instead of unhealthy food options.

This theory guide from Glanz (2008) clarifies *behavioral capability* as having the knowledge and skill to perform a given behavior. This construct is included through students' ability to learn about healthy meal planning and engage in an in-class activity where they have gained the skill to identify and choose fruits and vegetables to incorporate in their meals. Students' *expectations* are addressed at each grade level, in which they learn about the significance of a healthy diet. In an age appropriate context, students will gain an understanding about how their foods choices will affect their overall health. For example, eating the USDA recommended amount of fruits and vegetables in each meal will give students' bodies the energy it needs to get active and feel good. One example of addressing *self-efficacy* is through social modeling, in which students are shown that others like them are also performing this behavior .

This is one strategy to have confidence in one's ability to overcome barriers by taking action (Glanz et al., 2008). In a lesson, students may be asked to share their favorite family recipe of a healthy food, and one of the recipes is chosen to be made in class for every student to get involved and try the dish.

Students will experience *observational learning* through seeing videos of other children and classes composting at school to create a sustainable and healthy environment, which will help encourage students that they are able to do the same thing. Glanz (2008) explains that in this construct an individual attains a behavior by watching the actions and consequences of another persons' behavior. Finally, students will receive positive *reinforcement* throughout the curriculum and in each grade to further support positive attitudes towards eating fruits and vegetables. Reinforcements are explained as "responses to a person's behavior that increase or decrease the likelihood of reoccurrence" (Glanz et al., 2008). For example, classes will have joint gardening activities in which they will be able to work together to build their school garden and will have the opportunity to grow and harvest the fruits and vegetables in succeeding grades. This will promote a positive sense of a healthy community, where students are responsible for maintaining the garden and can benefit from the fruits of their labor.

Social Learning Theory

According to the Social Learning Theory, "Most human behavior is learned observationally through modeling: from observing others, one forms an idea of how new behaviors are performed, and on later occasions this coded information serves as a guide for action" (Bandura, 2002). This theory includes attention, retention, reproduction, and motivation as constructs that are necessary for effective modeling. A continuous process of reciprocal collaboration between behavioral, cognitive, and environmental influences is used to rationalize

human behavior. One component of the curriculum that is used to grasp students' *attention* is the inclusion of physical activity. For example, students are given pictures of different types of fruits and vegetables; and, they participate in a version of the "Hokey Pokey," where the picture that a student has is described, and when they hear their fruit or vegetable named in the song, the student will follow along with the Hokey Pokey dance. In this same example, images are used to help with students' *retention* on different types of fruits and vegetables, as well as demonstrating the idea that having these fruits and vegetables will give you energy to get physically active.

Reproduction is one construct of this theory in which students are challenged to reproduce an image. In one lesson, after students are asked to draw an image of a living thing, the class reviews and discusses these images. Then, the students go to the garden and are tasked with thinking about the living things that they reviewed in class and finding some of the organisms that they discussed through observation. The opportunity to leave the classroom, explore in the garden, and ultimately grow and harvest crops can also serve as *motivation* for students to engage in the material being taught and emulate positive attitudes around fruits and vegetables, as well as behaviors on choosing these healthy foods instead of unhealthy food options.

Experiential Learning Theory

Experiential learning is explained as learning through reflection on an action, and it requires that the learner engage in an iterative cycle of these four stages: concrete experience, reflective observation, abstract conceptualization, and active experimentation (Bergsteiner et al., 2010). Students will receive *concrete experiences* through engagement in hands-on activities and lessons that incorporate physical activity. They will be able to reflect on what was taught with in-class activities that integrate worksheets and question-and-answer segments conducted by the

teachers during the sessions, which satisfies the *reflective observation* stage. In the *abstract conceptualization* stage, subject matter will be presented and students will be given a chance to make a generalization or hypothesis, such as predicting the weather based on weather fronts. Then, using the same example lesson, students will be directed to report their prediction and apply it to the planning and construction of gardens in the *active experimentation* stage. Students will learn to plant and harvest in the garden, so that they will be equipped with the knowledge to grow and access their own fruits and vegetables. These activities are a few ways in which these theories can be applied to promote positive behavior change through the *Plant, Grow, & Learn* garden-based curriculum.

METHODS

Research has evidenced that within the past 30 years, obesity has more than quadrupled in adolescents (CDC, 2017). "In a population-based sample of 5- to 17-year-olds, 70 percent of obese youth had at least one risk factor for cardiovascular disease" (CDC, 2017). In 2013, there was a reported 13 percent of high school students in Georgia that were obese and 17 percent that were overweight (YRBS, 2016). Both these percentages of obese and overweight high school students had increased since the data from the Youth Risk Behavior Survey, 2003 (11% and 15%, respectively) (YRBS, 2016). This data is evidence that the issue of obesity in the state of Georgia is a worsening problem among adolescents. Therefore, the *Plant, Grow, & Learn* curriculum was implemented at a K – 5th grade level in Georgia schools as a preventative tool to address attitudes, perceptions, and knowledge before these youths have set dietary preferences and are completely able to access their own foods.

GCAPP developed the *Plant, Grow, & Learn* garden-based curriculum, as a component of the PowerMoves! program, to improve nutrition and healthy food choices among students in

Georgia. In addition to the curriculum, PowerMoves! built raised garden-beds at the partner schools where the curriculum was being implemented to improve students' access to fresh fruits and vegetables. The first version of the curriculum was piloted over the period of five weeks during Spring 2016 at Hamilton Holmes Elementary School. There were two-30 minute lessons per week, 10 lessons total, that teachers could integrate into their normal coursework through curriculum content that satisfied Georgia Education core curriculum standards in health, language concepts, math, nutrition, science, and social studies. *Plant, Grow, & Learn* was created to stand alone without having a garden present at the school, although a school garden enhances the curriculum through providing hands-on learning experiences. Pre-and post-tests from the lessons were collected to measure students' attitudes on fruits and vegetables and their daily consumption amount. Teacher survey data was also collected to access acceptability and to inform revisions for the second iteration.

Survey Results (gathered by GCAPP evaluator, Jenn Ballentine)

In 2016, *Plant, Grow, and Learn* was taught to 1,300 students. Overall, the data showed that curriculum implementation made a significant difference in the attitudes of students toward fruits and vegetables. The table below demonstrates the success of the curriculum in achieving stated outcomes.

Table 1: Plant, Grow, & Learn Spring 2016 Student Survey Data

Student Outcome	**Responded Yes (%)**
Eat more fruits and vegetables since learning about gardening	80%
Will increase their fruit and vegetable intake	84%
Gained knowledge about the importance of sustainable agriculture and good nutrition	88%
Participated in gardening activities	88%

A retrospective pre-and post-test survey was completed by a total of 42 teachers for a response rate of 55%, which included 22 teachers and one non-teaching staff member from H.E.

Holmes Elementary School. All teachers agreed or strongly agreed that their students enjoy trying new fruits and vegetables because of the curriculum, while fewer (83%) agreed that students are now interested in where food comes from and feel that healthy eating is important to them. They were also asked to rate the students' response to certain aspects of the curriculum, and the table below represents the percentage of teachers that agreed and/or strongly agreed with the statements.

Table 2: Plant, Grow, & Learn Spring 2016 Teacher Survey Data

Statement	**% Agreed/Strongly Agreed**
My students were interested in the material.	78%
The lessons were easy to implement.	74%
The activities kept the students' attention.	70%
The curriculum included performance standards I am responsible for meeting.	74%
The number of lessons was just right.	74%
The length of the lessons was sufficient.	78%

This data indicates that the teachers generally perceive the student response as favorable, and 96% of teachers reported that they were interested in continuing to implement the curriculum.

Curriculum Development

After piloting the curriculum and collecting data in Spring 2016, the revisions began in a three-step iterative process Summer 16 through Spring 2017.

1. *Content review and revision planning*
2. *Framework development*
3. *Lesson writing and delegation*

Content review and revision planning

In Summer 2016, curriculum content review and revision planning began. The revision process was initiated by meeting with the GCAPP evaluator, Jennifer Ballentine, on the teacher

survey results from the pilot year and discussing next steps for the content of a second iteration of the curriculum. All recommendations from the teacher survey for implementation improvement were addressed primarily through development of a curriculum guide & frequently asked questions packet (see Appendix 1), which gave instructions specifically on navigating the curriculum, time management options, support, and best implementation practices. An internal review of content revealed a need for more age appropriate activities, continuity of subject matter throughout and between each grade, as well as a more theory informed foundation. Curriculum strategic planning meetings were held in Fall 2016 at GCAPP between program staff and two Emory University Rollins School of Public Health interns, Ashley Phillips (AP) and Micah Ernst Beasley (MEB).

Framework development

The Spring 2016 version of the *Plant, Grow, & Learn* curriculum lacked significant components needed for a strong foundation. For the new iteration, the curriculum was grounded in theoretical frameworks; goals and objectives were developed; and a logic model was constructed to ensure that all lessons addressed all these components. The theories that most closely applied to behavior change through learning styles and content in the curriculum were the Social Cognitive Theory, the Experiential Learning Theory, and the Social Learning Theory. Lessons from the first version of the curriculum were matched to the constructs from each theory to find gaps and were intentionally addressed throughout the curriculum for each grade. The goal and objectives (please find below) were informed by the general content of lessons that would be kept from the pilot year. The objectives were also created to address the behavior change outcomes that the curriculum intends to accomplish, including: application of skills and knowledge to working with other gardens, increase in consumption of fruits and vegetables,

attitude change, and knowledge gain. The logic model (Figure 1) was then constructed by AP and MEB to offer a rationale for the flow of inputs, activities, and expected outputs that would lead to the outcomes or objectives, impact, and overall goal of the *Plant, Grow, & Learn* curriculum. The logic model also included inputs, activities, outputs, and outcomes for inclusion of a school garden.

Plant, Grow, & Learn Goal, Impact, and Objectives

Goal: To reduce childhood obesity among K – 5th grade students in Georgia.

Impact: Increased fruit and vegetable consumption among K -5th grade students in Georgia.

1. Students have transferrable skills to build and manage home and community gardens.
2. Improved decision-making behavior around making healthy nutritional choices among K – 5th grade students in Georgia.

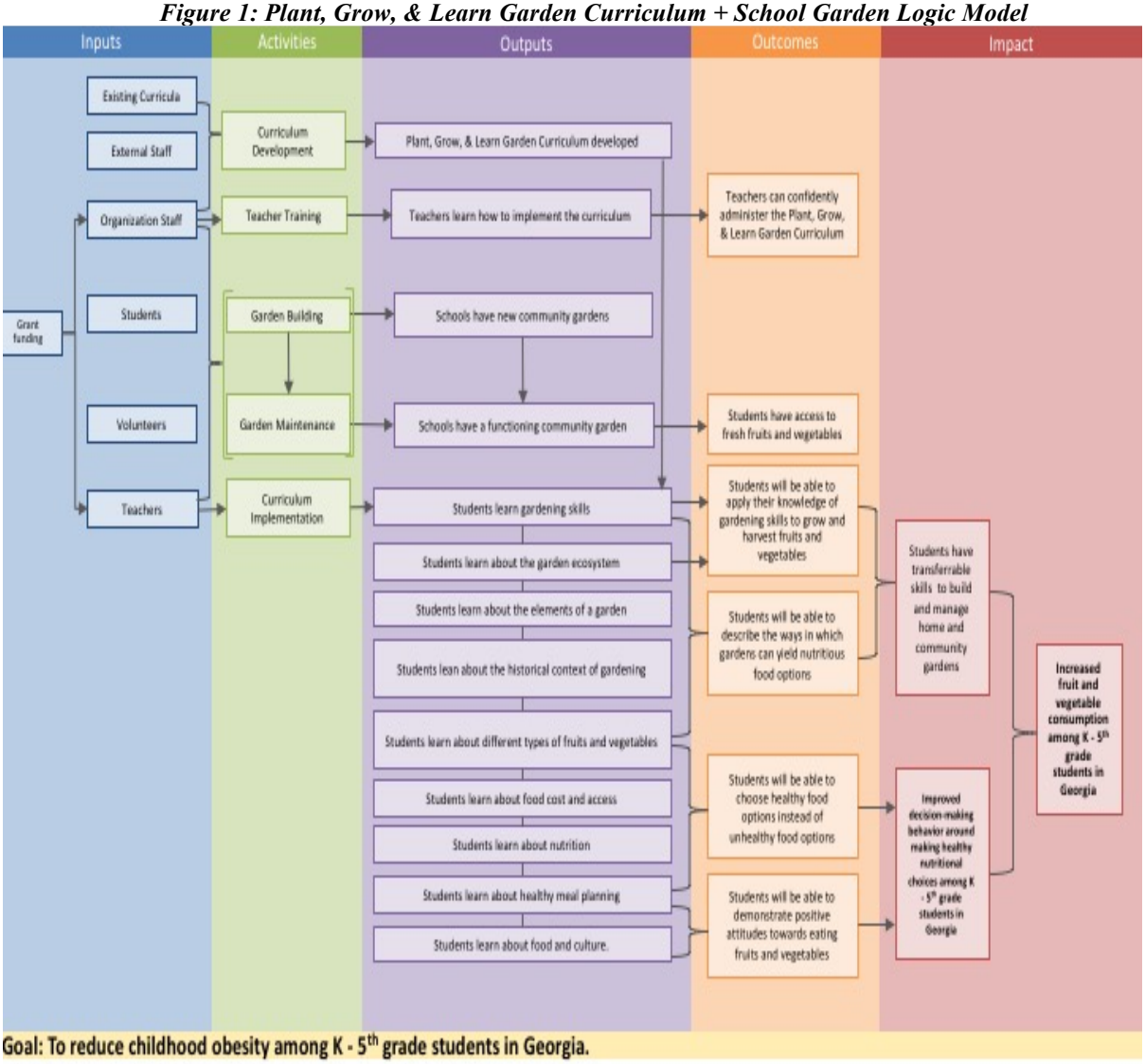
Objectives:

1. Students can apply their knowledge of gardening skills to grow and harvest fruits and vegetables.
2. Students can describe the ways in which gardens can yield nutritious food options.
3. Students can choose healthy food options instead of unhealthy food options.
4. Students can demonstrate positive attitudes towards eating fruits and vegetables.

School Garden Objective:

1. Students have access to fresh fruits and vegetables

Figure 1: Plant, Grow, & Learn Garden Curriculum + School Garden Logic Model



Lesson design, arrangement, and writing

Much of the subject matter of lessons from the first version of the *Plant, Grow, & Learn* curriculum was kept in the second iteration. However, in the strategic planning meeting in November 2016 each lesson for grades K – 5 were dissected based on relevance to the individual theme for every grade, age appropriateness of activities and lesson content, and continuity within lesson sequence and between grades. Many new lesson topics were created, and various activities were added from suggestions on the teacher surveys from the pilot year. Other lessons that were included from the first version were edited for cohesion, scoped and sequenced with

scaling difficulty of material up or down based on age appropriateness, and reviewed in detail to ensure theories and overarching objectives were met.

Specific objectives were also created for each lesson with intentional use of Bloom's Taxonomy as a guide for intended educational outcomes. Patricia Armstrong from the Vanderbilt University Center for Teaching (2017) explains, "Objectives (learning goals) are important to establish in a pedagogical interchange so that teachers and students alike understand the purpose of that interchange." Bloom's Taxonomy classifies learning outcomes by categories, which include: knowledge, comprehension, application, analysis, synthesis, and evaluation (Armstrong, 2017).

GCAPP staff member, Lauren Barineau, LB, and graduate interns, AP and MEB, split the lesson writing and review up by grade level and based on experience with content. This curriculum development team met bi-weekly and conferred regularly throughout the process. A curriculum roadmap table was developed in several iterations to outline lessons according to author, grade level, overall theme, evaluation question, topic, objectives, physical activity inclusion, and theoretical construct included in each lesson (see Appendix 2). Grade levels were divided as follows:

- Kindergarten – MEB
- 1st, 2nd, and 4th Grade – LB
- 3rd and 5th – AP

RESULTS

Kindergarten lesson objectives focused primarily on knowledge and comprehension as learning outcomes, which were indicated by Bloom's Taxonomy verbs. According to Armstrong (2017), knowledge "involves the recall of specifics and universals, the recall of methods and

processes, or the recall of a pattern, structure, or setting." Comprehension "refers to a type of understanding or apprehension such that the individual knows what is being communicated and can make use of the material or idea being communicated and can make use of the material or idea being communicated without necessarily relating it to other material or seeing its fullest implications" (Armstrong, 2017).

The kindergarten lessons that were revised from week one, students first learn about the characteristics of living things, draw pictures of organisms they believe are living, and will identify what is living versus what is not. The next lesson has students view pictures they drew in the previous class that were truly considered non-living things, and other students help explain why they are classified as non-living. The class will then go outside in the garden and categorize things that they find that are living or non-living through an interactive game.

The third week lesson revisions included students learning the differences between fruits and vegetables with an activity that encourages them to categorize examples into the correct food group. Students will learn that eating fruits and vegetables make you healthy and give you energy to be physically active. They will demonstrate getting active through a fruit and vegetable based "Hokey Pokey" dance. The lessons from week one and three were completely rewritten and are included below. All other lessons from kindergarten in the first iteration will only require minor edits, which will be made in Summer 2017 (Appendix 3).

(K.1.1) Week 1, Lesson 1: Exploring the Garden – Part 1

*This lesson was modeled after and adapted from the Captain Plant's Project Learning Garden curriculum lesson: Sense of Place (*http://captainplanetfoundation.org/learning-garden-lessons/)*

Time

30 minutes

Objectives

- Students will be able to identify a living thing.
- Students will be able to distinguish what is living from what is not.
- Students will be able to illustrate images of living things.

Materials

- "Sesame Street: Who's Alive?" video (3:15 min) https://www.youtube.com/watch?v=giWqEPNLtBo
- Blank white paper (1 per student)
- Markers
- Tape

Agenda

1. **Tell** the class that today you will be learning about living things, which can also be called organisms.
2. **Ask** each student to name one feature or characteristic that makes an organism living. Write their answers on the board, under a heading labeled "Living". Do not correct them, yet.
3. Give each student a piece of paper and ask them to take 5 min to draw something that is considered to be living.
4. **Explain** to the class that the scientific definition of a ***living thing*** is anything that is now or has ever been alive.
5. **Tell** the class that they are going to watch a video describing what is alive. Ask the students to write down the characteristics they hear mentioned in the video on the back of their paper.
6. **Show** the "Sesame Street: Who's Alive?" video.

7. **Ask** students to look at their new list and tell you what items to cross off and add on the board, if they were not mentioned before. Make sure they have included:
    a. It grows.
    b. It eats.
    c. It breathes.
8. **Explain** that living things also need food, water, shelter, and air to live, grow, and produce offspring or what is also called, reproducing.
9. **Ask** the students if they have any questions or need clarification. If asked, explain that offspring are like babies, seeds, eggs or a new organism that comes from a parent organism. This is what happens when a living thing reproduces.
10. Collect the pictures. Tell the students that you are going to share the pictures with the class, so they can decide if what was drawn is considered to be living. Explain that they do not have to identify what picture is theirs.
11. **Show** the pictures to the class and ask for a show of hands, if they think the picture is a living organism. Make sure that they correctly choose what is living and what is not. You may need to briefly explain that a plant grows, eats and breathes, too. If students are having trouble, you can add the following characteristics to the list on the board for clarification:
    a. It reproduces.
    b. It moves by itself.
12. Separate the drawings into two piles: living and non-living.
13. **Use** the living things pictures to hang in the room for reference. Save the non-living things pictures for the next class.

Resources

Kindergarten vocabulary list:

https://www.neisd.net/curriculum/.../sci/.../00_science_vocabulary_2012_2013.pdf

Modified lesson:

http://www.kindergartenkindergarten.com/2012/03/a-science-mini-unit-living-and-non-living.html

Modified lesson:

http://gpb.pbslearningmedia.org/resource/tdc02.sci.life.colt.lp_living/living-vs-nonliving/

(K.1.2) Week 1, Lesson 2: Exploring the Garden – Part 2

*This lesson was modeled after and adapted from the Captain Plant's Project Learning Garden curriculum lesson: Sense of Place (*http://captainplanetfoundation.org/learning-garden-lessons/)*

Time

30 minutes

Objectives

- Students will be able to identify and describe non-living things.
- Students will be able to categorize living and non-living things.
- Students will be able to point out living and non-living things in the garden.

Materials

- Living and Non-Living Things drawings from K.1.1 class
- Timer
- 2 clipboards
- 2 pieces of paper with the heading living on one and non-living on the other

- If garden is not available, please find an open area that might have shrubbery, plants, and flowers, as well as non-living things

Agenda

1. **Tell** the class that today you will be learning about non-living things, which is not the same as something that is considered to be dead.
2. **Review** with the class that a living thing is anything that is now or has ever been alive. This means that something that is dead would still be considered a living thing because it was once alive.
3. Write a heading on the board that says "Non-living," and under the heading write:
    a. Not alive.
    b. Does not have basic needs.
    c. Does not grow.
    d. Does not produce offspring.
4. **Explain** that ***basic needs*** are something required by a living thing like food, water, shelter, and air. Ask for any questions. Write down on board, if necessary.
5. **Show** the students the pile of non-living things drawings that they made in the previous class.
6. **Ask** students, after each picture, to raise their hands and explain why the drawing should be considered non-living. If they do not answer correctly, allow another student to try to correct them. (Only take about 5 min.)
7. **Explain** why the drawing would be considered non-living, if the students need help.
8. **Activity**
    a. Take the class outside, if weather permits.
    b. Have students choose a partner or assign partners.

c. Tell students that together they are going to choose two things in the garden that are either both living or both non-living, but they should not share what group they are in or what they choose with the class. Ask students to decide together whether they will choose living things or non-living things.
d. Ask students to close their eyes and raise their hands if they are going to look for a living thing. Do the same with non-living things. Try to make sure that the numbers are somewhat even. (If numbers are not even, whisper to a few groups to switch after the class disperses.)
e. Tell the students to take 2-3min to explore the garden and choose their items. Remind them not to pick the item up, and choose a back-up in case their first item is chosen by another group. (Use the timer)
f. While students are exploring the garden, find an open area nearby that will allow the students to have two sides: living and non-living. Place the living and non-living pieces of paper on either clipboard. You can place them on the ground to designate the sides or hold the clipboards up.
g. When the time is up, ask the students to line up in a single-file line, next to their partner. They should be in between the living and non-living sides that you have designated.
h. You may want to start with a more difficult example, like a wood plank or log. After the students choose a side, explain that although it is dead now, it was once a part of a living tree. So, it would be considered a living thing. Have students return to the line.

i. As time allows, go down the line and ask each group to share the item that they chose (not the category: living or non-living). After each group, ask the class to move to the living or non-living side. Allow students to challenge one another, if the sides are split. Give them the correct explanation, if necessary.

Resources

Kindergarten vocabulary list:

https://www.neisd.net/curriculum/.../sci/.../00_science_vocabulary_2012_2013.pdf

Modified lesson:

http://gpb.pbslearningmedia.org/resource/tdc02.sci.life.colt.lp_living/living-vs-nonliving/

(K.3.1) Week 3, Lesson 1: Fruit vs Vegetable

Time

30 minutes

Objectives

- Students will be able to define a fruit.
- Students will be able to define a vegetable.
- Students will be able to match a fruit or vegetable to a description.
- Students will be able to classify food as a fruit or vegetable.

Materials

- "What Am I?" By LaTonya A. Weston (can be viewed online for free or bought in advance) http://www.storyjumper.com/book/index/29366586/What-am-I-By-LaTonya-A-Weston#
    - The story has the answers for what fruit or vegetable is described on each page, so do not reveal the answers when reading.
- "What Am I?" worksheet with pictures

  - Make enough copies, so each student will have at least one fruit or vegetable picture or blank box to draw a fruit or vegetable of their own.

- Scissors
  - Cut the fruit and vegetable pictures for students before class
- Glue sticks (one per student or group)
- Colored pencils
- 2 Newsprints

Agenda

1. **Tell** students that they are going to learn about fruits and vegetables today.
2. **Ask** students to raise their hands and tell you if they know the differences between fruits and vegetables. Correct them if they are wrong by saying "almost" or "not quite".
3. **Explain** that some of the differences include:
   - **a.** Most fruits have seeds and usually vegetables do not.
   - **b.** Fruit grows above ground and vegetables can grow above ground or underground (as roots).
   - **c.** Fruit is usually sweet and vegetables can be more savory.
4. **Write** these short definitions on the board.
5. **Distribute** the "What Am I?" pictures that you have cut out and a glue stick to each student or group of students. Ask students to listen to the instructions before touching the supplies.
6. **Tell** students that you are going to read them a story, and they have to decide if the fruit or vegetable they have is being described.
7. **Ask** students to stand if the quality you name is true for their fruit or vegetable, squat if they are not sure, and stay seated if it does not apply at all to the picture that they have.

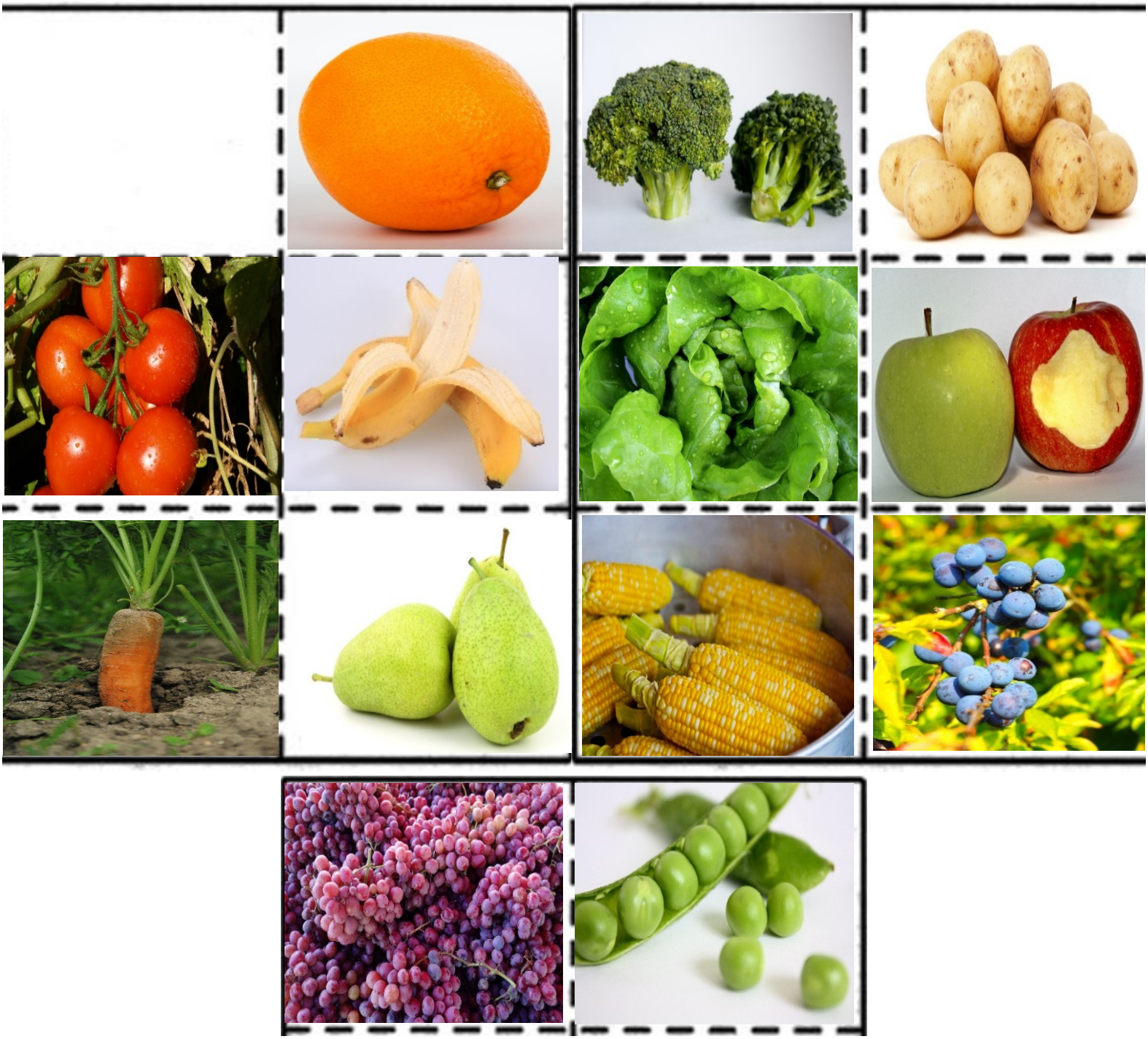
8. **Tell** the class that you will name a list of characteristics. If the first quality named fits their fruit or vegetable, then they should stand. If the second or third quality does not fit, then they should sit or squat if they are not sure.
9. Place newsprints on the board and write the header “Fruit” on one and “Vegetables” on the other.
10. **Tell** students that once they are sure that their fruit or vegetable is described, then they will put glue on the back of the picture and come to the front to place the cut out on the fruit or vegetable newsprint on the board. Tell them that they will not be gluing the pictures down until the class is sure that it is correct and when you instruct them to do so.
11. **Ask** students to raise their hands if they have a blank cut out. Tell these students to think of one of their favorite fruits or vegetables, and draw a picture of this in the blank box. Give these students colored pencils.
12. **Read** “What Am I?” by LaTonya A. Weston. After each description, stop for a few seconds and allow students to ask questions or think about what the fruit or vegetable might be. Help students that are squatting decide if they should stand or sit.
13. After reading the full description, without naming the fruit or vegetable, ask students to share the fruit or vegetable they have and believe was described.
14. **Tell** students the name of the fruit or vegetable described, and make sure the students that are standing have the correct picture. Then, they can glue the picture and place it on the newsprint in the right category.
15. At the end of the story, ask students that drew their favorite fruit or vegetable to raise their hand if they did not hear their picture described.

16. **Ask** these students to describe their fruit or vegetable the best they can using colors and the type of food, and let the rest of the class raise their hand to guess what the picture might be. After the class has guessed correctly, ask the students to put their pictures in the right category of fruit or vegetable on the board.

Resources

Fruit and vegetable differences:

http://oureverydaylife.com/teaching-preschoolers-differences-between-vegetables-fruits-44999.html



(K.3.2) Week 3, Lesson 2: Fruits and Vegetables Make You Healthy

Time

30 minutes

Objectives

- Students will be able to identify ways to be healthy.
- Students will be able to associate eating fruits and vegetables with being healthy.
- Students will be able to recognize that MyPlate shows the daily recommended amount of fruits and vegetables needed to have a healthy diet.
- Students will be able to identify physical activity as a way of being healthy.
- Students will be able to associate eating healthy with having energy to engage in physical activity.

Materials

- Two newsprints
- Red and green markers
- MyPlate handout (1 copy/student)
    - MyPlate posters for classroom available upon request at: https://pueblo.gpo.gov/TN/TNPubs.php
- Fruit and vegetable cut outs
    - Reuse the fruit and vegetable cut outs from lesson K.3.1.
        - Make sure each student will have one or make enough copies, so each student has two.
- Hokey Pokey (Fruit and Veggie) – Kids Dance Songs – Children's Songs by The Learning Station

- https://www.youtube.com/watch?v=0YxD2tsvCWQ (1:20s – 4:42s)

Agenda

1. **Tell** students that today they are going to learn about how fruits and vegetables can make you healthy.
2. **Ask** the class if anyone can tell you what it means to be healthy?
3. Write the answers on one end of the board under the header "Healthy".
4. **Explain** that those are some great answers, and some of the main ways you can be healthy are through what you eat and the amount of physical activity that you have each day.
5. Put the two newsprints on the board next to the first list and leave some room on the opposite end. Over the newsprints (on the board) write the header "Eating Healthy".
6. Write the header "Fruits" on one newsprint with the red marker, and "Vegetables" on the second newsprint with the green marker.
7. **Ask** the class to raise their hand and tell you what are some of their favorite things to eat that they think are considered healthy?
8. Use the red marker to write fruits that students might mention as their favorite healthy foods under the "Fruits" header, and use the green marker to write vegetables that students might mention under the "Vegetables" header. Foods that students might mention that are not a fruit or vegetable can be written in the remaining blank space on the board in a non-red or green writing utensil. Thank the class for sharing.
9. **Explain** to the students that the fruits and vegetables that they mentioned are very important parts of their diet and what they eat on a daily basis, in order to stay healthy.
10. **Give** each student a copy of the MyPlate handout.

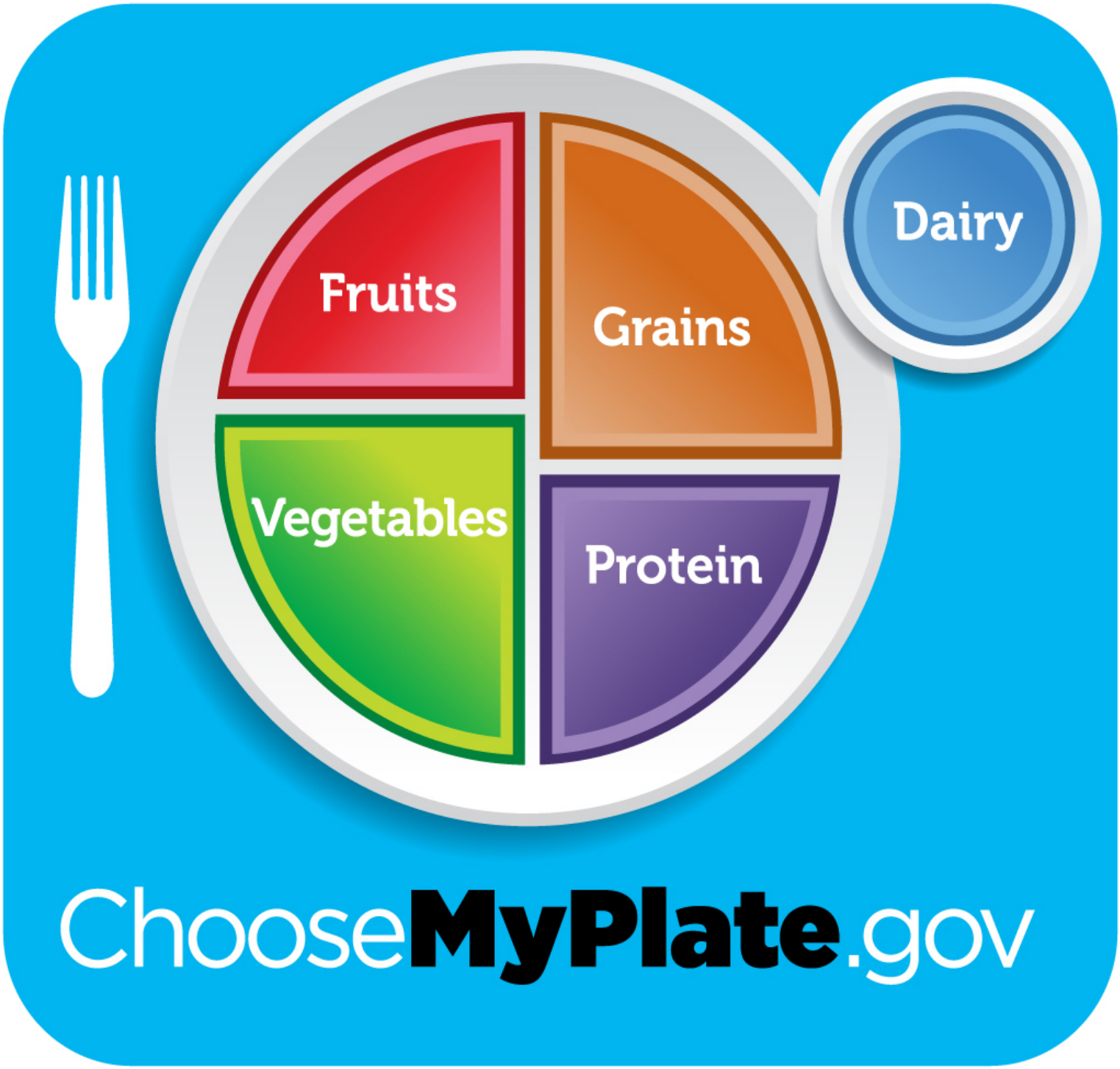
11. **Explain** to the class that this handout shows them the daily recommended amounts of different types of foods that they should have for each meal to make sure that they have a healthy diet.
12. **Tell** your students that eating fruits and vegetables is so important that it is recommended that these types of foods make up half of each of their meals. Point out how the fruit and vegetable portions take up half of the plate.
13. **Ask** the class if they remember the other important part you mentioned about what makes you healthy, besides eating healthy?
    a. If students do not mention it, tell them "the amount of physical activity that you have each day."
14. **Explain** that there are many different ways to get active just like there are many different types of fruits and vegetables that you can eat, and both of these are ways to be healthy.
15. **Give** each student a fruit and/or vegetable cut out. Reuse cut outs from the last lesson.
    a. Make enough copies, so each student has a picture of a fruit or vegetable.
16. **Tell** the class that they will now have an opportunity to get active because the fruits and vegetables they will use in the next activity are examples of the foods that play an important role in making them healthy and giving their bodies energy.
17. **Explain** that healthy foods, like the fruits and vegetables they named and the ones that they are holding, give their bodies what it needs to, like energy, to be active.
18. **Ask** them to stand, make a circle, and bring their fruit and/or vegetable.
19. **Tell** them to look at the fruits and vegetables they were given and to think about whether it is a fruit or vegetable. Ask if anyone needs help.

20. **Ask** if anyone has ever done the hokey pokey? Tell them that today they will do the "Fruits and Vegetables Make You Healthy: Hokey Pokey".
21. **Explain** to the class that you will play a video, and when their fruit or vegetable is described to follow the directions and stick it in the circle, then out the circle, then in again and shake it, and then the whole class will do the hokey pokey and turn around.
22. **Demonstrate** what it will look like and sing along or play a short segment of the video.
23. **Play** the Hokey Pokey (Fruit and Veggie) video and have class follow along.
    a. https://www.youtube.com/watch?v=0YxD2tsvCWQ (1:20s – 4:42s)
24. **Ask** the class to give the cut outs back to you before returning to their seats.

Resources

MyPlate poster: https://pueblo.gpo.gov/TN/TNPubs.php

Hokey Pokey (Fruit and Veggie) – Kids Dance Songs – Children's Songs by The Learning Station: https://www.youtube.com/watch?v=0YxD2tsvCWQ (1:20s – 4:42s)


Fruits
Grains
Dairy
Vegetables
Protein
ChooseMyPlate.gov

DISCUSSION

Plant, Grow, and Learn revision efforts took place from Summer 2016 through Spring 2017. Revisions included: (1) grounding the lessons in appropriate theoretical frameworks, (2) creating clear goals and objectives for the curriculum, (3) developing a logic model to explain the rationale for achieving the curriculum's intended outcomes through the skills and knowledge that students would gain from the lessons. These revisions helped build a solid foundation from which positive behavior change around making healthy food choices can now be expected. Overall the curriculum aims to facilitate an increase in fruit and vegetable consumption among elementary school-aged children in Georgia to ultimately reduce childhood obesity in K – 5th grade students throughout the state. The school gardens also aid in promoting a healthier school and community environment through improving access to fresh fruits and vegetables for this population.

Limitations

Curriculum Writing Experience

All revisions for this version of the curriculum were done by LB, a Program Manager for the Working to Institutionalize Sex Education (WISE) Initiative at GCAPP, who served as the lead in curriculum development and AP and MEB, two graduate student interns, that supported all efforts in rewriting and foundation establishment. LB has an extensive background in sexual health curriculum development and implementation, but she did not have experience in working with nutrition subject matter. The theories that shape sexual health curricula focus explicitly on behavior change. However, much of the material in *Plant, Grow, and Learn* focused on knowledge gain, skills, attitudes, and intention. So, LB layered her knowledge and experience with sexual health curricula onto the nutrition curriculum with the expectation that it would yield

behavior change outcomes. Her lack of expertise in developing a nutrition-focused curriculum and the application of a sexual health theory lens could have been reflected in the foundation and content of this curriculum. Organizations will often utilize the staff that they already have for ongoing projects and can often stretch an individuals' skills and background to match the demands of a project, as closely as possible.

Furthermore, the graduate interns AP and MEB, did not have formal experience writing curricula, nor with nutrition-focused subject matter. However, AP did help develop the lessons for 1st and 2nd grade in the pilot version of the curriculum, but she did not have previous experience with the material or writing a curriculum prior to this involvement. In order to support the gaps in knowledge, all parties did extensive background research for theory application, age-appropriate content, and lesson writing. Additionally, it was necessary for a survey-developer to be contracted to develop and administer the teacher evaluation surveys, and she will be providing the same service for the upcoming surveys. Having an outside evaluator design the surveys produces an additional burden for the curriculum development team to communicate all the outcomes that the curriculum is looking to analyze.

Timing and Objectives

Each lesson was allotted 30 minutes, so that teachers did not feel over-burdened by implementing this curriculum into their already busy course schedule. This time constriction limited the extent to which all objectives could be met in every lesson. Therefore, the aim was to address all the objectives over the extent of a complete curriculum grade, in two lessons per week over five weeks. Including more objectives in each lesson, would mean needing additional time for a lesson to be taught.

Access

"SCT (Social Cognitive Theory) has a reciprocally deterministic viewpoint and hypothesizes that no amount of observational learning will lead to behavior change unless the observers' environments support the new behaviors" (Glanz et al., 2008). It is an assumption that students will have a sufficiently supportive environment in both their school and homes to facilitate a change in behavior around healthy food choices. Children generally rely heavily on their parent or guardian to provide them with food. So, if their caregiver does not have the ability to obtain nutritious foods or does not understand the importance of a healthy diet, then the child will not be supported in the application of what they learned. If these children do not have access to fresh fruits and vegetables in their homes or a nearby store, then knowledge will not suffice in changing this behavior either.

Recommendations

The second iteration of the *Plant, Grow, and Learn* curriculum should be piloted to analyze possible behavior change in students and differences in data from the first and second versions. It would be expected that the revised curriculum should yield equal or greater results among students for improved attitude on nutritious foods, increase in daily consumption of fruits and vegetables, and acceptability of the curriculum among students and teachers based on changes in age-appropriate material, continuity of lessons, and guidance in implementation. Ultimately, pre- and post-test findings from students that have received the curriculum each year could be matched and compared to students from similar target neighborhood schools that have not received a garden-based nutrition curriculum to promote and advocate for policy that requires schools to offer such curriculums and establish school gardens to assist the state in reducing childhood obesity.

This curriculum could also be further enhanced through adaptation of the material based on a cultural and geographical context for the schools that it would be implemented in. The adaptations might be comprised of changes in the recipes that are used for taste-testing, pictures, videos, and language, suggested field trips and speakers, and need for a school garden. For example, if the curriculum were implemented in a predominantly Latino and urban community the types of fruits, vegetables, and recipes used for taste-testing might be different from a majority African-American population, based on culturally relevant food choices that might be available at their homes or neighborhood food sources. In addition, implementation in rural Georgia might need adaptation because it is possible that the students already have access to family farms with fresh fruits and vegetables, in which the need for addressing certain behaviors and access would be different. In these scenarios, a close analysis of populations and communities that will be reached though the curriculum would indicate necessary adjustments for content.

Overall, the current version of the *Plant, Grow, and Learn* curriculum offers an opportunity for improvement in attitudes around nutritious food choices and an increase in daily fruit and vegetable consumption among children of predominantly urban populations. As the curriculum expands and is evaluated for effectiveness in more schools throughout Georgia, beginning Fall 2017 and in the future, there will be additional opportunities to hone the material and further develop a product that fits the needs of a diverse group of communities and schools. As more students are reached, the health of youth in Georgia should begin to improve through healthier decision-making around food choices. Ultimately, childhood obesity will be decreased throughout the state of Georgia.

APPENDIX

1. Curriculum Guide & FAQs:

PowerMoves
Get Active Eat Better Do Better!

Welcome to the Plant, Grow, & Learn Garden Curriculum!

Plant, Grow, & Learn is a garden-based K-5 curriculum that has been launched by the Georgia Campaign for Adolescent Power & Potential (GCAPP), as a part of *PowerMoves!*, its nutrition and physical activity program initiative. This curriculum helps cultivate healthy communities in primarily underserved areas that are considered food deserts and offers enriching lessons to increase fruit and vegetable consumption among youth. *Plant, Grow, & Learn* also develops students' skills in creating and harvesting a garden, while integrating health, nutrition, math, science, social studies, and language concepts that satisfy the Georgia Education core curriculum standards. Through *PowerMoves!*, GCAPP has successfully built raised garden-beds at elementary schools in the Atlanta area and offers the curriculum as a complement to the gardens to build students' understanding of plant-based foods that provide essential nutrients for their growth and development. Hands-on outdoor garden activities can supplement the lessons if your school or community has access to a garden. For schools that do not have access to a garden, the lessons also include indoor alternatives that can still engage students in developing gardening knowledge and skills.

Objectives

- ✓ Students will be able to grow and harvest fruits and vegetables
- ✓ Students will be able to demonstrate positive attitudes towards eating fruits and vegetables
- ✓ Students will be able to describe the way in which gardens can yield nutritious food options
- ✓ Students will be able to choose healthy food options instead of unhealthy food options

Navigating the Curriculum

- Each week is comprised of two 30 minute lessons.
- Each lesson is introduced with:
    - A summary of the lesson objectives
    - The Georgia Educational Standards it addresses
    - A summary of the lesson agenda
    - An indication of any homework being assigned
    - Resources for the teacher
    - Instructions to help prepare for the lesson
- The lesson introduction is followed by the lesson content.

- *Plant, Grow, & Learn* is designed to be instructive, interactive, and stimulating and uses several different modes of teaching to keep students engaged. These learning modes are indicated by the following icons:

 —Indicates that the teacher will read to the students.

 —Indicates that the teacher will explain or discuss content with the students.

 —Indicates students will view a video or use media to learn lesson content.

 —Indicates students will participate in a learning activity or game.

 —Indicates students will compare/contrast information to understand content.

Action verbs that indicate the different steps of the lesson are highlighted with unique formatting: ***Action Verb***

Lesson handouts and worksheets are included at the end of each lesson and can be copied or projected accordingly.

While some lessons recommend using certain books or web resources to enhance the lesson, *Plant, Grow, & Learn* can be used independent of outside materials.

All web resources can be found at the following website:
http://www.gcapp.org/PowerMoves/videos

Downloadable copies of all curriculum lessons and supplemental inserts can be found at the following website:
http://gcapp.org/powermoves-curriculum

Some lessons in this curriculum were modeled after and adapted from the Captain Planet's Project Learning Garden curriculum: http://captainplanetfoundation.org/learning-garden-lessons/

Frequently Asked Questions (FAQs)

Do the lessons need to be taught in this order?
While the weekly lesson pairs are organized in order to lead students through a logical progression from plant growth through healthy eating, pairs may be taught in the order that best fits the educational needs of your class. However, it is recommended to keep lesson pairs together and only modify the order of the weeks. It should also be noted that if the curriculum is being taught in conjunction with a community garden, changing the order of the weeks will affect how well the lessons coordinate with ongoing plant growth.

This lesson includes a specific book in the "Materials" section that I don't have. Will this affect the quality of the lesson?

All external resources are simply recommendations to enhance the lesson material. *PowerMoves!* has included supplements to these materials where needed. All necessary content is contained within the *Plant, Grow, & Learn* curriculum booklets.

I don't have time to add a 30 minute lesson to my regular lesson plans. How can I fit this into my teaching schedule?
The *Plant, Grow, & Learn* lessons are designed to achieve Georgia Educational Standards and can be used as supplements to lessons you are already planning to teach to meet these requirements. Additionally, many of the 30 minute lessons are divided into two 15 minute parts. If you are running short on time, consider spacing out the curriculum into 15 minute sessions throughout the semester.

Is taste-tasting helpful?
Taste-testing is an effective way to engage students in developing their own attitudes about fruits and/or vegetables. It also offers them an opportunity to eat healthy foods that they may be trying for the first time and provides them with multiple healthy options they may be able to add to their diet.

How will my students' attitudes change towards fruits and vegetables?
Thus far, the curriculum has been demonstrated to increase observable, positive attitudes towards fruits and vegetables among students. According to post-implementation teacher surveys, 100% of respondents agreed or strongly agreed that their students enjoy trying new fruits and vegetables. In addition, nearly all of the teachers agreed that students are interested in where food comes from and feel that healthy eating is important to them.

The majority of the respondents noted that the curriculum changed the way students think about food because they were exposed to and thus, more interested in new fruits and vegetables, as well as where food comes from.

In order to understand the effect of the curriculum on students' attitudes towards healthy eating, it is very important that your students complete the pre and post-tests, which are the best way to evaluate behavior change and are included along with this insert.

My school doesn't have a garden, but I want my students to experience plant growth hands-on. How can I do this?
There are many other ways to demonstrate and engage students in plant growth without a school garden. Consider planting potted flowers with your class and keeping them by the window. Students can take turns being responsible for watering the flowers and illustrating their growth. Alternatively, each student can grow a Ziploc bean plant, which can also be kept by the window. The following resources provide additional details and suggestions for engaging students inside the classroom:

Bean Plant Activity:
http://ourcommunityourkids.org/media/2972/Farm%20to%20PreK_How%20to%20Sprout%20a%20Bean%20Plant_Dec09.pdf

Indoor Terrarium:
http://www.kidsgardening.org/garden-activities-building-a-terrarium/

Indoor Succulent Garden:
https://www.bayeradvanced.com/articles/growing-succulents-indoors

What type of support can I get?
For any additional support or training needs, please contact Tyra Norris-Ellis at tyra@gcapp.org.

What kind of additional activities can be added to the lessons?
Incorporating additional food, garden, farm, and/or nutrition activities into your lessons can be great for enrichment. The curriculum can also be enhanced through field trips, like apple orchards or pumpkin patches in the fall, and guest speakers, whom GCAPP can make connections with, per request. The following resources provide additional activities, ideas, resources and ways to further engage students:

- **Kid Gardening Activities**: includes appropriate ages (most are all ages)- http://www.kidsgardening.org/garden-activities/

- **Learning games and activities**: some are grade-level specific- http://theeducatorsspinonit.com/category/gardening

- **National Agricultural Literacy Curriculum Matrix**: http://www.agclassroom.org/teacher/matrix/

When is the curriculum best implemented?
The *Plant, Grow, & Learn* lessons can be best implemented at the same time your class is covering similar standards and subject matter. This curriculum integrates health, nutrition, math, science, social studies, and language concepts that can also satisfy Georgia's core curriculum standards. GCAPP encourages teaching staff to implement *Plant, Grow, & Learn* over a 6-week time period.

What is the best time or season to begin the curriculum?
Please refer to the planting schedule (attached) to identify crops that can be used in the lessons during the season in which you plan to begin teaching the curriculum.

Contributors

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and access to high quality care for everyone. The views presented here are those of the author and not necessarily those of the Aetna Foundation, its directors, officers or staff.

Georgia Planting Schedule

A Garden Planting Chart							
Crop	Days to Maturity	Spring Planting Dates	Fall Planting Dates	Seed/Plants 100 ft.	Distance Between Rows	Distance Between Plants	Depth to Plant
Asparagus	2nd season	Jan. 15-Mar. 15	Nov. & Dec.	50 roots	3 to 5 ft.	1½ to 2 ft.	6 in.
Bean, bush	50-60	Apr. 1 - May 1	July 15-Aug. 20	½ lb.	3 ft.	2 to 4 in.	1-1½ in.
Bean, pole	65-75	Apr. 1-May 1	July 15-Aug. 10	½ lb.	3 ft.	6 to 12 in.	1-1½ in.
Bean, lima	65-75	Apr. 1 - June 1	July 1-Aug. 1	1 lb.	2 to 2½ ft.	3 to 4 in.	1-1½ in.
Beet	55-65	Feb. 15-Apr. 1	Aug. 1-Sept. 20	1 oz.	2 to 2½ ft.	2 in.	1 in.
Broccoli	60-80	Feb. 15-Mar. 15	Aug. 1-Sept. 1	100 plants	2½ ft.	14 to 18 in.	
Cabbage	65-80	Jan. 15-Mar. 15	Aug. 15-Oct. 1	100 plants	2½ ft.	12 in.	
Cantaloupe	80-90	Mar. 25-Apr. 20	Not recommended	1 oz.	4 to 6 ft.	3½ to 4 ft.	1½ in.
Carrot	70-80	Jan. 15-Mar. 20	Aug. 20-Sept. 15	½ oz.	2 ft.	2 to 3 in.	½ in.
Cauliflower	55-60	Mar. 1-Apr. 1	Aug. 1-Sept. 1	100 plants	3 ft.	12 to 18 in.	
Collard	55-70	Feb. 1-Mar. 20	Aug. 1-Oct. 1	½ oz.	2½ ft.	8 to 16 in.	½ in.
Corn	80-100	Mar. 15-June 1	June 1-July 20	¼ lb.	3 to 3½ ft.	12 to 18 in.	2 in.
Cucumber	60-65	Apr. 1-May 15	Aug. 20-Sept. 1	1 oz.	3½ to 5 ft.	3 to 4 ft.	1½ in.
Eggplant	75-90	Apr. 1-May 15	July 10-15	50 plants	3 ft.	2½ to 3 ft.	
Kale	50-70	Feb. 1-Mar. 10	Aug. 10-30	½ oz.	3 ft.	10 in.	½ in.
Lettuce	60-85	Jan. 15-Mar. 1	Sept. 1-Oct. 1	½ oz.	2 to 2½ ft.	10 to 12 in.	½ in.
Mustard	40-50	Jan. 15-Apr. 1	Aug. 20-Oct. 1	½ oz.	2 ft.	1 in.	½ in.
Okra	55-60	Apr. 1-June 1	June 15-July 1	1 oz.	3 to 3½ ft.	6 in.	1 in.
Onion (mature)	100-120	Jan. 1-Mar. 15	Sept. 1-Dec. 31	300 plants or ½ gal. sets	1 to 2 ft.	3 to 4 in.	¾ in.
Peas,garden	60-80	Jan. 15-Feb. 15	Not recommended	1 lb.	2½ ft.	1 in.	1½-2 in.
Peas, southern	60-70	Apr. 1-Aug. 1		½ lb.	3 ft.	4 to 6 in.	1½-2 in.
Pepper	65-80	Apr. 1-June 1		50 plants	2½ ft.	1½ to 2 ft.	
Potato, Irish	70-90	Jan. 15-Mar. 1	Aug. 1-Aug. 15	1 peck	2½ to 3 ft.	10 to 14 in.	5 in.
Potato, sweet	90-150	Apr. 15-June 15		100 plants	3½ ft.	12 in.	-
Radish	25-30	Jan. 15-Apr. 1	Sept. 1-Oct. 15	1 oz.	1½ ft.	1 in.	½ in.
Spinach	40-45	Jan. 15-Mar. 15	Sept. 1-Oct. 15	1 oz.	1½ to 2 ft.	1 to 2 in.	¾ in.
Squash, bush	50-55	Apr. 1-May 15	Aug. 1-20	1 oz.	3 to 4 ft.	2 ft.	1½-2 in.
squash, winter	85-90	Apr. 1-Aug. 1		½ oz.	5 ft.	3 ft.	1½-2 in.
Tomato	70-85	Mar. 25-May 1	June 1-Aug. 10	50 plants	3 to 4 ft.	2½ to 3 ft.	
Turnip	45-65	Jan. 15-Apr. 1	Aug. 10-Sept. 15	½ oz.	1 to 2 ft.	1 to 2 in.	½ in.
Watermelon	80-90	Mar. 20-May 1	Do not plant	1 oz.	10 ft.	8 to 10 ft.	1½ in.

Note: Planting dates in this chart are approximate for Middle Georgia. North Georgia plantings should vary about two weeks later in the spring and earlier in the fall. South Georgia plantings can be made two weeks earlier in the spring and somewhat later in the fall.

2. Curriculum Roadmap

Evaluation Questions	Week	Lesson	Topic	Objectives: SWBAT…	Physical Activity Inclusion	Theoretical Constructs Included in Lesson
Kindergarten: Living and Non-living (Micah)						
Draw fruits that you ate yesterday: Draw vegetables that you ate yesterday: How much do you like eating fruits and vegetables?	1	***Exploring the Garden Part 1***	***What is a living thing?***	**Students will be able to identify a living thing. Students will be able to distinguish what is living thing from what is not. Students will be able to illustrate images of living thing.**	None	EL- Reflective observation
Bold and italic: lesson exists but needs modifications	1	***Exploring the Garden Part 2***	***Non-living things***	**Students will be able to identify and describe non-living things. Students will be able to categorize living and non-living things. Students will be able to point out living and non-living things in the garden.**	Moving around in the garden with category game	SCL- retention, attention
Bold: new lesson	3	**Fruit vs Vegetable**	**Differentiate between fruits and vegetables**	**Students will be able to define a fruit. Students will be able to define a vegetable. Students will be able to differentiate between a fruit and a vegetable. Students will be able to classify food as a fruit or vegetable.**	Sit, stand, or squat if your fruit/vegetable is described	SLT- attention, retention, reflective observation

3. Spring 2016 – Plant, Grow, and Learn: Kindergarten Lessons (Pilot Version)

PowerMoves
Get Active Eat Better Do Better!
gcapp.org/PowerMoves

"Plant, Grow & Learn Garden Curriculum"

KINDERGARTEN

GCAPP
GEORGIA CAMPAIGN FOR ADOLESCENT POWER & POTENTIAL
Education • Prevention • Action For Adolescent Health

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ABOUT GCAPP

Whether it's teen pregnancy prevention, physical activity or healthy relationships, in our 18-year history of working with young people, giving them the knowledge, skills and motivation they need to make good, healthy choices is at the heart of our work.

We know the adolescent years represent a critical stage of development. We also know these years present opportunity for sustained well-being through education and prevention efforts. Adolescents in Georgia need more focus and attention. GCAPP addresses the *whole* youth and works to bring more focus to their overall health and wellness.

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KINDERGARTEN OVERVIEW

WEEK ONE

- Lesson One: Soil Sam
- Lesson Two: Soil Sam and His Yam

WEEK TWO

- Lesson One: Soil Recipes
- Lesson Two: Soil Lasagna

WEEK THREE

- Lesson One: Mystery Plant
- Lesson Two: Parts of a Plant

WEEK FOUR

- Lesson One: Garden Senses
- Lesson Two: Exploring the Garden

WEEK FIVE

- Lesson One: I SPY Shapes
- Lesson Two: Planting Day

Kindergarten Pre-test

1- Draw **fruits** that you ate yesterday:

2- Draw **vegetables** that you ate yesterday:

Please circle the best answer:

3- How much do you like eating fruits and vegetables?



KINDERGARTEN WEEK ONE

Lesson One: 30 minutes. **"Soil Sam"**

Lesson Two: 30 minutes. **"Soil Sam and His Yam"**

This session introduces students to soil. Students will collect soil samples and discover that soil is different from place to place and that it is made up of living and non-living components. Students will observe and sort soil samples according to physical attributes and make the connection between healthy soil, healthy plants, healthy vegetables, and healthy people.

LESSON ONE: "Soil Sam"

Time: 30 minutes

Objectives:
- Students will learn five things that help make soil.
- Students will able to identify differences between dirt and soil.

Standards:
- GPS.SKE2. Students will describe the physical attributes of rocks and soils: (a) Use senses to observe and group rocks by physical attributes such as large/small, heavy/light, smooth/rough, dark/light, etc. (b) Use senses to observe soils by physical attributes such as smell, texture, color, particle/grain size. (c) Recognize earth materials—soil, rocks, water, air, etc.
- NGSS.K.ESS3.A Natural Resources: Living things need water, air, and resources from the land, and they live in places that have the things they need. Humans use natural resources for everything they do.

Agenda

Soil Sam (30 min)

Homework

None assigned

Teacher Resources & Instructions

All videos and other online resources included in the lesson can be accessed from www.gcapp.org/PowerMoves/videos

Soil Sam:

- You may want to have a sample of dirt and a sample of soil to show students.
- Prepare to show the "Soil formation" video to the class https://www.youtube.com/watch?v=kybPmB1zBUw

Soil Sam

Time

 30 minutes

Summary

Students will be introduced to Soil Sam who guides them through how soil is formed and what it is made of.

Materials

 "Soil formation" video https://www.youtube.com/watch?v=kybPmB1zBUw

Learning Modes

Lesson Plan

1. *Ask* students if they have ever planted anything. Allow about 2 minutes to share their experiences with the class.
    a. You may want to ask questions like: Have you ever planted flowers or vegetables or other plants with your Mom or Dad? What did you plant? Did you watch the plant grow the in the following weeks?
2. *Introduce* Sam:
    a. Sam is a little boy who is interested in all sorts of garden stuff like soil, plants, vegetables, fruits, bugs, and leaves. He loves sharing his knowledge and experience with other kids.
3. *Activity:*
    a. *Show* the "Soil formation" video.
    b. Afterwards, *ask* the following questions:
        1) What did Soil Sam used to be? (A rock)
        2) Do you remember what Sam showed us that helped turn a rock into the soil that we use to plant flowers and plants? (water, wind, lichens, sun, and changes in temperature)
        3) How did water help make the soil? (It widened the cracks in the rocks)
        4) Next, ask the students to recall the difference between dirt and soil. Have samples of each to show the students.
            - Remind students that the soil is darker in color because it contains nutrients.

4. Conclude by ***discussing*** the connection between non-living things (rocks), natural resources (sun, wind, air temperature) and living things (lichen).

LESSON TWO: "Soil Sam and his Yam"

Time: 30 minutes

Objectives: Students will learn the differences and similarities between two root vegetables commonly found in community and school gardens.

Standards:

- **GPS.MGSEK.G.1** Describe objects in the environment using names of shapes, and describe the relative positions of these objects using terms such as ***above***, ***below***, ***beside***, ***in front of***, ***behind***, and ***next to***.
- **GPS.MGSEK.G.2** Correctly name shapes regardless of their orientations or overall size.
- **GPS.HEK.1** Students will comprehend concepts related to health promotion and disease prevention to enhance health.

Agenda

Soil Sam and His Yam (30 min)

Homework

None assigned

Teacher Resources & Instructions

All videos and other online resources included in the lesson can be accessed from www.gcapp.org/PowerMoves/videos

Soil Sam and His Yam:

- It may be helpful to show the students actual root vegetables (i.e., yams and sweet potatoes)
  - If these are not available, you can show images or you can use other root vegetables such as turnips, carrots, or beets.
- Prepare to show the "Sweet potato versus yam" video to the class https://www.youtube.com/watch?v=pToAf_p5RLE

Soil Sam and his Yam

Time

30 minutes

Summary

Students will be introduced to one of Soil Sam's favorite vegetables. Students will be asked to compare the characteristics of two similar root vegetables.

Materials

A sweet potato and a yam

"Sweet potato versus yam" video https://www.youtube.com/watch?v=pToAf_p5RLE

Learning Modes

Lesson Plan

1. ***Ask*** students if they remember who Soil Sam is. (Remind them that Soil Sam is a little boy who likes to learn about gardening)
2. ***Introduce*** one of Sam's favorite things: a yam.
3. ***Ask*** students if they have ever tasted a yam. How did it taste? Was it sweet? Was it sour?
4. ***Ask*** students if they remember what color the yam was?
5. ***Show*** them a real yam (if you have one). Let them hold it, touch it, and examine it.
6. ***Ask*** if they know the difference between a yam and a sweet potato?
    a. ***Explain*** that sometimes we call them the same thing, but they are actually different.
7. ***Ask*** students if they have ever had sweet potato? Ask if they liked it? How did it taste?
8. ***Show*** them a real sweet potato (if you have one). Let them hold it, touch it, and examine it.
9. ***Activity:***
    a. ***Introduce*** the concept of classification. Classification is when you put things in groups based on their characteristics like color, taste, size, and shape.
    b. ***Ask,*** How do we use classification to figure out what type of vegetable we have?
    c. ***Write*** 2 columns on the white board and label one yam and one sweet potato.
    d. ***Ask*** students to describe the yam and write it on the board. Then ask students to describe a sweet potato and write it on the board.
    e. ***Compare and Contrast*** the yam and the sweet potato.
    f. ***Show*** the "Sweet potato versus yam" video
10. If there is extra time for discussion ***Ask*** the following questions:

a. Do you eat sweet potato pie at Thanksgiving or during the holidays?
b. Have you ever had sweet potato French fries?
c. What about mashed sweet potatoes?

KINDERGARTEN WEEK TWO

Lesson One: 30 minutes. "Soil Recipes"

Lesson Two: 30 minutes. "Soil Lasagna"

This session "digs" deeper into soil and continues to address the living, non-living and once-living components of soil. Students will collect soil samples and discover that soil has layers and each serves a purpose for plants. Students will make the connection between healthy soil, healthy plants, healthy vegetables, and healthy people.

LESSON ONE: "Soil Recipes"

Time: 30 minutes

Objectives: Students will learn about different types of soil and what living things are in soil.

Standards:

- **GPS.SKE2.** Students will describe the physical attributes of rocks and soils: (a) Use senses to observe and group rocks by physical attributes such as large/small, heavy/light, smooth/rough, dark/light, etc. (b) Use senses to observe soils by physical attributes such as smell, texture, color, particle/grain size. (c) Recognize earth materials—soil, rocks, water, air, etc.
- **NGSS.K.ESS3.A** Natural Resources: Living things need water, air, and resources from the land, and they live in places that have the things they need. Humans use natural resources for everything they do.
- **GPS.HEK.1.** Students will comprehend concepts related to health promotion and disease prevention to enhance health.
- **GPS.HEK.8.** Students will demonstrate the ability to advocate for personal, family, and community health.

Agenda

Part A: (15 min) Soil Recipe

Part B: (15 min) The Scoop on Soil

Homework

Bring in your favorite meal recipe

Teacher Resources & Instructions

All videos and other online resources included in the lesson can be accessed from www.gcapp.org/PowerMoves/videos

Part A: Recipe for Soil

- http://school.discoveryeducation.com/schooladventures/soil/recipe_soil.html

Part B: Soil Layers diagram / worksheet

- http://www.enchantedlearning.com/geology/label/soillayers/
- Facts about soils http://www.epa.gov/gmpo/edresources/soil.html

Part A: Soil Recipe

Time

15 minutes

Summary

Students will discuss the non-living, living, and once-living ingredients in soil as it relates to their favorite recipe or meal.

Materials

"Recipe for Soil"
http://school.discoveryeducation.com/schooladventures/soil/recipe_soil.html

Learning Modes


Lesson Plan

1. ***Discuss*** the following questions as a class:
    a. What is soil?
    b. How does soil affect food we grow in the garden?
    c. What does soil have to do with your health?
2. ***Introduce or Review*** the following concepts to the students:
    a. Soil is made up of living things (like animals and plants) and once-living things (decomposing bits). Living and once-living things are called organic matter.
    b. Soil is also made of non-living things including bits of rock (mineral soil), water, and air. (Remember Soil Sam?)
    c. The top layer of soil includes a mix of living and non-living components and is fertile, thin, and fragile. Fertile means that it is good for helping things grow. It takes many years for healthy, fertile soils to be formed, but poor farming or gardening practices can deplete the nutrients in soil and even cause soil to blow away or erode.
    d. Soils are a valuable natural resource we must protect. Most plants need soil to hold them up and to provide the water and nutrients (provided by decomposed organic matter) that plants absorb through their roots.
    e. Soil quality can be hurt by toxins and pollutants that make it unhealthy, or by overuse for gardening and farming which can remove nutrients and encourage pests, or by heavy use of artificial fertilizers and pesticides.
    f. Fortunately, people can improve soil health in the garden by adding compost to

restore nutrients, rotating crops, growing legumes (peas or clovers), covering crops in alternate seasons to restore nitrogen, and implementing other garden practices.

Students can learn more about soil in this lesson and have the opportunity to improve soil health in the school garden by composting their lunch leftovers and adding completed compost to garden beds.

3. ***Activity***: Introduction to Composting
   a. ***Introduce*** the cycle of life and the concept of decomposition. Explain that by building a compost pile, we build a home for decomposers. Biodegradable matter is anything that can decay. Have participants give examples of biodegradable materials that they might throw away at home or at school (banana peel, dried leaves). Keep a list.
   b. ***Explain*** that composting is a way of recycling the materials that the participants have listed. Composting recycles materials such as yard trimmings and food waste through a process of decomposition. Bacteria, earthworms, and other creatures actually eat these materials and break them down into food that plants can eat. The end result is a rich, dark brown, earthy smelling material called compost. This compost can then be returned to the earth to help build a healthy soil and ensure more plant growth.
   c. ***Introduce*** the steps to composting.
   d. ***Share*** with the class the three steps to building a pile: 1. Chop materials in to pieces that are six inches in size or less. 2. Mix browns and greens (half of each by volume). 3. Maintain moisture by keeping pile as wet as a wrung-out sponge.
   e. (***Optional***) If time allows, have students collect biodegradable materials from a school lunch and start your own compost pile.
      a. Include in the pile any materials students may have collected, such as orange peels, apple cores, other vegetable and fruit trimmings, and paper. You can also add plant matter from around the school, like grass clippings and leaves. Avoid diseased plants. You may want to ask participants to bring lunch debris from the day before, although use this in moderation. Do not add dairy or meat products which may attract animals to the pile. Always bury the food waste in the center of the pile.
      b. Have the students collect the brown and green materials in separate piles (an equal amount of each works well).
      c. Assign students to help with each of the various tasks of chopping, layering greens, layering browns, mixing, and watering. Students can chop materials by piling up materials on the ground and using a flat edge shovel to bruise or chop pieces. Clippers can be used to cut up pieces. Ideal size is about six inches long, although any bruising is helpful. These activities should be carefully supervised.
      d. Build the compost pile by alternating layers of brown and green material. Add water by spraying with a hose as you add each layer. The pile should be about as wet as a wrung-out sponge. Stir the layers together with a pitchfork as you build the pile. Keep the pile “fluffed up” to maximize the air in the pile.

Part B: The Scoop on Soil

Time

 15 minutes

Summary

Students will learn about the properties of soil.

Materials

 Dirt: The Scoop on Soil by Natalie Rosinsky

Learning Modes

Lesson Plan

1. ***Review*** the properties and components that make up soil. Remind students that healthy soil makes healthy plants and that healthy plants make US healthy!
2. ***Read*** the story, Dirt: The Scoop on Soil.
    a. If this book is unavailable, watch What's the dirt on…dirt? (optional) https://www.youtube.com/watch?v=if29mjcd5bc
3. ***Conclude*** with the following questions.
    a. What makes healthy soil so special? (has lots of nutrients)
    b. How do we make soil healthy? (feed or fertilizer, water, till)
    c. If we planted carrots, what would see in the ground once it grows? (green leaves)
        i. What about under the soil? (the orange part)
    d. Why do some vegetables grow underground? (protection from weather)

LESSON TWO: "Soil Lasagna"

Time: 30 minutes

Objectives:
- Students will be able to identify different layers of soil
- Students will be able to identify the different role each layer plays in gardening

Standards:
- **GPS.SKP1.** Students will describe objects in terms of the materials they are made of and their physical properties: (b) Use senses to classify common materials, such as buttons or swatches of clot, according to their physical attributes (color, size, shape, weight, texture, buoyancy, flexibility).
- **GPS.SKL1.** Students will sort living organisms and non-living materials into groups by observable physical attributes: (a) Recognize the difference between living organisms and nonliving materials (c) Group plants according to their observable features such as appearance, size, etc.
- **GPS.SSKCG1.** The student will demonstrate an understanding of good citizenship: (a) Explain how rules are made and why (b) Explain why rules should be followed.
- **NGSS.K.LS1.C.** Organization for Matter and Energy Flow in Organisms: All animals need food in order to live and grow. They obtain their food from plants or from other animals. Plants need water and light to live and grow.
- **NGSS.K.ESS3.A.** Natural Resources: Living things need water, air, and resources from the land, and they live in places that have the things they need. Humans use natural resources for everything they do.

Agenda

Soil is like lasagna!

Homework

None assigned

Teacher Resources & Instructions

All videos and other online resources included in the lesson can be accessed from www.gcapp.org/PowerMoves/videos

Soil is like lasagna!

- Soil Layers diagram / worksheet
  http://www.enchantedlearning.com/geology/label/soillayers/
- Soil Profile video ***https://www.youtube.com/watch?v=R0MEVLTsvL8***

Soil is Like Lasagna

Time

30 minutes

Summary

Students will learn about soil layers and which layer is important for plant growth.

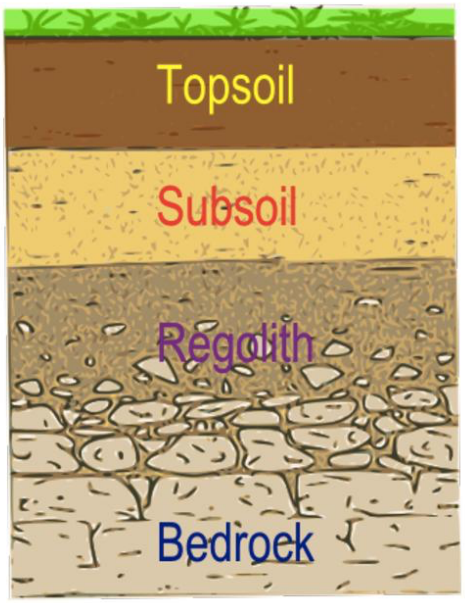
Materials

- Soil Profile video ***https://www.youtube.com/watch?v=R0MEVLTsvL8***
- BLM soil activity web site for kids http://www.blm.gov/nstc/soil/Kids/soilimpt.html
- Soil Layers diagram & worksheet
  http://www.enchantedlearning.com/geology/label/soillayers/

Learning Modes

Lesson Plan

1. ***Review*** what makes soil different than dirt.
2. ***Ask*** the class, "What are some ways you can tell if you have soil or dirt?"
   a. Acknowledge all answers, and then suggest color and texture as two ways to tell if it is soil or dirt.
   b. If available, ***show*** the students a handful of soil and a handful of dirt and have them describe each.
3. ***Ask*** if anyone has ever eaten lasagna before. Then ask for someone to describe it.
   a. Point out that the lasagna has different layers. The layers are made of different ingredients.
4. ***Explain*** that soil also has layers and that each layer is made of different ingredients and serves a different purpose for plants.
5. ***Introduce*** the different layers of soil using the diagram below:



6. ***Ask*** students which layers they think are important in growing plants. (topsoil)
7. ***Tell*** students that the top layer of soil includes a mix of living and non-living components and is fertile, thin compared to the deep bedrock below, and fragile. It takes many years for healthy, fertile soils to be formed yet poor farming or gardening practices can deplete the nutrients in soil and even cause soil to blow away or erode. Soils are a valuable natural resource we must protect. Most plants need soil to hold them up and to provide the water and nutrients (provided by decomposed organic matter) that plants absorb through their roots. Soil quality can be hurt by toxins and pollutants that make it unhealthy, or by overuse for gardening and farming which can remove nutrients and encourage pests, or by heavy use of artificial fertilizers and pesticides. Fortunately, people can also improve soil health in the garden by adding compost to restore nutrients, rotating crops, growing legume (pea or clover) cover crops in alternate seasons to restore nitrogen, and other certain garden practices.
8. ***Watch*** the short video on soil profiles https://www.youtube.com/watch?v=R0MEVLTsvL8
9. ***Conclude*** by completing the worksheet on soil layers. http://www.enchantedlearning.com/geology/label/soillayers/

KINDERGARTEN GRADE WEEK THREE

Lesson One: 30 minutes. "Mystery Plant"

Lesson Two: 30 minutes. "Parts of A Plant"

This session introduces students to plants. Students will describe and draw a mystery plant and use the process of elimination to determine what type of plant is being described. The parts of the plant are introduced and each function is discussed.

LESSON ONE: "The Mystery Plant"

Time: 30 minutes

Objectives:
- Students will use process of elimination to determine plant type.
- Students will be able to demonstrate and describe plant parts.

Standards:
- **GPS.SKP1.** Students will describe objects in terms of the materials they are made of and their physical properties: (b) Use senses to classify common materials, such as buttons or swatches of cloth, according to their physical attributes (color, size, shape, weight, texture, buoyancy, flexibility)
- **GPS.SKL1.** Students will sort living organisms and non-living materials into groups by observable physical attributes: (a) Recognize the difference between living organisms and nonliving materials (c) Group plants according to their observable features such as appearance, size etc.
- **NGSS.KLS1.C.** Organization for Matter and Energy Flow in Organisms: All animals need food in order to live and grow. They obtain their food from plants or from other animals. Plants need water and light to live and grow.
- **NGSS.KESS3.A.** Natural Resources: Living things need water, air, and resources from the land, and they live in places that have the things they need. Humans use natural resources for everything they do.

Agenda

Let Me Introduce Myself (30 min)

Homework

(All homework is optional)

Find one plant to examine at home. Make a list or draw a picture of what you see. Compare it to the mystery plant that you examine in class.

Teacher Resources & Instructions

Let Me Introduce Myself:

- For this lesson, students should be able to see an actual tomato plant. You can alter the description of the plant for convenience if you need to bring in a different type of plant. Basil, strawberries, blueberries, or pepper plants work well.

Let Me Introduce Myself

Time

 30 minutes

Summary

Students will learn about a mystery (tomato) plant.

Materials

 Whiteboard/Smartboard and markers

 Paper and crayons or markers (optional)

Lesson Plan

1. *Ask* students to have their piece of paper and crayons out. Tell them that they are going to be drawing a mystery plant. They are the detectives in a mystery and are getting a description of the suspect. The suspect has stolen all of the drinks in the whole city of Gardentown. There is nothing left for the other plants to drink and the day is about to begin with the hot sun beating down. They are already getting thirsty!
2. *Activity:*
    a. *Introduce* this lesson by describing a mystery scene. Have students draw as you tell the story and allow breaks so they can keep up.
    b. *The Mystery:* The morning was foggy, the dew was just starting to settle, and out of the ground grew a large, somewhat fury stalk with little leaves coming off long, spider web like stems. Continue by describing the mystery plant by using the adjectives and images below.
    c. *Continue…* The leaves were sticky and green. The sun came up and the air felt thick in the summer air. The plant's stems began to get heavy as if they were like arms holding big water balloons. In fact, like five big red water balloons! Bees begin to buzz all around. They landed on the water balloons and sucked out the juice. It tasted like flavored water but not sweet, a little on the sour side. Do you know who stole all the drinks in the whole city of Gardenland? If they do not guess correctly, *continue…*
    d. About midday a farmer stopped by to see what all the fuss was about. The plants looked so sad and he knew something had to be done to quench their thirst. He reached down and picked on of those red water balloons right off the plant and said, if you keep stealing all the water around here, I will have to make you into ketchup.
3. *Ask* the students what type of plant is the suspect. What was he stealing and why?
4. *Conclude* by asking the students to share their pictures and show them an actual tomato plant that you have brought in. Are their similarities between the story, the students' drawings, and the tomato plant?

LESSON TWO: "The Parts of a Plant"

Time: 30 minutes

Objectives:
- Students will be able to identify the main parts of a plant.
- Describe plant parts and the function of each part.

Standards:
- **GPS.SKP1.** Students will describe objects in terms of the materials they are made of and their physical properties: (b) Use senses to classify common materials, such as buttons or swatches of cloth, according to their physical attributes (color, size, shape, weight, texture, buoyancy, flexibility)
- **GPS.SKL1.** Students will sort living organisms and non-living materials into groups by observable physical attributes: (a) Recognize the difference between living organisms and nonliving materials (c) Group plants according to their observable features such as appearance, size etc.
- **NGSS.KLS1.C.** Organization for Matter and Energy Flow in Organisms: All animals need food in order to live and grow. They obtain their food from plants or from other animals. Plants need water and light to live and grow.
- **NGSS.KESS3.A.** Natural Resources: Living things need water, air, and resources from the land, and they live in places that have the things they need. Humans use natural resources for everything they do.

Agenda

Plant Parts (30 min)

Homework

None Assigned

Teacher Resources & Instructions

All videos and other online resources included in the lesson can be accessed from www.gcapp.org/PowerMoves/videos
Plant Parts:

- Parts of a Plant video https://www.youtube.com/watch?v=X6TLFZUC9gI

Parts of a Plant

Time

 30 minutes

Summary

Students will learn about the parts of a plant by watching a short video and recalling what they saw and heard.

Materials

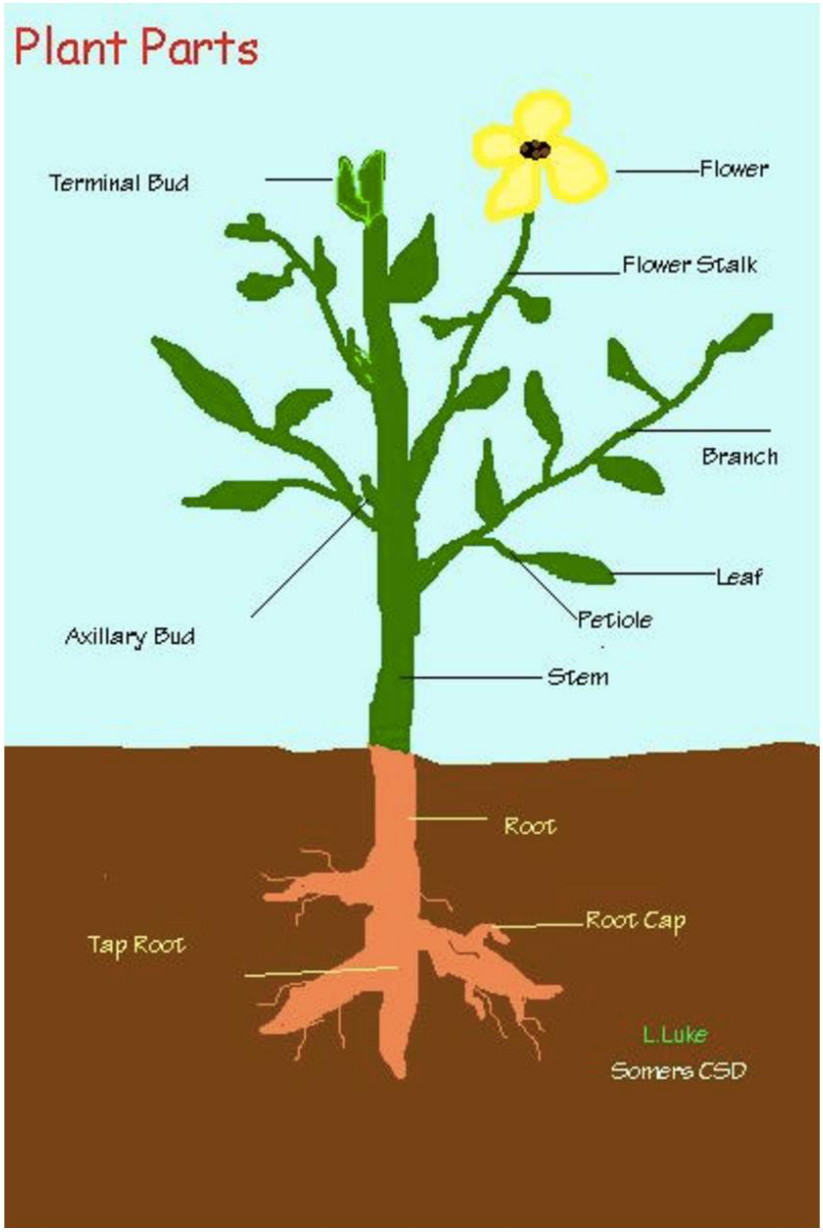
 "Parts of a Plant" video https://www.youtube.com/watch?v=X6TLFZUC9gI

 ***Plant Parts Diagram***

Lesson Plan

1. ***Review*** the parts of the tomato plant described in "Lesson One: The Mystery Plant."
    a. Use the terms stalk, stem, fruit (tomato), and leaves.
2. ***Show*** the "Parts of a Plant" video to the class.
3. ***Ask*** students about these terms:
    a. Root, shoot, stem, flowers, fruit, branches, leaves, chlorophyll, photosynthesis
4. ***Show*** students the ***Plant Parts Diagram*** and use it to have students tell you where each of the plant parts are.

Plant Parts Diagram



KINDERGARTEN WEEK FOUR

Lesson One: 30 minutes. "Garden Senses"

Lesson Two: 30 minutes. "Exploring the Garden"

This session introduces students to the garden and allows for exploration. Sorting and classification skills will be used. Using their five senses, students will learn about garden dimensions and differentiate between living and non-living things.

LESSON ONE: "Garden Senses"

Time: 30 minutes

Objectives: Students will demonstrate how they can use their 5 senses to explore and describe a garden.

Standards:

- **GPS.SKP1.** Students will describe objects in terms of the materials they are made of and their physical properties: (b) Use senses to classify common materials, such as buttons or swatches of cloth, according to their physical attributes (color, size, shape, weight, texture, buoyancy, flexibility)
- **GPS.SKL1.** Students will sort living organisms and non-living materials into groups by observable physical attributes: (a) Recognize the difference between living organisms and nonliving materials (c) Group plants according to their observable features such as appearance, size etc.
- **NGSS.KLS1.C.** Organization for Matter and Energy Flow in Organisms: All animals need food in order to live and grow. They obtain their food from plants or from other animals. Plants need water and light to live and grow.
- **NGSS.KESS3.A.** Natural Resources: Living things need water, air, and resources from the land, and they live in places that have the things they need. Humans use natural resources for everything they do.

Agenda

Using your Senses (30 min)

Homework

None assigned

Teacher Resources & Instructions

All videos and other online resources included in the lesson can be accessed from www.gcapp.org/PowerMoves/videos

Using your Senses:

- This week you will want to visit a garden or have class outdoors.

Using your Senses

Time

30 minutes

Summary

Students will learn about sights, smells, touch, and tastes of the garden.

Materials

Edible fruits and vegetables (You may have each student bring in a fruit for snack.)

Paper and crayons

Learning Modes

Lesson Plan

1. ***Review*** what you learned about plants so far. Plants start from seeds and grow in topsoil with their roots digging down into the subsoil in some mature plants. When plants flower, some produce fruit. Others grow as roots and produce vegetables like carrots, parsnips, or beets. Some grow out of the ground and look like little trees and bushes, such as broccoli, cabbage, or cauliflower.
2. ***Ask*** the class, "What are some ways that you can use your senses to discover the garden?"
    a. Remind students of the 5 senses: sight, smell, taste, sound, and touch. Acknowledge all answers, then suggest sight, smell, and sound as a few ways to discover a garden.
    b. If you are outdoors, you can have students do the following without any visuals. If you are in a classroom, find a garden scene or an image with a garden and sounds. https://www.youtube.com/watch?v=GTlQXmqFGko
3. ***Ask*** the class to close their eyes and listen (30 seconds). Tell them to open their eyes. Ask them one at a time what they hear. Encourage students to use descriptive words - especially adjectives - when telling about things they sensed.
4. ***Ask*** the class to close their eyes and smell (30 seconds). Tell them to open their eyes. Ask them one at a time what they smell.
5. ***Ask*** the class to close their eyes and just pay attention to what and how they feel (1 minute). Tell them to open their eyes. Ask them one at a time what they felt. (wind, sunlight, calm, tired, relaxed)
6. Now that they have experienced the first 3 senses, they will now focus on sight and taste. Have edible fruits and vegetables for them to taste.
7. ***Ask*** students what they see in the garden. What do they notice first? Encourage students to use descriptive words - especially adjectives - when telling about things they see.
8. If time allows, have students draw a picture of the garden.
9. ***Conclude*** by asking each (or a few) student(s) to share their drawing.

LESSON TWO: "Garden Exploration"

Time: 30 minutes

Objectives: Students will be able to differentiate between living and non-living organisms.

Standards:

- **GPS.SKP1.** Students will describe objects in terms of the materials they are made of and their physical properties: (b) Use senses to classify common materials, such as buttons or swatches of cloth, according to their physical attributes (color, size, shape, weight, texture, buoyancy, flexibility)
- **GPS.SKL1.** Students will sort living organisms and non-living materials into groups by observable physical attributes: (a) Recognize the difference between living organisms and nonliving materials (c) Group plants according to their observable features such as appearance, size etc.
- **GPS.SSKCG1.** The student will demonstrate an understanding of good citizenship: (a) Explain how rules are made and why (b) Explain why rules should be followed
- **NGSS.KLS1.C.** Organization for Matter and Energy Flow in Organisms: All animals need food in order to live and grow. They obtain their food from plants or from other animals. Plants need water and light to live and grow.
- **NGSS.KESS3.A.** Natural Resources: Living things need water, air, and resources from the land, and they live in places that have the things they need. Humans use natural resources for everything they do.

Agenda

Exploring the Garden (30 min)

Homework

None assigned

Teacher Resources & Instructions

Exploring the Garden:

- This week you will want to visit a garden or have class outdoors.

Exploring the Garden

Time

30 minutes

Summary

Use powers of observation to sort things in the garden or outdoor space into living and non-living categories and discern what distinguishes the two.

Materials

- Clipboard
- ***What's Alive in the Garden*** worksheet
- Is it Living or Non-Living? By Rebecca Rissman

Learning Modes

Lesson Plan

1. ***Review*** what you learned about soil, plants, vegetables, and fruit so far.
2. ***Ask*** students to think about rules. Ask students, what are rules? Why do we have rules?
3. Then ***Ask*** students to create their own rules for exploring the garden (or outdoor space). Example rules are
    a. Do not step on any living things
    b. Respect the garden and each other
    c. Handle everything with care
4. ***Activity***
    a. Take the class outside if weather permits. You may want to have students bring with them the ***What's Alive in the Garden*** worksheet. Read aloud a book about living and non-living things, such as Rebecca Rissman's Is it Living or Non-Living?
    b. ***Ask*** students how they decide if something is living or non-living? Supplement students' list to include these criteria, all of which must be met for something to be considered living:
        i. Eats or makes its own food
        ii. Breathes or respires (plants exchange gases through tiny holes in their leaves)
        iii. Moves or has moving parts (inside or out)
        iv. Removes waste from its system (plants release waste gases through tiny holes in their leaves)
        v. Grows and develops
        vi. Sensitive and reactive to surroundings
        vii. Produce young, seeds, or eggs

c. Pass out the ***What's Alive in the Garden*** worksheet copies and tell students whether they should use it as a sorting chart by placing objects on either side, or to draw things that they observe in the garden that are living or non-living.
d. After allowing a few minutes to sort or draw, bring the class together to consider whether several items are living or non-living, asking students to give reasons and challenge each other if they disagree. It will be easier for students to rule out something from the living category (to determine it is non-living) than to definitively identify it as living.

What's Alive in the Garden?

LIVING THINGS	NON-LIVING THINGS

KINDERGARTEN WEEK FIVE

Lesson One: 30 minutes. "I SPY Shapes"

Lesson Two: 30 minutes. "Planting Day"

This session continues the students' exploration in the garden. Students will identify two and three dimensional shapes of different sizes and orientations by planting seeds in differently- shaped containers; going on a 'shape hunt'; and using positional words to direct others to the shapes they find while playing "I Spy in the Garden." Students will also learn that vegetables grown in the garden are part of a healthy diet, as they snack on fall vegetables in geometric shapes.

LESSON ONE: "I Spy Shapes"

Time: 30 minutes

Objectives: Students will demonstrate knowledge of different shapes occurring in the environment.

Agenda

I Spy in the Garden (30 min)

Homework

None assigned

Teacher Resources & Instructions

I Spy in the Garden:

- This week you will want to visit a garden or have class outdoors.
- If possible, have edible fruits our vegetables for students to try. Try to bring in ones that are less common and different in shape like a starfruit, kiwi, rhurbarb, and/or mango.
- You will also be asking students to bring in recyclable containers in different shapes for planting day. You will need to buy seeds to plant for the last session.

I Spy Shapes!

Time

30 minutes

Summary

Students will learn about the shapes that make up a garden (or outdoor space)

Materials

- Paper and pencils
- Pick a Circle, Gather Squares: A Fall Harvest of Shapes by Felicia Sanzari Chernesky
- *Shape Hunt in the Garden*

Learning Modes


Lesson Plan

1. ***Review*** shapes that you have talked about in class.
2. ***Read*** a book about shapes such as Pick a Circle, Gather Squares: A Fall Harvest of Shapes by Felicia Sanzari Chernesky.
3. ***Ask*** students to look around the room and identify what shapes are in the classroom. You may hear rectangle (books, whitebars, erasers, flag), squares (tables), triangles, circles….
    a. Try to find as many shapes you can before taking students outside to play "I Spy."
4. ***Activity***: For the next part you will need to be outside in an area that has plant growth. This could be a garden common space, yard, recreation area.
    a. Ask students to name shapes they know and find objects with those same shapes in the environment.
    b. Pass out copies of the handout titled ***Shape Hunt in the Garden***
    c. Review the words for related two-dimensional and three-dimensional shapes, such as circles vs. cylinders, squares vs. cubes, and triangles vs. (3-sided) pyramids.
    d. Compare two and three dimensional objects side by side, if possible.
    e. Ask students to find these objects in the garden.
        i. Each student will start by saying, I spy a (name of shape) and other students will have to guess. Encourage students to use positional words to describe direction and location of the object. They can also use color to describe each object after all students have tried to guess.
5. ***Introduce*** the different shapes of the fruit that you have brought in to class. Have students examine each one and try a taste if they would like.
6. ***Conclude*** by asking students to bring containers for the next lesson in different shapes and sizes. Examples are milk cartons, soup cans, or juice boxes.

Shape Hunt in the Garden

Name: _____

Find something in the garden that looks like each of these shapes. Draw pictures of the things you find. Write the name of their shapes.

triangle 

square 

circle 

trapezoid 

LESSON TWO: "Planting Day"

Time: 30 minutes

Objectives: Demonstrate how 3 dimensional shapes are used in planting.

Agenda

Planting Day (30 min)

Optional high school student volunteers involvement

Homework

None assigned

Teacher Resources & Instructions

All videos and other online resources included in the lesson can be accessed from www.gcapp.org/PowerMoves/videos

Planting Day:

- This week you will want to visit a garden or have class outdoors.
- Planting tips on starting seeds indoors:

  http://www.gardenbetty.com/2011/03/the-no-brainer-guide-to-starting-seeds-indoors/

  http://www.hort.vt.edu/HORT6004/network/YouthGardener/Helpsheets/seeds.pdf

Planting Day

Time

30 minutes

Summary

Students will examine more 3 dimensional shapes and plant seeds in a container. Allow enough time for planting and clean up.

Materials

- Extra containers for planting
- Soil
- Seeds

Learning Modes

Lesson Plan

Optional: High school volunteers may participate by assisting the teacher with preparing planting containers as well as by helping students plant their seeds.

1. ***Review*** the shapes that they saw in the garden.
2. ***Ask*** about some of the recycled containers brought in for planting, and ask students to identify the shapes.
    a. Examples: soup cans= cylinders, old sports ball with top cut off = spheres, milk cartons with tops cut off and other to-go containers = cubes or rectangular prisms,
    b. Three sided pyramids can be made by surrounding containers with folded card stock or construction paper
    c. Optional: provide card stock or construction paper and glue so students can create different 3-D shapes by surrounding their containers with folded paper
3. ***Activity***:
    a. Let students plant seeds in containers for cool-weather crops such as carrots, radishes, beets, turnips, kale, cabbages, collards, kohlrabi, spinach, leaf lettuces, potatoes, sweet potatoes, Swiss chard, snap peas, or greens.
    b. Note: indoor container-planting is common in winter so plants can have a head-start before the weather and ground are warm enough to planting outside. The purpose of the containers in this lesson is to observe three dimensional shapes. (If seeds are not available, grow veggies from rooting plant parts such as potato eyes, carrot tops, sweet potato slips (sprouts), turnip tops, radish tops, or beet tops. Non-organic vegetables are often treated with chemicals to prevent sprouting, so look for organic

vegetables to use as food scraps that can be rooted.)

c. Poke drainage holes (teacher or adult volunteer only) in bottom of each container before students plant (use a pen, scissors or a nail). Let students fill their containers with soil and plant with 3-4 seeds. Have each student write his/her name and the type of seed planted on one end of a craft stick (or toothpicks with a taped paper 'flag') and place the stick in the soil. Students should lightly water containers and place in sunny spot near a window, on a tray or saucer.

4. *Ask* the class to brainstorm what their seeds will need to survive and stay healthy? (sunlight, water, air, nutrients)
5. When well established (2 - 3 weeks later) let students transplant seedlings into garden soil, mulch, water, and tend.

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