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Fostering Family Engagement at the Morris Arboretum

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An independent study project report by The McLean Contributionship Endowed Education Intern (2015-2106)

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Abstract

This project is a web-based Arboretum app for families with children between the ages of 6 and 8 years old. This piece of digital mobile technology is in support of the Arboretum's interpretive initiative, *Awakening the Senses*. The main purpose of this project is to encourage families to connect with their natural surroundings and one another through sensory engagement. There are five unique experiences that coordinate with the five senses and five different plant parts. Each experience provides a movement cue, interactive activity, scientific lesson, an open-ended question to answer as a family, and a digital reward for completing the section.

The project began by identifying a target audience based on data compiled from the Arboretum Membership and Visitor Education departments. Research began by benchmarking digital interpretation at other museums and arboreta in the Philadelphia area as well as across the country. Select digital experiences from these institutions provided the inspiration for navigation, movement cues, and open-ended questions built into this project. Each of the five experiences referred to the Pennsylvania Department of Education Standards for language and accompanying scientific lesson. A local illustrator, Todd Miyashiro, was selected to create the graphic elements for the digital app. He will be designing illustrated graphics in collaboration with the project author and supervisor. A paper prototype version of the app will be tested among member family groups, and a focus group will be conducted with school teachers of the target age range to assess the comprehension of language used in the project. Finally, the app will be designed and made available via the Arboretum website.

Disciplines

Horticulture | Instructional Media Design

Comments

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INTRODUCTION

Awakening the Senses

Awakening the Senses is an Arboretum initiative that focuses on innovative digital interpretation in the garden. The new content developed through *Awakening the Senses* focuses on user-centered experiences, placing emphasis on visitor motivation and the Arboretum's unique living collection. Research conducted as a part of this initiative shows that 84% of Arboretum visitors carry a smartphone, and 60% are active on social media. These findings support the strategy to expand digital interpretation in the garden.

Goals and Objectives

The main purpose of the project is to encourage families to connect with their natural surroundings and one another through sensory engagement. Many goals support the main purpose of the project. One goal is to promote interaction and spark conversation between adults and the children they bring with them. That goal is accomplished by using open-ended questions and interactive cues throughout the experience. Another goal is to help children understand basic plant science concepts, which are conveyed in five unique educational lessons. A third goal is to guide families towards areas of interest at the Arboretum. Each experience begins with a movement cue, which leads users to an Arboretum feature that best fits the theme of each experience.

User Needs to be Addressed

This project will serve our visiting families by prompting them to engage with plants and garden features in detail instead of passing them from afar. It will advance communication within visitor groups, and facilitate an interactive experience that the group may not otherwise have without a piece of mediating technology (*Simon, 2010*).

Although some people may think that all technology in a garden setting is a barrier to nature, *The Participatory Museum* describes how a piece of technology that may look like a social barrier, when designed correctly, can actually “make us more comfortable socializing with strangers” and “invite visitors to engage with each other in some unusual and valuable ways” (*Simon, p. 97*). Examples of this project are the prompt to hop like bunnies together and share the feeling evoked by a favorite color.

Some Arboretum members do not have a background in plants, and may not know how to communicate on a deeper level with their children about the natural elements they encounter at the Arboretum. This tool will give adults a prompt to engage the children they bring with them in a conversation about nature while they are immersed in the Arboretum's living collection. It will also convey a scientific lesson that coordinates with the sensory engagement, and may otherwise go unnoticed if the family group were touring the garden without a guide or digital tool.

Defining Audience

Since the opening of *Out on a Limb* in FY2010, there has been a rise in family memberships at the Arboretum. As of September 30, 2015, families with children made up 45.7% of total memberships and 51.7% of new Arboretum memberships for FY2016 (see *Figure 1*). This data, together with the visitor smartphone usage data captured by *Awakening the Senses*, supports the opportunity for a digital family app experience at the Arboretum.

Visitor Education data shows that since FY2014, 58% of all school tour groups have been for children in kindergarten through 3rd grade. This percentage is based on individual student numbers, and includes all of pre-kindergarten through 12th grade school tours.

Based on the data gathered from Development and Visitor Education and a natural interest in family group engagement by the project author, this project focuses on families with children between six and eight years old. Since the Arboretum Membership Department data does not show ages of member children, the specific six-through-eight age group is based on the average grade level of school tour visitors.

Using a family as the target visitor group allows for the developed content to be fun and imaginative. The project goal of intergenerational engagement leaves space for adults to engage in activities that may remind them of their childhood and allow them to connect more readily with the younger individuals in their group.

In addition to family visitor groups, this digital tool will be available to school teachers who may choose to bring their class for a self-guided tour of the Arboretum. This project can enrich the experience of a self-guided tour by providing structure, interaction with nature, and dialogue to the group's day in the garden.

CONTENT DEVELOPMENT

Benchmarking

In order to benchmark the digital media of other cultural institutions, research was done into apps and web programs available to the public by these institutions. It was found that not many other arboreta offer family-focused apps for visitors, in person or online. In fact, not many gardens offer experiential apps for visitors; most apps are meant for the purpose of geolocation and navigation around the garden.

One family app that offers inspiration for this project is the San Francisco MOMA *Country Dog Gentlemen Gallery Game*. This app engages families by providing whimsical movement cues between galleries, offers sensory experiences that correspond with the collection being viewed, and poses open-ended discussion questions that promote dialogue among user groups. These aspects are the main inspiration for the structure of the experience of this project.

Another app that inspires this project is Independence Park's *Junior Ranger* app. The navigation includes badge icons at the bottom of the screen that illuminate once each section has been completed and that badge has been earned. The badges also serve as navigation tools to access each experience. *Junior Ranger* offers interactive digital rewards for completing each badge, such as ringing the Liberty Bell and the ability to hear the way the sound changes before and after the famous crack.

Site Visits

In the lobby of the Benjamin Franklin Museum, there is a digital exhibit that depicts Benjamin Franklin's house during the time that he and his family were residents. The experience begins by looking at the different rooms in the house. With a click, users are transported into that room and given a visual list of items that Ben Franklin owned. By clicking on each item, users learn what each object is used for, and see it being placed into that room. The exhibit is easy to navigate with one click at a time, and offers an easy route back to the home screen. It also invites participants into a story of place and time. The sense of place within this digital exhibit is what inspires this project to become a welcoming tool for families to connect with the Arboretum and the nature around them.

The *Science at Play* exhibition at the Chemical Heritage Foundation features chemistry sets from the 1930s to present. The room is painted in decade-appropriate colors, which invites the visitors to experience nostalgia, creates an experience, and transports visitors back in time. This exhibit sets the bar for age and theme-appropriate colors, which will be considered in the Arboretum family digital experience. The colors for this project are playful and whimsical in order to encourage children and their parents to have fun at the Arboretum.

Outside-In, the children's discovery center at the Academy of Natural Sciences, invites children and their parents to investigate live animals in their simulated natural habitats. The room is filled with calming sounds of nature, and includes many nooks and crannies where children can feel like they are exploring independently from others. The whimsical action cues leading up to the exhibit, such as chirp, flap, and leap, inspired the prompt for users to move to their next location.

Length and Scope of Experience

The content for this project was developed based on the overall goal of the project, which is to encourage families to connect with their natural surroundings and one another through sensory engagement. Research was done into the themes, subjects, and colors that the six through eight age range gravitates towards. Popular apps, TV shows, and books were studied in order to pull common design themes into the project. The language and accompanying scientific lesson of each experience consider the Pennsylvania Department of Education Standards for kindergarten through third grade levels. In an attempt to also engage the adults in user groups, these childish themes, colors, and language were used as inspiration, but were not exclusive to the development of the project content.

To promote sensory engagement, five unique experiences are offered based on five plant parts. Each sensory experience highlights a unique plant part that the users interact with in order to engage with nature. The movement cues, which prompt user groups to locate a specific Arboretum feature, are meant to promote fun group interaction while tying in with the subsequent sensory experience. The length of each experience is deliberately kept brief in order to engage the user without overwhelming them with too much information.

Special attention is paid to the balance of scientific content and play, because "...while the objects and facts [exhibitions] embody remain important, it is the ideas and emotions raised by them and by the visitors that currently take precedence in the creation of contemporary exhibition." (*McKenna-Cress & Kamien, p.70*) The experience encourages creativity and play, and the main focus of the project is human engagement and interaction with nature. The scientific lesson in each section is meant to support the sensory experience and round out the play with a learning opportunity.

Interdepartmental Collaboration

"Three survival instincts museums must possess that are best fueled by collaborative models in the development and design process [are] varied points of view, interdisciplinary engagement, [and] innovation." (*McKenna-Cress & Kamien, p.6*) Collaboration with multiple Arboretum departments was relied on in order for the project to be engaging and innovative. A meeting was held with the heads of Botany and Horticulture at the Arboretum to discuss the scientific accuracy and depth of the project. Much progress was made with the development of scientific content because of that meeting.

The project was also presented at two committee meetings, Education & Visitor Experience and Marketing. The Marketing Committee had suggestions for promotion and advertisement. A link to this app, as well as other *Awakening the Senses* experiences, will be included on the Arboretum's website.

USER EXPERIENCE

User Testing/Focus Group

User testing will be conducted with member families to see how they interact with the digital navigation and how they engage with the content. "Visitors are our most important collaborators, and their opinions, needs, and input must be considered in the creation of the experience." (*McKenna-Cress & Kamien, p.5*) They will be presented with a paper prototype of the experience, and asked to navigate between screens. Their feedback will be recorded in a separate document.

A focus group of teachers, grades K-3, will be assembled. The teachers will evaluate the scientific lessons and language used in each experience to ensure that the lessons and language will relate to students of this level.

Navigation

Navigation for this project is meant to be linear and uncomplicated. The home screen consists of a large tree with five icons that resemble plant parts. By clicking on one of these five icons, the user will be led to that particular experience. Once the prompt has begun, the user clicks “Next” until the reward activity is reached. A simple digital interactive prompt begins, and by clicking “done” the user is led back to the home screen. At any time during the experience, the user can click on the “Home” button and be led back to the home screen. The home screen will have a “Start Over” button in the top right-hand corner, which will clear all progress if a user group wants to restart the experience. The same five icons are mirrored in a bottom navigation screen. Each icon will illuminate after the experience is completed. Any icon can be pressed at any point, and the user will be led to the coordinating section.

Collaboration with Illustrator

Local children’s illustrators were researched online, and over fifty individuals were considered to collaborate on this project. The selection was narrowed down based on the common look and themes currently found to be popular among six to eight year olds. Five illustrators were considered in a focus group of the target age range, and the results were inconclusive; the aesthetic tastes and preferences varied from child to child. RFPs were sent to four local illustrators. The artist whose proposal was chosen, Todd Miyashiro, has a whimsical, soft illustration style with natural elements (*see Appendix E*). His proposal showed that he is willing to collaborate and accept feedback during the development process.

The illustrator attended a preliminary meeting with the project author and supervisor to better understand the essence of the project. Since the meeting, Todd has finished all storyboard sketches, and will proceed with pencil sketches. Once the final illustrations are completed, the web manager will compile all of the images into the app, which will be made available online. The illustration process has been very collaborative between Todd, project manager, project author, and Arboretum web manager.

DISCUSSION

The effectiveness of this project can be measured by the number of clicks on the new link found on the Arboretum website. It would be a success if users access the website at home and in other gardens in addition to on Arboretum grounds.

Images created for this app may be applied to other Arboretum projects, including gift shop merchandise. Success could also be measured by how recognizable the characters from this experience become, based on what merchandise is sold.

This project will advance the Arboretum family experience by prompting user groups to engage with plants and garden features in detail instead of passing them from afar. It will advance communication within visitor groups, and facilitate an interactive experience that the group may not otherwise get without a prompt.

REFERENCES

McKenna-Cress, P., & Kamien, J.A. (2013). *Creating exhibitions*. Hoboken, NJ: John Wiley & Sons, Inc.

Simon, N. (2010). *The participatory museum*. Santa Cruz, CA: Museum 2.0

TABLES AND FIGURES

Figure 1: Rise in Family Memberships at the Arboretum, FY 2014-2016

	FY2014	FY2015	FY2016 (as of 9/30/2015)
Total Memberships	6,728	6,633	6,628
Total Memberships with Kids	49.6%	46.3%	45.7%
Total New Memberships	1,904	1,646	323
Total Number of New Memberships with Kids	49.4%	45%	51.7%

APPENDICES

Appendix A: Project Goals and Objectives

Main Message: The main purpose of this project is to encourage families to connect with their natural surroundings and one another through sensory engagement.

Major Goals: One major goal of the program is to promote interaction and spark conversation between adults and the children they bring with them. Another goal is to help children understand basic plant science concepts. Another is to guide families towards areas of interest in the Arboretum.

Scope of Content: The experience will be a guided prompt of questions for adults and children about features they encounter at the Arboretum. It will focus on the exploration of different parts of a tree, with an emphasis on the senses.

What Program Objectives will be Advanced: The digital tool will support the Awakening the Senses initiative within the garden by providing an interactive tool that will prompt families to use their 5 senses to connect with nature.

What User Needs will be Addressed: Some Arboretum members do not have a background in plants, and may not know how to communicate on a deeper level with their children about the trees they encounter at the Arboretum. This tool will give parents a prompt to engage their children in a conversation about nature.

How will it Stimulate Knowledge Development Among Users: This tool will ask open-ended questions to promote critical thinking among families. It will also provide a simple scientific lesson about plants.

What Influence will its Use Have: This tool will advance the average family's experience at the Arboretum by prompting them to engage with plants and garden features in detail instead of passing them from afar. It will advance communication within visitor groups, and facilitate an interactive experience that the group may not otherwise get without a prompt.

How Does it Fit with Other Project Work: This project will fit in with Awakening the Senses by incorporating a digital component and using sensory experiences to guide families around the Arboretum.

How Will We Evaluate its Influence: We will evaluate its influence by testing the prototype with member families and seeing how they respond.

What are Measurable Activities to Assess the Effectiveness of the Tool: The measurable activities that will determine effectiveness are the prototype testing, where we will give family visitors a chance to interact with (a mockup of) the tool and provide feedback.

Appendix B: Storyboard Content

Welcome to the Morris Arboretum! Get ready to see, smell, and even hear trees in a way you have never experienced before. Help keep your group and our plants safe during your visit. Please stick together and don't scurry through plant beds.

Button: Let's go!

Experience begins with an image of a tree, with 5 points highlighted: flower, leaf, acorn, bark, and roots. As the user clicks on 1 of the 5 points, the screen zooms into a close-up of that element, with a prompt written over the picture. The prompt provides a movement cue toward an example of that element, provides information about that aspect of tress which relates both to plants and animals, and then poses a question to prompt family interactions around these topics. Finally, an interactive "reward" will be displayed.

Log Cabin

Click image of LEAF (hear):

(2) Bounce like a bunny to the Log Cabin. *Button:* Found it!

(3) Cup your hands around your ears to help you hear like a bunny. Take a deep breath and listen to the sounds around you. Share three things that you hear with your group. *Button:* Next

(4) Do you hear leaves rustling? Some trees, called deciduous trees, drop their leaves in the fall. This protects them from freezing weather. Deciduous trees grow new leaves each spring once the danger of frost has passed. *Button:* Next

(5) Other trees have adapted to survive freezing weather. Called evergreen trees, they keep their needle-like leaves year-round. *Button:* Next

(6) What season of the year is it today? What is your favorite thing to hear outside during this time of year? *Button:* Next

(7-10) Tip the phone back and forth to make the leaves fall off the deciduous tree. Congratulations! You have just helped a deciduous tree shed its leaves, protecting it for the winter! *Button:* Done

Rose Garden

Click image of FLOWER (sight):

(2) Buzz like a bee to a flower. You'll find many in the Rose Garden. *Button:* Found it!

(3) What color is the flower you found? Does it have a scent? Bees and other insects are attracted to bright colors and smells, which lead them to flowers. *Button:* Next

(4) Flowers are brightly colored and scented to direct insects to their source of *nectar*, a sugary liquid that insects love to eat. When the insect flies in for nectar, it gets covered in the plant's powdery pollen. The insect carries the pollen to other flowers. Plants rely on this pollen exchange to make seeds, which will grow into new plants. *Button: Next*

(5) Take turns sharing as a group: What color is your favorite flower? How does that color make you feel? *Button: Next*

(6-7) Help this flower attract insect pollinators by coloring it in.

After finished coloring: Congratulations! This flower is now ready to feed hungry insects, who will in turn help pollinate other plants. Post your coloring page to Facebook or Instagram and tag @morrisarboretum *Button: Done*

Oak Allée

Click image of ACORN (taste):

(2) Scamper like a squirrel to a nearby oak tree. You'll find many at the Oak Allée. *Button: Found it!*

(3) Do you see any acorns on the ground beneath the tree? If so, pick one up and examine it. An acorn is the fruit of an oak tree. *Button: Next*

(4) Inside of the acorn's shell are a seed and food to help the seed grow into a plant. *Graphic: labelled cross section of an acorn. Button: Next*

(5) The food meant to feed the baby plant is also a tasty meal for squirrels. What healthy snacks do you eat at home? What plant does your favorite snack come from? *Button: Next*

(6-10) Plant the acorn to watch it grow into an oak tree. Congratulations! You planted a tree that will provide food and shelter for squirrels and other wildlife. *Button: Done*

Bark Park

Click image of BARK (touch):

(2) Flap like a woodpecker to Bark Park (a group of trees across the path from the Log Cabin). *Button: Found it!*

(3) Gently touch the bark of a tree. How does it feel? How are the textures and colors different from those of other nearby trees? *Button: Next*

(4) We tend to think of trees growing to the sky, but did you know that trees also grow outward? This outward growth forms tree rings. It also causes bark to stretch and break apart, creating texture. Button: Next

(5) Bark protects trees from outside elements such as wind, rain, pests, and diseases. What do humans have that protects us like bark protects trees? Button: Next

(6-7) Trees provide a habitat for insects. Tap the insects when they appear to help the woodpecker find food. Congratulations! You have helped a woodpecker feed its family. Button: Done

Fernery

Click image of ROOTS (smell):

(2) Squirm like a worm into the fernery. Button: Found it!

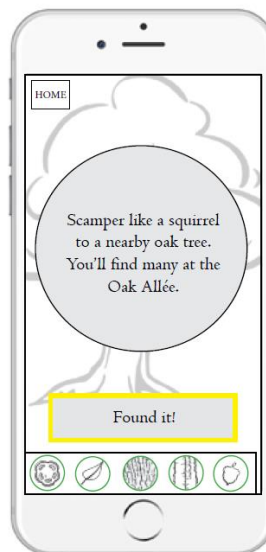
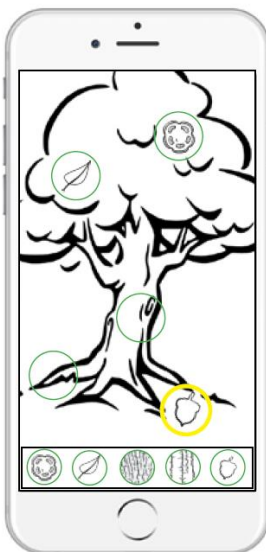
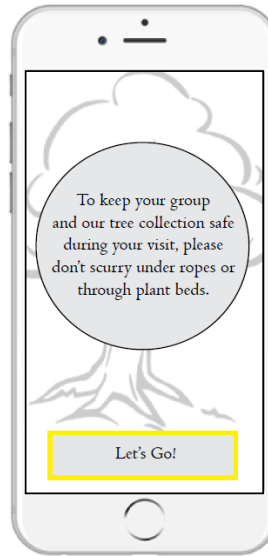
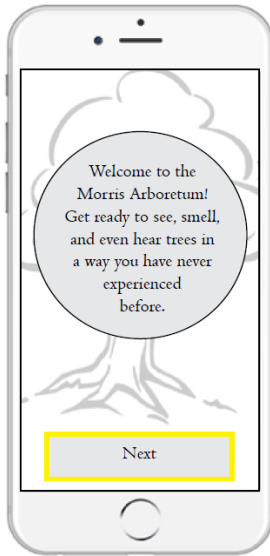
(3) Look up and around you to find roots. Point out those you see to the rest of your group. Button: Next

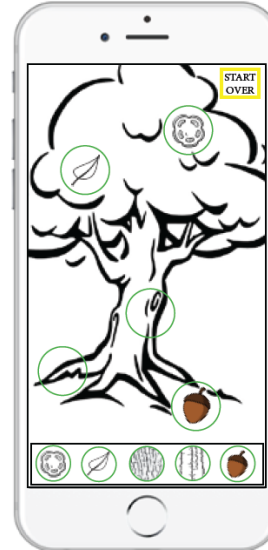
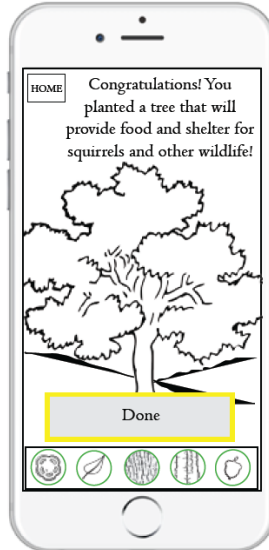
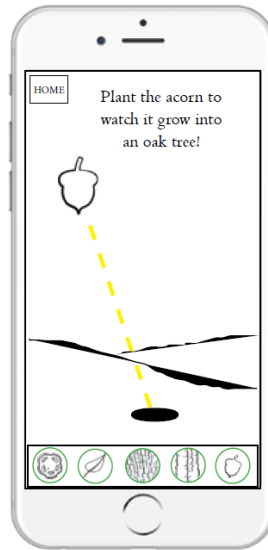
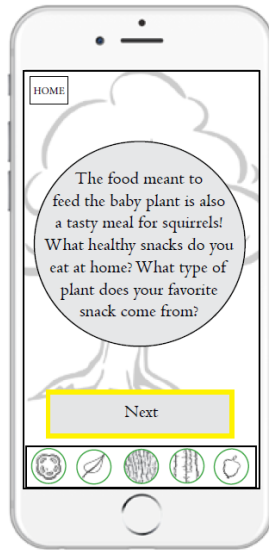
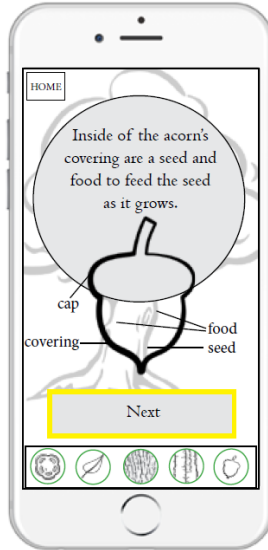
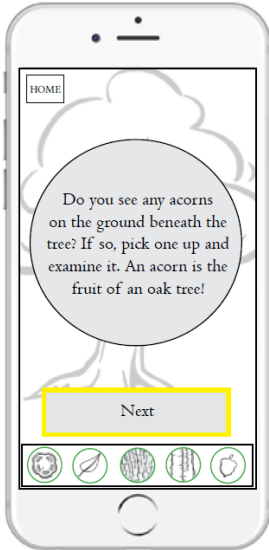
(4) Roots deliver water, nutrients, and minerals to the plant. They grow outward so they can reach deep in the soil to support the plant. Roots also anchor plants down so they don't blow away. Button: Next

(5) Take a deep breath. What does it smell like in the fernery? Does it smell like your front yard or your local park? This earthy smell is caused by good bacteria that lives in the soil and eats dead plant material. Share your favorite and least favorite smells with your group. Button: Next

(6-7) Slide the bar to see what roots look like below ground. Wow! You have just seen how tree roots spread at least as far as its canopy, its full spread of branches and leaves! Button: Done

Appendix C: Prototype





Appendix D: Project Tie-In to PA Learning Standards

Sense/ Plant Part	Learning Goal Re: Plants	Tie-in Humans/ Animals	Educational standards supported	Movement	Location	Activity
Hear/ leaf	Some trees' leaves fall off in the autumn (deciduous), while others hold their leaves year-round (evergreen).	What sounds do you hear in each season?	1st: Describe [evolutionary/adaptive] changes that occur as a result of habitat // 2nd: Identify differences in living things (color, shape, size, etc.) and describe how adaptations are important for survival	Bounce like a bunny	Log Cabin	Shake device to see leaves fall off of an autumn tree.
Sight/ flower	Flowers attract insects with special means humans can't see, which enables pollination	Flowers attract us, too!	K: Observe and describe structures and behaviors of a variety of common animals // 1st: Identify and describe plant parts and their function // 2nd: Describe how a plant or an animal is dependent on living and nonliving things in an aquatic habitat // 3rd: Demonstrate the ability to define objects, express emotions, illustrate an action or relate an experience through creation of works in the arts. // 3rd: Recognize, know, use and demonstrate a variety of appropriate arts elements and principles to produce, review and revise original works in the arts	Flutter like a butterfly	Rose Garden	Take a photo, which turns into a coloring page. Color in your own photo. Post to social media.
Taste/ acorn	Acorns are fruits, which grow into new trees	fruits and seeds are nutritious for animals as well as humans	K: Observe, compare, and describe stages of life cycles for plants and/or animals // 1st: Grow plants from seed and describe how they grow and change. Compare to adult plants.	Scamper like a squirrel	Oak Alee	Plant an acorn, watch it grow into an oak tree
Touch/ bark	Trees grow up and out. Bark protects trees from sun, wind, predators. Also provides habitat for insects.	Humans also have a protective layer (skin)	1st: Categorize living and nonliving things by external characteristics. // 1st: Identify and describe plant parts and their function. // 3rd: Recognize, know, use and demonstrate a variety of appropriate arts elements and principles to produce, review and revise original works in the arts	Flap like a woodpecker	Bark Park (between Step Fountain and Swan Pond)	Help the woodpecker find food! Tap the insects when they appear. (whack-a-mole style)
Smell/ roots	The function of roots	Smells trigger memories.	2nd: Explain how different parts of a plant work together to make the organism function // 2nd: Explain that living things can only survive if their needs are being met // 1st: Describe the role of soil in agricultural systems	Squirm like a worm	Fernery	Slider to show spread of roots beneath the ground

Appendix E: Examples of Illustrator's Work

