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Fostering Science in a Preschool Setting

Patricia Ramirez
California State University, Monterey Bay

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A Capstone Project for the Bachelor of Arts in Human Development and Family Studies

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Introduction

Preschool students benefit from science education, because it nurtures their natural curiosity to explore the world around them and strengthens their language, cognitive skills, and vocabulary. However, there is a lack of science education in typical preschool curriculum. As a result, researchers have found that children who are not exposed to science early may struggle later in Kindergarten with science in comparison to other subjects like math and language. For that reason, I have created a three-day science curriculum for preschool children at MPC ECE Lab School in Monterey, California.

Needs Statement

Exposing preschool age children to science, is giving them the tools, they need to have a better understanding of their community and the world around them. At preschool age, children already have a natural instinct to observe, explore and question their surroundings (Eshach et al., 2005). Children at this age have a natural curiosity to want to know the functions of the world around them. The best way to nurture that curiosity is through science. With science, children can make inquiries and create conjectures of those inquiries to make final determinations of findings being conclusive or inclusive. Science can also be a hands-on experience, children can further their knowledge through exploration, observation, and documentation of their findings. Science can expand children's vocabulary, their sense of communication, and other areas of development that gets them ready for kindergarten. (Greenfield et al., 2009)

Studies have found that preschool children that are not exposed enough to science-based curriculum is because it can be intimidating for teachers to introduce the subject. Children who

attend preschool but do not have the opportunity to learn and grow their science skills have a hard time going to pre-kindergarten. (Greenfield et al., 2009) Respectively of these findings, researchers felt that preschool is a great starting point to develop science skills in children. The researchers also found that children benefit in science readiness in preschool because science can contribute to other learning domains like language development. Based on Greenfield et al. (2009) science is a subject that can foster other domains because within science there are other combinations of domains that children are using while learning about science like early language and literacy, math, and creative thinking.

Although not intended for preschool age children, researchers found that with the appropriate adjustments, Next Generation Science Standards (NGSS) can be used in the preschool classroom. NGSS is a tool that K-12 grade teachers use to create science-based class activities. Presser et al. (2017), advised that children in a preschool setting can conduct investigations, make observations, and do comparisons to have a better understanding of their environment. They also stated that children can collect and analyze data and create arguments or predictions based on their findings. These are all skills that develop their science skills and give children a connection and understanding to the world around them. However, despite the potential use of these standards, most children are not engaging in science activities. Research supports that young children can do science activities at their level.

Plant exploration is a positive introduction to science for preschoolers and also brings an awareness of caring for the environment. Based on Ryan-Krause (2018), doing activities like gardening can foster symbolic thought, which is when the child uses past experiences as their representation to present. With symbolic thought, children can expand their language through hands-on experience. This could be like making observations of a plant seedling, and creating a

conjecture of the shape, size of the plant once it grows based on their past experience with plants. At this stage, children are also egocentric, meaning that they are not fully aware that their thoughts and needs are different from people around them. (Ryan-Krause, 2018)) With gardening, children start to think more flexibly because they are sharing thoughts with each other and they are sharing the experience and work. As a result, their egocentrism is less, because gardening is an opportunity to explore, share their thoughts, and work together to expand their knowledge of the environment around them.

Trundle and Kantor (2010) found that a preschool classroom can be enriched with science through a Reggio Emilia approach in the classroom. A Reggio Emilia approach can include science in three domains of science exploration in the classroom. The first domain of science exploration was the placement of science around the classroom, meaning that science can be explored in different areas in the classroom. This arrangement could be something like having child-appropriate science books in the reading area. To have a pet in the classroom where children can interact with the pet and feed the pet. Spaces like this motivate their curiosity and reinforce their skills to science exploration. (Trundle and Kantor, 2010) The second is catalysts for science, where science is introduced through the child's interest or the teacher-directed science exploration. Science through the child's interest could be something like a child showing interest in planets so the teachers provide books about planets and the child plays what it would be like to be in space. Teacher- directed science exploration is when the teacher creates a science activity to further their knowledge of the world. Finally, the third domain is through the different ways' science can be learned. Science can be explored indoor or outdoor, it is having an environment where there are different ways to engage in science. In this third domain, Trundle and Kantor (2010) stated that there are four categories where children can engage in science:

hands on exploration, searching sources, using science process skills, and using representing ideas in multiple ways. These are the four categories that the article stated as the different ways children can engage in science.

Science introduction in a preschool setting, is about nurturing their natural curiosity of learning, while also getting them ready later in school. For that reason, it is important to incorporate science in early childhood education. Given the lack of science education in preschool curriculum, I have created a three-day science curriculum for preschool children at MPC ECE Lab School in Monterey, California.

Theory/ Development

Piaget, in his theory of cognitive development, asserted that children between two to seven years old are in the preoperational stage of cognitive development. The preoperational stage is the stage where children are developing their language and start to use symbolic thinking and symbolic play to understand the word around them. In this stage, children look at the world through an egocentric view, meaning they can only see it through their perspective. (Novak, 1977). Based on this theory, children learn through symbolic interaction. For that reason, I will use books as representations to introduce new vocabulary and connect it through visual images that represent the word. With the books and images, children will have the opportunity to expand their language development and connect with an image that portrays that word.

The second element of Piaget's concept development will be to build the children's schema. The schema is part of the preoperational stage development in children. Schema is "the structure common to all those acts which-from the subject's point of view-are equivalent."

(Furth, 1969, p. 29) I will support their schema development, through large group reading and image modeling activity. The focus on this element is to expand their existing knowledge of plants through the large group reading interaction and small group activities.

Consideration of Diversity

For my project, I will conduct in the MPC ECE Lab School, this center operates under the licenses of the Department of Social Services. The center is a public service where a diverse range of income families are welcome to be part of this center. This center is connected with the State of California's Subsidized Program, which is a program that aids qualified families to financially assist them with the center's fee. There are also sliding scale fees that families can qualify based on their income and family size. The program also provides a private enrollment, where families can pay $45 a day for school attendance at the center. While in the center, children are provided with breakfast, lunch, and snacks. The fee of the food is included with the total fee of the child's enrollment. Because of family privacy, data is not provided of the family's income in the center. To the center, there is no discrimination based on the family's income, racial/ ethnic background, or English language proficiency.

For my three-day activities, I will be interacting with children in the garden room classroom. This classroom has a total of 26 children, with an ethnic diversity of 11.54% being Asian, 11.54% being Black or African American, 26.92% being Caucasian (Non-Hispanic) and 50.00% being Hispanic or Latino. As for diversity in language, out of the 26 children, 44% are counted as English being their native language. There are 48% of children that are counted as Spanish being their native language, followed by a 4% count as Arabic as being their native

language, 4% count as Russian as a native language, and one child not counted because it was not reported by the caregiver. (MPC ECE Lab School, personal communication, March 11, 2020) The children in the classroom all can comprehend and speak English, so in that aspect there is no need for adjustment for my project.

Based on the books that I will share and read with the children, and activities that I do with them. I believe that my project is inclusive based on the participant that I will interact with. I tried my best to select books and activities that are age appropriate and that are connected with each other. If modifications had to be implemented for the participants to be part of the reading and activities, it would be the language. I understand that not all participants are proficient in the English language. So, if needed, it can be modified to include children that may not be English proficient. My native language is Spanish, so I can translate the reading and activities to Spanish if needed, but I would need assistance if it is another language other than English or Spanish.

Learning Outcomes

For my project, I provided a three-day whole class discussion followed by small group activity to preschool age children in MPC ECE Lab school. The ages of the children ranged from 4-5 years of age.

The goal of these three-day discussion and activities is, for children to be able to:

1. identify two components of the plant life cycle.
2. indicate at least three parts of a plant.
3. identify two foods that grow from plants.

Method

Day 1

For the first day of my meeting in the center. I will introduce myself and let the children know that for the following three days I will come to class and interact with them in large group reading story time and small group activity where they will explore the topic of plants. Then, I will introduce the book for the day. For the first day, I will read the children's book *Seeds go, seeds grow* (Weakland, 2011). This is a children's book that introduces seeds and then breaks down the life cycle of a seed which grows into a plant. The children and I will engage with the book by pausing and giving them time to look at the illustrations in the book and by asking them questions throughout the reading. This could take approximately 10-15 minutes.

After the reading, I will illustrate and model the words that describe the life cycle of a plant. I will use a plastic model of a plant cycle as a visual representation of the words that I would be introducing. See Appendix A for an image of a plant life cycle model. The visual models will be used to represent the vocabulary I read in the book. With the model, I will be able to visually describe the life cycle of the plant and use the vocabulary. This interaction will take about 10 minutes. After introducing the vocabulary to the children with the visual model, I will use 5 children from the large group in a small group activity to see if they can model back the visual pictures with the vocabulary that I introduced to them. In the small group, I will give each child four images that represent each step of the life cycle of plants. I will model one more time the life cycle of the plants and the vocabulary with the children. Then, the children will have an opportunity to use the four images to model the life cycle of the plants in a horizontal linear sequence. See Appendix B for the images the children will use. Once the children have

had the chance to place the images in a horizontal linear sequence, I will ask them to describe to me the order they have placed the images. I will encourage the children to use the vocabulary that pertains to the image. I will document the children's image sequence through picture and verbal documentation. At the end of the small group children will be able to keep the images so they can take home.

Day 2

For the second day, in a large group I will greet the children and introduce the book that we will interact with for that day. The name of the book that I will use for this day will be *I'm a Seed* (Marzollo, 1996). This book tells the story of two seeds growing and describing their experience as they grow in first person. While reading the story, I will pause and ask children questions of the illustration. During the reading the children will have a chance to connect back the vocabulary that they acquired the day before while also having the chance to gain new vocabulary words. The extent of the book interaction will take approximately 10-15 minutes with the children.

Once the reading is over, I will use visual pictures to model the vocabulary for the parts of a plant. I will use an image of a flower as a visual interpretation of the new vocabulary. See Appendix C for an image of the parts of the plant. The flower images will be in for individual images of each part of the plant and its corresponding vocab word. I will introduce the vocabulary by modeling the words with each picture. On an easel, I will place each image of each flower plant on a vertical linear sequence. After modeling the visual interpretation of the new vocabulary, I will pick 5 children from the large group to be part of a small group activity which will be used to assess the second learning outcome.

In the small group, children will be provided with four visual representations of the new vocabulary we have engaged with in large groups. The images will be the same visual images I used during large group time. The children will be instructed to place the images in a vertical linear sequence based on the parts of the flower. Once the children have placed the images on the order, they saw fit, I will ask the children to describe to me the order they used by using the vocabulary of each part of the flower. I will document their order by writing their verbal description of the parts and also by taking pictures of the order they placed the image.

Day 3

For the final day of interacting with the children, I will greet and thank the children for their participation for the past three days and inform them that this will be my final day coming to their classroom and interacting with them in a large group and small group setting. From there I will introduce the book, *Growing Vegetable Soup* (Ehlert, 1987). In this book, it is a short story of step by step description of planting seeds to grow vegetables in a garden and then making soup from the vegetables that are grown in the garden. In this book, children will be able to connect gardening with bringing food to their table. During the time of reading the story, I will pause and ask children questions about the story. This story reading will take approximately 10 to 15 minutes.

For this last day, there will be no small group activity. Instead, I will end asking children what foods they know grow from plants? This will be the way I will assess their knowledge of plants and the foods that grow from plants which connect back from the first, second, and third day of reading in large groups. On a large paper, I will write down all of the food that children share with me. I will end my interaction with the children by selecting a group of 5 to 6 kids to come with me and together make a fruit salad. In this small group, children will have a chance to

cut the fruits and share the salad with peers after cutting them. Children will also have a chance to see the fruits have seeds which can be used to plant and group new fruits.

Results

For learning outcome one, the children would be able to identify two components of the plant cycle. For this learning outcome, I would say that it was partially met. During the time I was introducing the vocabulary and we practiced it together as a group, the children were able to name the components of the plant cycle. However, when it came to small group time, the interest of the children had shifted to going outside to play instead of doing the activity in small group. In the small group, the children and I as a group we reviewed the components of the plant cycle. However, once I passed down the images of the plant cycle for them to do the activity. One child asked if she could go outside and play instead, from there all the other children also asked if they could leave the group as well. I feel that the reason this was partially met, is because the children as a group did use the vocabulary to name the components of the plant cycle. But as an individual activity they did not, because their interest had shifted to leaving the group to play. Also, it was their first time meeting me. During large group meeting and small group meeting, the children's interests were more in sharing stories about them and building relationship with me than listening to the story and doing the activity. They did show some interest, but their main focus at first was building a relationship with me since it was my first time in their class.

For the second learning outcome, the children would be able to indicate at least three parts of a plant. This learning outcome was met. As a whole class group meeting, I read *I'm a Seed* (Marzollo, 1996). During that time, the children engaged in the book by asking questions

and describing the image they saw in the book. After reading the book, I introduced the parts of a flower with a visual model that had the word and picture the parts of the flower. As a group, we practiced putting the parts of the flower in order while also using the corresponding vocabulary. After interacting as a whole class, I picked five children to be part of a small group activity. In the small group activity, the children used the vocabulary words that we model in large group with a puzzle of the parts of the flower. Four out of the five children in the group were able to put the parts of the flower in sequential order and were able to use the vocabulary terms for each body part. See Table 1 for the children's results.

For the final learning outcome, the goal was that children were able to identify two foods that grow from plants. For this final day, after reading the story, *Growing Vegetable Soup* (Ehlert, 1987). I asked the children to name foods they know that grow from plants. Each child in the group had a chance to name as many foods they could identify. In total, the children were able to name 13 foods that grow from plants, and 6 foods that did not grow from plants. Out of the 13 foods the children identified, strawberries were identified the most with a count of 7 followed by apples with the count of 6. The children named 6 foods that do not apply to the question, but they are foods that children connected to the topic with the exception of one which is the marshmallow. 2 children mention stone soup, the teacher explained that the children read a story called *Stone Soup* (Brown, 1947) which a town and traveling soldiers using vegetables and stones to make soup. For this learning outcome, the children met the goal of identifying foods that grow from plants. See Table 2 for the count of foods that grow from plants.

Discussion

For this project, I conclude that it was a success. The purpose of this project was to foster science in a preschool classroom and see if children can meet the expectation of each activity.

With the exception of day one activity, the children were engaged in the reading that I read with them and participated when I was modeling and introducing new vocabulary about the plant cycle or the parts of the plant. The teacher of that class did share with me that some of her students were drawing flowers in their journal for journal group time, and they used the term they learned for each part of the flower.

I believe that my activity did reflect Piaget's Preoperational Thought stage. The children did expand their vocabulary through the reading and activities I shared with them. While I interacted with them, the children used the vocabulary that I introduced them and connected it with their life. The children understood that the models I provided were symbol representations of real plants. Because of the reading and activities that I introduced with the children; their knowledge of plants expanded.

The thing that I would have done to make the activity more inclusive could be to incorporate the Spanish language in the curriculum. Based on the demographic data, 48% of the children in the garden room are native Spanish speakers. By incorporating the Spanish language, I could have expanded the vocabulary of Spanish bilingual children in the classroom and introduced new foreign vocabulary to monolingual English-speaking children.

If I could do this three-day activity again. The only thing that I would change would be to introduce myself a day before actually starting the tree day activities. I strongly believe that the outcome for day number one would be different if the children had met me before. Other than that, I believe this project was a success.

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Table 1

Parts of a flower placed in sequential order with the correct vocabulary

Participants	**Number Correct**
Participant 1	4 out of 4
Participant 2	4 out of 4
Participant 3	3 out of 4
Participant 4	4 out of 4
Participant 5	4 out of 4

Table 2

Responses to identifying foods that grow from plants.

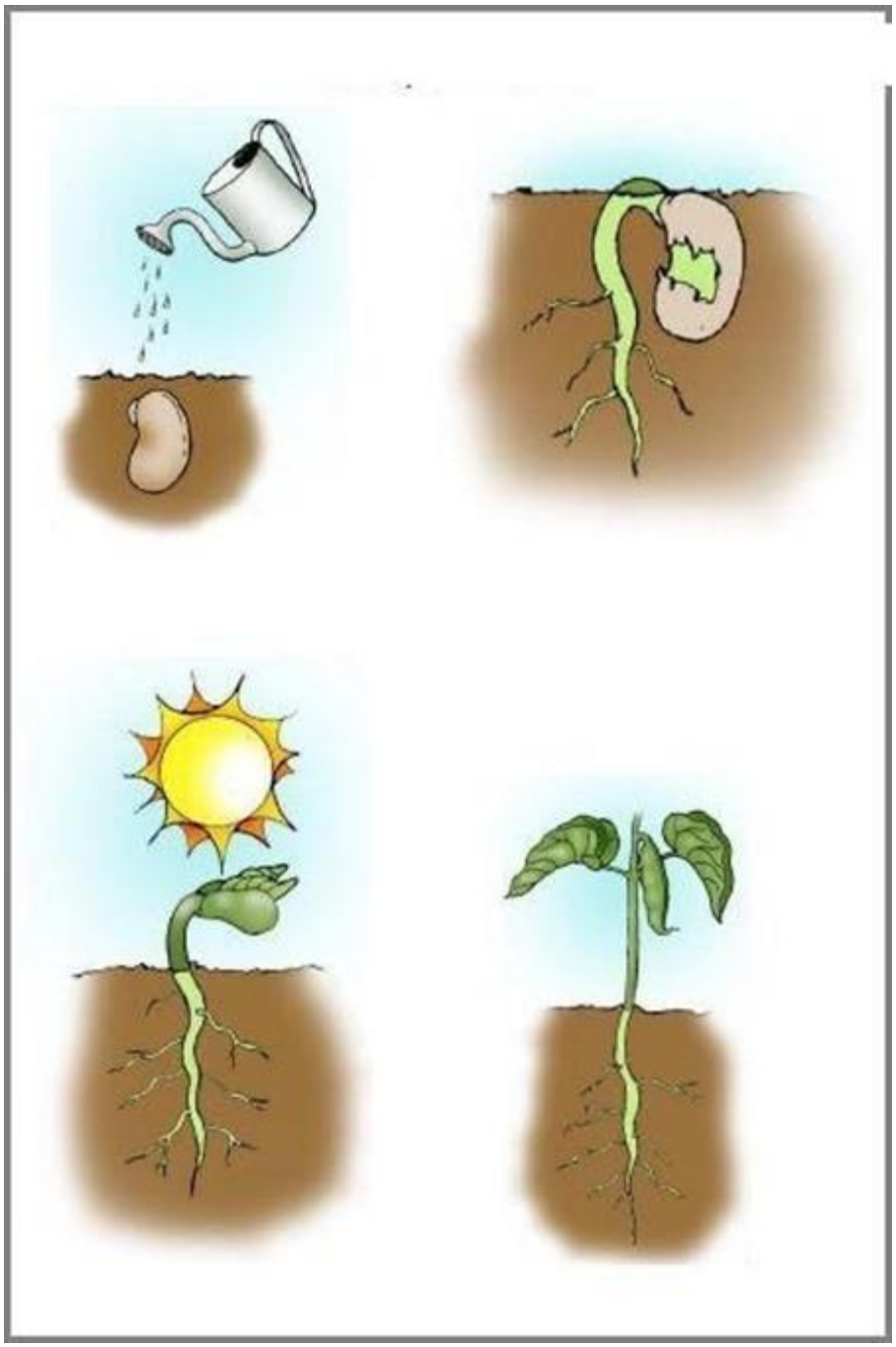
Answers of participants	**Count**
Apples	6
Carrots	3
Corn	4
Banana	3
Strawberries	7
Pears	1
Broccoli	3
Blueberries	3
Cauliflower	1
Tomatoes	1
Lettuce	1
Raspberries	1
Olives	1
Chicken noodle soup	1
Stone soup	2
Marshmallows	1
Strawberry soup	1
Salad	1
Apple tree	1

Appendix A:

Activity 1: Visual model for plant cycle.

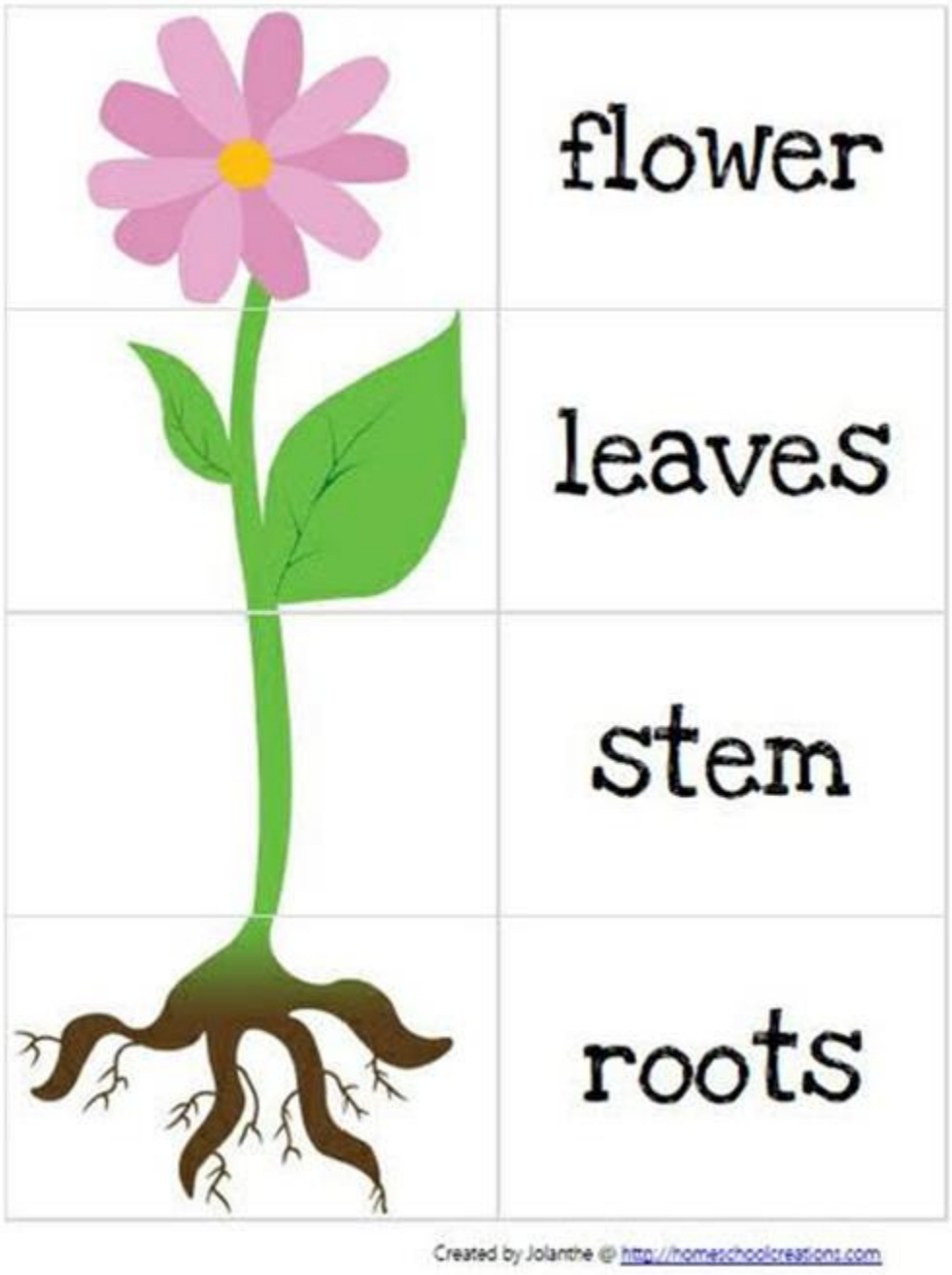
Appendix B:

Activity 1: Image model for plant cycle.



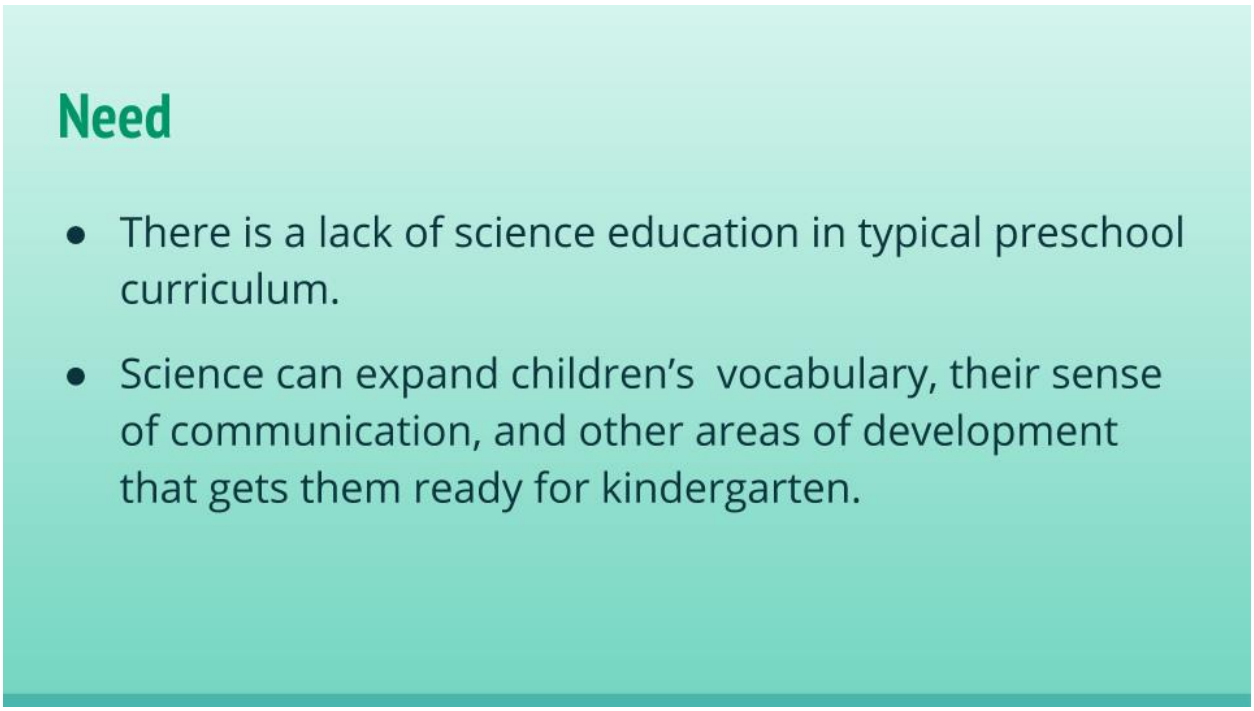
Appendix C:

Activity 2: Image model for parts of a plant.



Appendix D:

Capstone presentation slide show.



Jean Piaget's Theory of Cognitive Development

- Preoperational Stage

  Ages between 2-5 years old. Children start to think symbolically and their language development expands.

- Schema

  The structure common to all those acts which- from the subject's point of view are equivalent. (Furth, 1969, p. 29)

The Project

- MPC Early Childhood Lab School in Monterey, California.
- Garden Room Classroom: 26 students between the ages of 4-5 years old.
- 3 day curriculum fostering knowledge of plant life.

Learning Outcomes

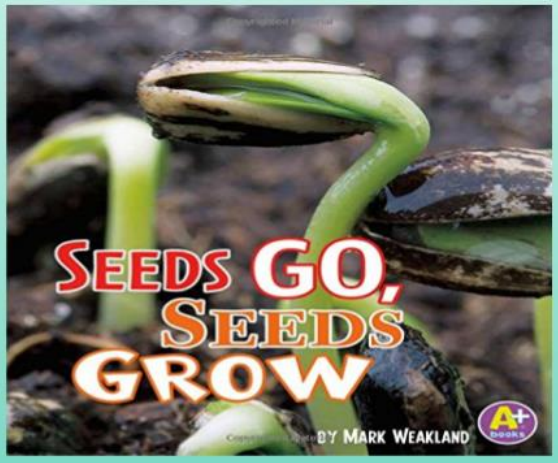
The goals were that children will be able to:

1. Identify two components of the plant life cycle.
2. Indicate at least three parts of a plant.
3. Identify two foods that grow from plants.

Day 1 Activity and Results

Day 1 Activity

- LO 1: Identify two components of the plant life cycle.
- Book: *Seeds go, seeds grow* (Weakland, 2011).
- Activity: Model the life cycle of the plants with pictures.



Day 1 Results

Learning outcome 1:Partially met.

Day 1 Results

Modeling the plant cycle with the children.

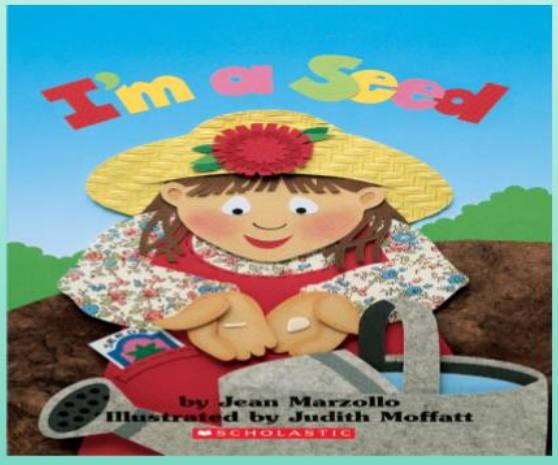
Day 1 Results

Children try to model back the the plant cycle.

Day 2 Activity and Results

Day 2 Activity

- LO 2:Indicate at least three parts of a plant.
- Book: *I'm a Seed* (Marzollo, 1996).
- Activity: Model the parts of a plant with pictures.



Day 2 Results

Learning outcome 2: Met.

Day 2 results

This child was able to model back the parts of the cycle correctly.

Day 2 Results

This child was partly able to model back the parts of the plant.

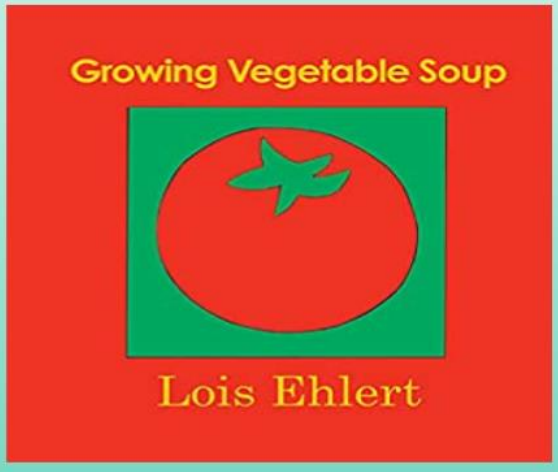
Day 2 Results

Participants	Number Correct
Participant 1	4 out of 4
Participant 2	4 out of 4
Participant 3	3 out of 4
Participant 4	4 out of 4
Participant 5	4 out of 4

Day 3 Activity and Results

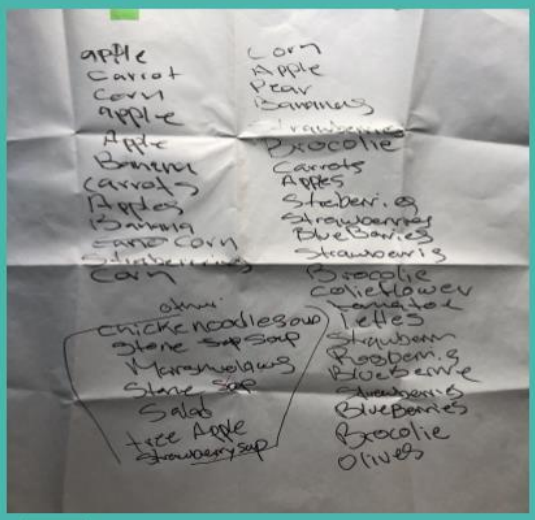
Day 3 Activity

- LO 3:Identify two foods that grow from plants.
- Book: *Growing Vegetable Soup* (Ehlert, 1987).
- Discussion: Could you name foods the grow from plants?



Day 3 results

Learning outcome 3: Met.



Day 3 Results

Answers of Participants	Count
Apples	6
Carrots	3
Corn	4
Banana	3
Strawberries	7
Pears	1
Broccoli	3

Day 3 Results

Answers of Participants	Count
Blueberries	3
Cauliflower	1
Tomatoes	1
Lettuce	1
Raspberries	1
Olives	1

Day 3 Results

Answers of Participants	Count
Chicken noodle soup	1
Stone soup	2
Marshmallow	1
Strawberry soup	1
Salad	1
Apple tree	1

Discussion

The outcome of the project was overall a success.

What worked

- Children engaged in reading and activities.
- Children connected the reading to their day to day life.
- Children were able to met two out of the three learning outcomes.

What would do different

I would come a day before to meet and introduce myself to the class.

Thank you for your time. Any questions?