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Early Childhood Science Exposure Acts as a Catalyst for the Grasping of Complex Scientific Concepts in Later Years

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

Introduction

The curriculum in early childhood education does not include enough science-based concepts. Without early exposure to science concepts, children lack opportunities to build critical thinking and skills that can help them become Kindergarten ready. To increase the amount of science in the curriculum, I have created a three-day lesson on bees for children aged 4 to 5 years old at the Hartnell Community College Child Development Center in Salinas, California.

Need Statement

According to next-generation standards, children lack exposure to early sciences that would prepare them for K-12. The objective for the Next-Generation Science Standards (NGSS) is to advocate science education so children can meet the standards as they continue their education. Children who engage in scientific exploration in early childhood have a better understanding of science concepts later in life. The NGSS wants Science, Technology, Engineering and Mathematics (STEM) to be introduced in early childhood because they believe that children are capable of grasping STEM concepts (Dejarnette, 2018). Science in early childhood can provide a rich context in which they can develop other vital skills such as language, early math concepts, and cooperation.

The Next Generation Science has three standards, which is a performance expectation of what children should know and be able to do by the end of the objective. The three standards are science engineering practice (SEP), disciplinary core idea (DCI), and crosscutting concept (CCC). The goal of NGSS is to prepare children K-12 to develop a rich foundation where they can practice scientific literacy and get ready for the future (Lontok, Zhang, Dougherty, 2015). Research has shown that approaching STEM in early childhood children can explore, question, discover, and be innovative as they problem solve and exercise critical thinking (Dejarnette,

2018). Children in early childhood who can explore outdoors have the opportunity to develop science inquiry skills. Science inquiry refers to seeking information by investigating ideas and questions regarding a topic. Children who are exploring living things can become involved with mathematics, such as counting, measuring and sorting. Science inquiry is essential as is that it allows children to connect with their environment and create questions, helping them experiment with how the world functions. It is proven that when a child participates in a science inquiry, they have a more developed social language and basic scientific language (Gillies, Nichols, Khan, 2015).

A science-based concept can provide many learning foundations that can help a child become ready for kindergarten. The California Preschool Learning Foundation has created three volumes of the preschool curriculum framework. All three volumes of The California Preschool Foundation have eight principles that are grounded in early childhood research and practice (California Preschool Curriculum Frameworks, 2013, p.V). The objective of the framework is to prepare children for school readiness. Early childhood Development (ECE) invites a child to a natural environment where children can be engaged and start their exploration. When a child is exposed to water, sand, blocks, or other materials, they can explore a different concept such as balance, motion and forces (Pritzker, Bradach & Kaufmann, et al., 2015). Studies have shown that children who have been exposed to a preschool foundation are more likely to be ready for kindergarten, mastering basic skills (Pritzker, Bradach, Kaufmann, et al., 2015). Children in ECE are learning cognitive skills, social and emotional development and much more. These domains help children become successful in kindergarten. Early childhood education setting focuses on a natural environment where much of the scientific inquiry is put to play. Children begin to make an observation, asking questions and gathering information as a form of learning that will help

them develop an appropriate practice in science education towards inquiry-based learning (Merle, Nichols, Rodney, et al., 2000). The goal of ECE is to foster children's curiosity and built competence.

Overall, Early Childhood Education is working on meeting the California framework to prepare children for kindergarten. As children continue to explore their surroundings, early childhood educators are supporting their curiosity. Children enter preschool with a sense of wonder and readiness to learn. Therefore, that is why early childhood is one of the most critical factors in a child's life. Due to the rich foundation of science, I will intend to provide a three-day lesson on bees for children ages 4 to 5 years old at the Hartnell Community College Child Development Center in Salinas, California.

Theory

Piaget, in his theory of cognitive development, explained how children construct an understanding of the world around them and adapt their thinking based on what they know through active engagement with the environment (Garhart, 2000, p.61-63). Piaget's Preoperational development stage influences my project because my target group is children ages four to five years of age. Piaget explains how children who are two to seven years of age acquire the ability to learn through symbols and are starting to develop interactions through meaningful experiences that allow them to gain knowledge that can be integrated into information later in life (Garhart, 2000, p. 62-63). Piaget explains how, during the preoperational stage, children are egocentric, meaning that they think of everything only as it relates to them (Garhard, 2000, p. 69). As part of this stage, students can describe what a honeybee does without observing their busy days. The intuitive thought substage is when a child is confident of their knowledge and their understanding but are unaware of how they gained the information they currently hold

(Santrock, J. W. 2011). An essential factor Piaget talked about was how he believed that children form ideas from their personal experiences in life (Santrock, J.W. 2011). Therefore, helping children find a way to think on their own through a problem can be more helpful than just giving them the information. I created a lesson on honeybees, where I will read a book and present visuals of the stages of the life cycle of a bee so children can process the information that has been given to them. In the end, children will reflect if they were a honeybee, how they would help the environment. Having them reflect at the end helps the teacher understand what they learned from the lesson and if they were able to retain the information. Overall, the lesson on honeybees ties back to Piaget's theory of how children can acquire information from the world around them and continue to add and build upon new existing knowledge. Open-ended activities support children's cognitive development because they begin to think critically. Instead of putting children in the position of being right or wrong, they put them in the place of inquiry of finding out what the possibilities are (Garhart, 2000, p.77).

Consider Diversity

I will be conducting my project at the Hartnell Community College Child Development Center in Salinas, California. This Center serves 120 students each year, which range from three to five years of age. The participants who I will be working with are in the afternoon session. The afternoon session consists of sixty students in total. According to learning genie, a portfolio and rating tool for the Desired Results Developmental Profile (DRDPS) presented a demographic of the 2019-2020 school year. See Appendix B. The age group percentage showed 26.6% of five-year-olds, 51.8% of four-year-olds and 19.6% of 3-year-olds attending. Of the total children who attended the Hartnell Child Development center, 87.5% were White, 3.6% American Indian or Alaska Native, 1.8% Korean, 2.7% more than one race, 1.8% other Asian. See Appendix B. A

total of ten students were assigned to participate in the lesson presented on bees. Two out of ten only spoke Spanish. As a result, it is possible that the two participants who only speak Spanish may not participate, given that the lesson will only be in English. Overall, the project is intended for children in early childhood and for those who speak at an English proficient to complete and understand the task.

Learning Outcome

I intend to provide three, 30-minute lessons to students 4-5 years of age at The Hartnell Community College Child Development Center regarding honeybees.

By the end of the project, participants will:

1. Identify two different stages of the cycle of a Honey Bee.
2. Indicate one benefit of bees to the environment.
3. Describe one reason honey has different flavors.

Method

Day 1

First, I introduced myself and told my group why they would be meeting twice a week for three weeks. The group was ten children minimum and was a mix of girls and boys. To start the activity, I first asked the group if they knew what an insect was. Once they described what an Insect was, I asked them if they knew if a honeybee was an insect. I then read a book called Are you a bee? (Judy Allen and Tudor Humphries, 2001). The book talked about the different stages of the life cycle of a honeybee and the unique role they play in pollination. Once I finished with the book, the children explored a honeybee foam model where they were able to remove the pieces of the stage. See Appendix A.

To conclude the activity, I gave each student a worksheet on the life cycle of a honeybee. Each child cut the four pictures of the cycle and glued them in order. See appendix A.

Day 2

I will start the group by asking a question, are bees good or bad? I then will read a book called What if there were no bees (Suzanne Buckingham Slade, 2010). The book explained how honeybees are one of the most valuable insects in the world. At the end of the story, we will reflect on key points of the story. Children will be asked if they were a honeybee how would they help the environment. I then will pass paper and colors so each student can draw their idea and share them with the group.

Day 3

On day three, I will lead a discussion where they can reflect on what they know so far about a honeybee. I will ask the children if they have ever tasted honey. I then show the students a honey flower menu on all the different colors and flavors of honey. I then asked them if they were a honeybee what flavor would their honey be. To conclude group time, I provided three different flavors of honey with a visual of the flower from which the bee collected nectar. The children were able to smell, taste, and compare the honey.

Results

The Learning outcome of day 1 invited participants to identify two stages of the cycle of a honeybee. I believe the learning outcome of day 1 was met. As I read the story *Are you a bee?* By Judy Allen and Tudor Humphries, the children stayed engaged as they learned about the stages of a honeybee. After the story was finished children explored a plus bee life cycle foam model that allowed the children to remove the pieces of the stages of a honeybee. The children stayed engaged and participated at all times. When I presented the flashcards, children waited their turn to categories the stages. In total, they were able to identify two different stages of the cycle of a honeybee.

Learning outcome 2 was not met due to covid-19

Learning outcome 3 was not met due to covid-19

Discussion

I believe that the first learning outcome was successful. All participants were able to identify two parts of the honeybee. Children demonstrated in the first part of the project how they adept to objects as evidence much of what Jean Piaget's talks about in the preoperational stage. Overall, I was not able to finish my project due to covid-19.

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Appendix A

Learning Outcome 1

Learning outcome 1

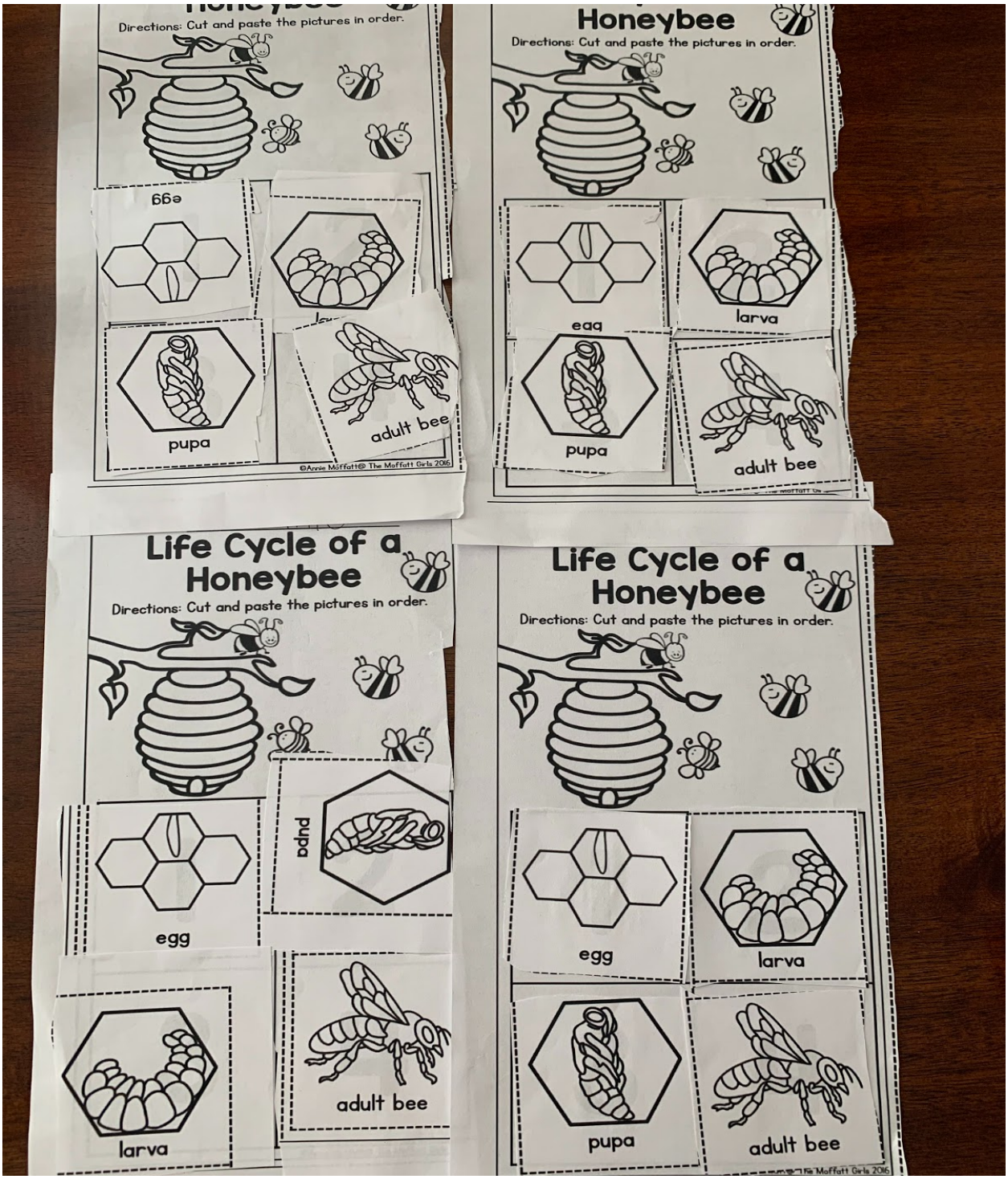


Table 1

Results of learning outcome 1. Participants 4-year-olds.

	Student 1	Student 2	Student 3	Student 4
Egg	✓	✓	✓	✓
Larva	✓	✓	✗	✗
Pupa	✓	✓	✗	✗
Adult bee	✓	✓	✓	✓

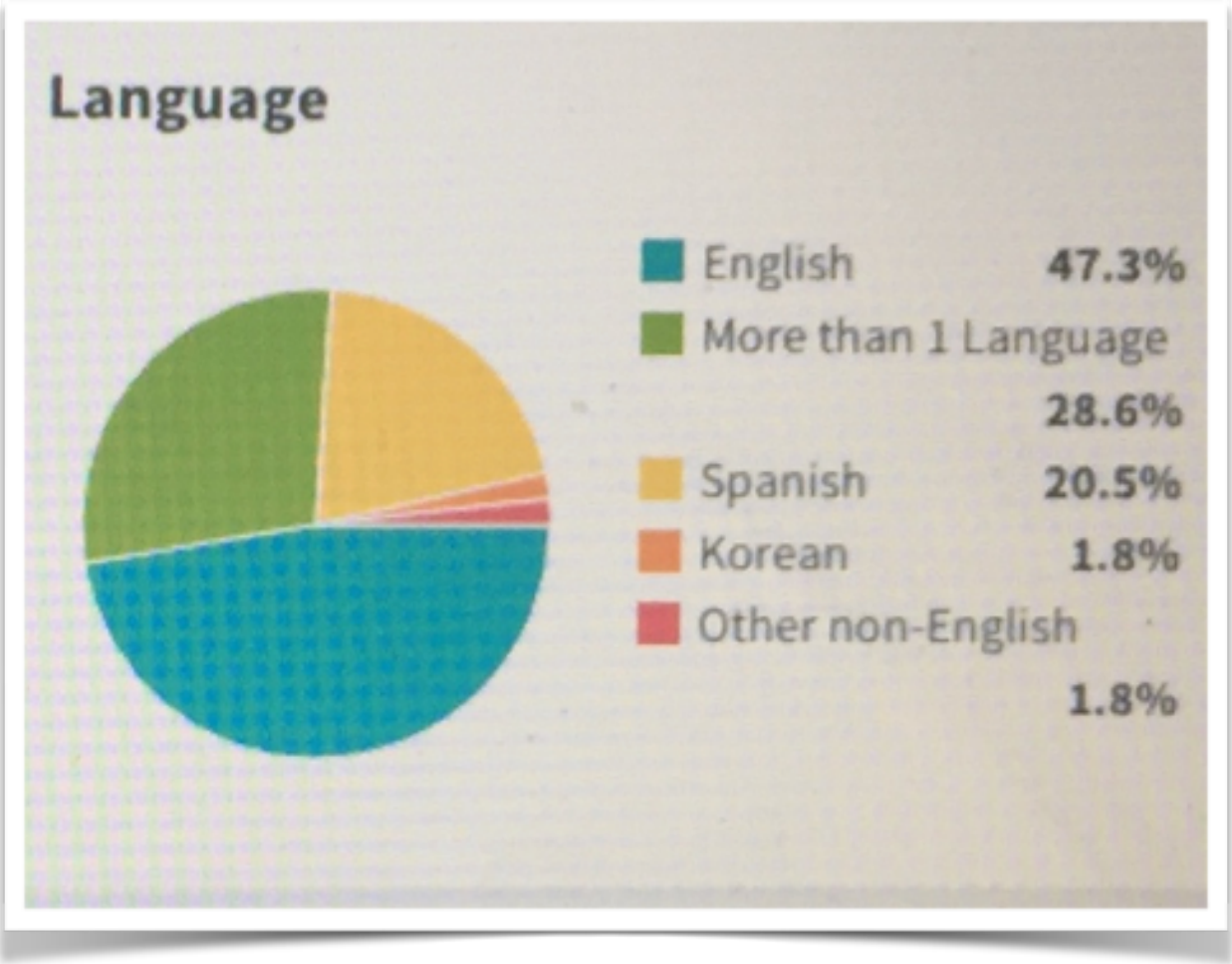
Table 2

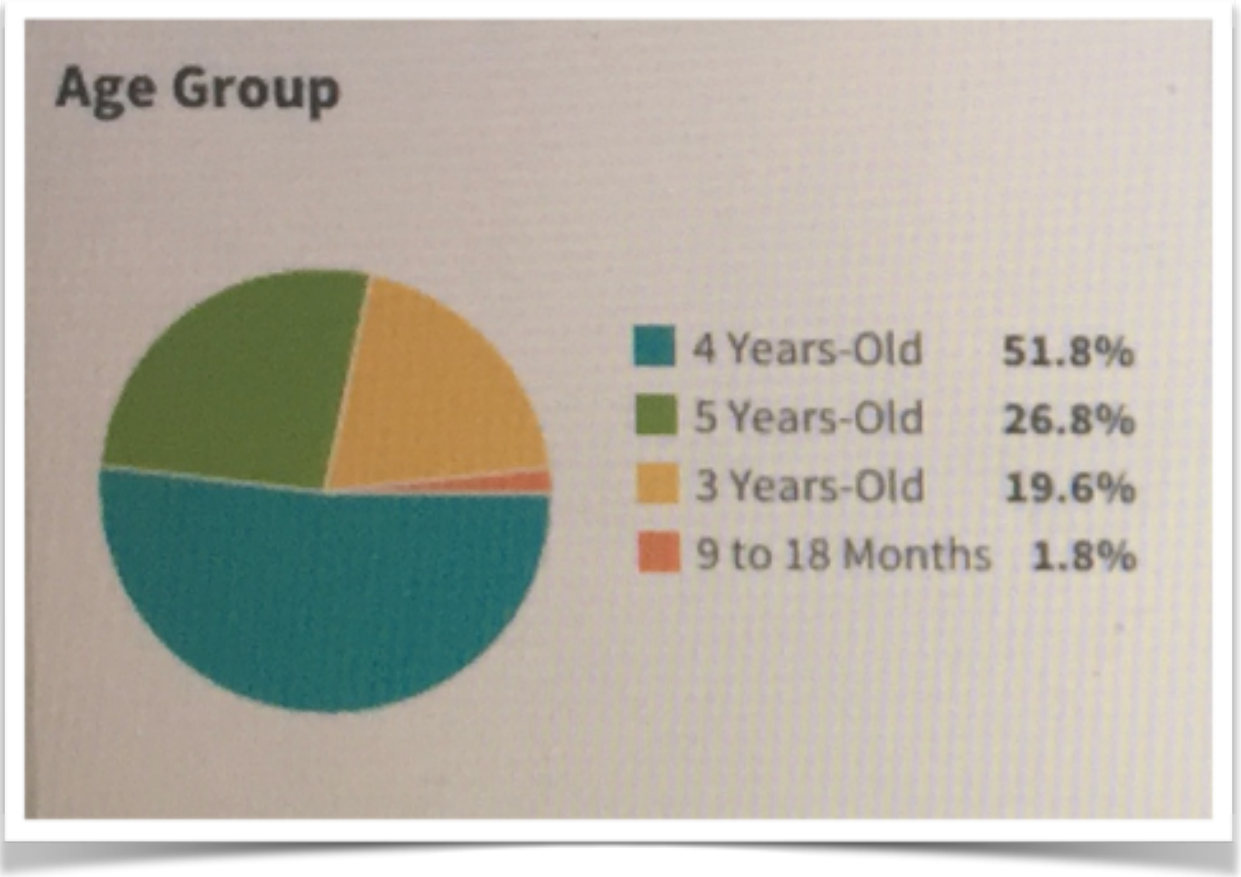
Result of learning outcome. Participant 5-year-olds.

	Student 1	Student 2	Student 3	Student 4	Student 5	Student 6
Egg	✓	✓	✓	✓	✓	✓
Larva	✓	✓	✗	✓	✓	✗
Pupa	✓	✓	✗	✓	✓	✗
Adult bee	✓	✓	✓	✓	✓	✓

Appendix B

Demographics 2019-2020 school year.




Age Group
4 Years-Old 51.8%
5 Years-Old 26.8%
3 Years-Old 19.6%
9 to 18 Months 1.8%

Appendix C

PowerPoint on Early childhood science exposure acts as a catalyst for the grasping of complex scientific concepts in later years.

Early childhood science exposure acts as a catalyst for the grasping of complex scientific concepts in a later years.

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Human Development and Family Studies 2020 Capstone

Need Statement

The Next Generation Science Standards (NGSS) emphasize that children lack exposure to early sciences that would prepare them for K-12.

Theory

Jean Piaget's theory of cognitive development explains the four different stages of mental development

- Sensorimotor stage: birth to 2 years
- Preoperational stage: ages 2 to 7
- Concrete operational stage: ages 7 to 11
- Formal operational stage: ages 12 and up

Method

Three-day lesson regarding honeybees to preschoolers at The Hartnell Community College Child Development Center.

Participants: Four 4-year-olds
Six 5-year-olds

Learning outcomes

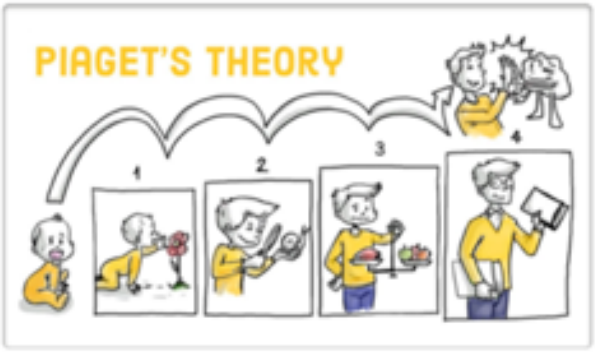
Students will Identify two different stages of the cycle of a honey Bee.

Students will Indicate one benefit of bees to the environment.

Students will describe one reason honey has different flavors.

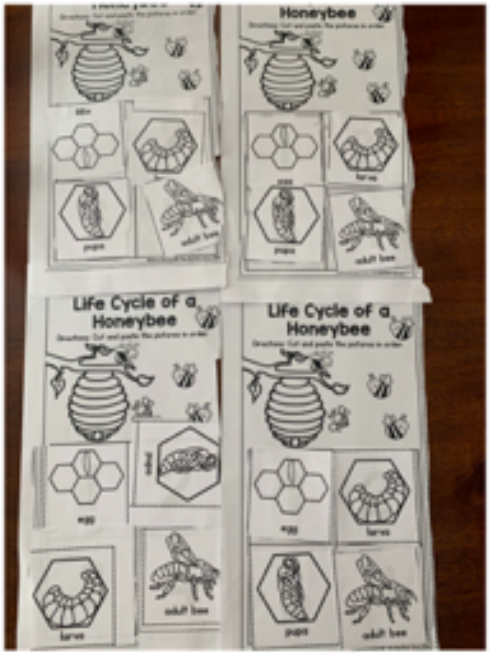
Preoperational Stage

- Symbolic Play
- Egocentric
- Children acquire knowledge
- Interact with the world around them



Learning outcome day 1: Identify two different stages of the cycle of a Honey Bee

Learning outcome day 1



Learning outcome day 1

Learning outcome day 1 results

Participants: 4 year-olds

	Student 1	Student 2	Student 3	Student 4
Egg	✓	✓	✓	✓
Larva	✓	✓	✗	✗
Pupa	✓	✓	✗	✗
Adult bee	✓	✓	✓	✓

Learning outcome day 1 results

Participants: 5 year-olds

	Student 1	Student 2	Student 3	Student 4	Student 5	Student 6
Egg	✓	✓	✓	✓	✓	✓
Larva	✓	✓	✗	✓	✓	✗
Pupa	✓	✓	✗	✓	✓	✗
Adult bee	✓	✓	✓	✓	✓	✓

Day 2: Indicate one benefit of bees to the environment.

Not complete due to covid-19

After reading a story of *What if there were no bees?* Children would draw what if they were a honeybee how would they help the environment.

Day 3: describe one reason honey has different flavors.

Not complete due to covid-19

Learning outcome 3 was a honey tasting lesson. I would present a honey flavor menu of different types of honey. The children would able to smell, taste, and compare the honey. They then would draw if they were a honeybee, what would their honey taste like.


Thank you
Questions ?