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The Tomato Hornworm Project

by Kathryn Owen and Sarah Goodyear-Charney

Teaching can be effortless! Share in the joy and wonder of an organic learning experience inspired by the unexpected arrival of the tomato hornworm in a toddler classroom.

Every moment is a snapshot of time in the life of a young child; something can capture their interest or dissipate like a bubble floating away beyond their reach. If captured in that moment, their senses come alive as they are drawn into the wonder of their natural world. Last spring, at the Early Childhood Education Center on the University of California, San Diego campus, the unexpected arrival of nine green worms captured the interest and the hearts of our two-year-olds. From that moment what evolved was a captivating learning experience, which engaged the whole school community. In an outdoor setting purposefully created to promote exploration and foster the spark of curiosity, children became researchers navigating their own process of inquiry. In preschool, we promote following the motivation of children as we foster dialogue to expand on their knowledge, but this experience was unique in that it happened with two-year-olds. As the children began to think about what these creatures were and why they were there, they embarked on a journey that continued into the summer months and touched on all areas of the curriculum.

It began with the planting of an edible garden, which turned into a sustainable ecosystem. The children were used to observing creatures come and go, but the nine thick tomato hornworms that were first found on the tomato plants did not go away. The children were immediately intrigued by their new friends and stretched out their hands to hold them. Sarah placed the worms on a tray with leaves and tomatoes and took them inside so the children could closely observe them. Within a few weeks the worms became an integral part of the everyday experience. The children participated in the daily activities of feeding the worms, creating a habitat for them, measuring and monitoring their growth, and finally witnessing them blossom into tiger moths. It became a child-directed project tailored to foster their fascination with the worms within a developmentally appropriate context.

Modeling curiosity and excitement is the key to a successful project, and as the children became more involved in the lives of the worms, they began to apply their own abilities and passion as researchers, artists, engineers, mathematicians, and scientists. They developed new skills and built on their knowledge and understanding in the following areas: engineering, mathematics, social and emotional, creativity, physical health, and language acquisition.

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Kathryn J. Owen, M.S., grew up in Australia, where she trained as a junior primary teacher before moving to the United States. She has been director of early care and education at the University of California San Diego since 2003. In her role as director, she has fostered a naturalistic learning approach and has participated in the design of a GOLD LEED Reggio inspired program. Intrigued by the complexity of a completely child-driven learning experience in her program, she shared the story of the tomato hornworm project at the World Forum break out session, "When Nature Comes Alive" in Auckland, May 2017. Owen serves on several committees including the San Diego Child Care and Planning Council and was recognized as an Exceptional Master Leader by *Exchange* in 2015. She completed her graduate studies with the School of Education at San Diego State University, where she continued to participate as a part-time lecturer in program administration for the department of child and family development. For the past decade she has also been a key participant in the ongoing social robotics research at the University of California San Diego involving RUBI, a small humanoid robot who has been designed to interact with young children and support documentation of developmental progress.

Sarah Goodyear-Charney holds a diploma in children's services from the Australian Institute of Child Care Training and has worked in early childhood for a decade. In 2010, she volunteered her services in an orphanage in Nepal and over the years has worked in various settings around the world. Charney is passionate about supporting children's individual needs and fostering their ideas. She is currently a child development teacher at the University of California San Diego. Charney developed the tomato hornworm project in 2015 with the toddlers in her classroom. The project has been presented at the 2016 National Coalition for Campus Children's Center Annual conference, the San Diego Association for the Education of Young Children's 2017 Spring conference, and the 2017 World Forum on Early Care and Education.

Engineering

The first step was to build a habitat for the tomato hornworms because their tomato plant was at the end of its harvest and was without leaves. Teachers and children went for a walk through the local community gardens to gather sticks and leaves in order to make a small teepee. Together, we wrapped pipe cleaners around the top of the habitat to keep it in place. We then laid the tomato leaves against the sides to create a wall. With just a few materials, we were able to engineer a simple structure that simulated a tomato plant.

When an unexpected weekend-long rainstorm hit in July, the habitat was threatened and needed to be rebuilt and redesigned. The children and teachers made an action plan of how to repair the worms' home, while making sure it didn't happen again. When asked, "Where could we put the worms so they won't get wet" and, "Where do we go when it's raining," the children used their problem solving skills in deciding to move the habitat to a space under the backyard awning.

Mathematics

As a small group activity, and occasionally at circle time, we would do a head count every few days and discuss why it had changed from the time before. Often, new baby worms had arrived or bigger worms burrowed underground to pupate. Pupating is when the worms go into a cocoon, in this case underground, to metamorphose into a tiger moth. We hung up pieces of yarn measuring the length in inches of the worms, then hung up yarn measuring the height of the children. The display allowed for the children to compare their respective heights with that of the worms. We also created a graph based on the information gathered and were able to track the growth of the tomato hornworms, making it possible to discuss the different sizes, such as small, medium, and large. This was exhibited in the classroom to share with families for the duration of the project.

Language

For Kathryn, one of the most rewarding features of this project was that it exposed very young children to a wide range of descriptive language, which in turn promoted rich discussion. Over the course of the project they frequently heard and used words like: green, brown, red; tomato, eggplant; tomato hornworm, garden, head, tail, horn, burrow, soil; pupa, pupate; small, medium, large; thin, thick; measurement, length, inch; lifecycle, tunnels, camouflage, metamorphosis, and tiger moth.

Here are a few examples of verbal responses from children of different ages in our program. Sybil, age 18 months, described the worm as "icky" after she had held it in her hand for a brief moment. Jessica, age two years, pointed to the horn on the end of the worm's tail, and asked "Will it poke me?" Greyson, age two years, said to a small tomato hornworm that had just pooped on Sarah's hand, "Hey, don't poop your pants, we poop on the potty!" Greyson had just begun toilet training and was passing on the information he had learned to the worm. When we took the tiger moth to the preschool classroom, we talked about how the tiger moth's wings were camouflaged. When asked, where do you think the moth is going, one child, age four years, responded, "To war?" As San Diego is home to several military bases, we are accustomed to seeing military uniforms in our community. The children were able to make meaningful connections, which were expanded through open ended questions and follow up discussion.

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Social Emotional

The worms supported the children's engagements, social interactions, and allowed them to naturally build on their social skills. They shared their discoveries and observations with friends, or would even call their friends over to observe a worm if it was climbing to the top of the teepee. Some children were afraid at first and kept their distance, but over time they became risk takers and even grew to care for and nurture the worms.

Perhaps the most valuable learning experience was the children's ability to grasp the concept of empathy and sense of loss. During the unexpected weekend-long rainstorm, four of the worms drowned in their habitat. When the children and families arrived early that following Monday morning, they were devastated to see the destruction of the worms' home and loss of life. As a group, the children had the opportunity to discuss how it made them feel, and they rallied around to create a new habitat and brainstorm ideas about how to keep the worms safe.

Creativity

Our children participated in many types of worm and bug art activities, such as bug stamping and group mural finger-painting (wormy fingers). But Sarah's favorite art activity was completely spontaneous and child-directed. It was initiated by a two-year-old named Diya. Each day the children would pull a chair up to the habitat to observe the worms. One particular morning, Diya asked for paper and a marker so she could draw one of them. After Sarah gave it to her with a mini-clipboard, more friends asked for the same so they could make their own illustrations of the friendly creatures. The results of their efforts, based on their observations of the worms, were remarkable examples of child-driven documentation.

Physical Health

As soon as the worms were discovered, our room leader did some research to make sure the tomato hornworms were safe to touch and harmless. After the children held the worms, they washed their hands thoroughly. As a gross-motor activity, Sarah wore a children's play tunnel to make herself move like a tomato hornworm and the children would follow her wiggling and giggling outside. This ended up being the children's favorite game; they thought it was hilarious. To practice safety, we held hands on our nature walks to the local community garden to gather food in buckets for the tomato hornworms. We explored healthy eating and cooking with ingredients from our garden, like freshly picked tomatoes for a snack and dairy-free eggplant lasagna. On a side note, Sarah found a recipe where one of the ingredients was tomato hornworms (but for obvious reasons we did not use that recipe). We also put tomatoes and eggplants from our garden in a basket with a little sign that read "Room 5 Farmer's Market." Several parents took home our fresh produce to add to their dinner.

To conclude this two-month-long project, Sarah created a hard copy storybook for the classroom and a digital version for the families. It contained photos and written observations of the project. This beautiful and spontaneous experience could have been a missed opportunity if not embraced as a teachable moment when the "pests" first arrived in the garden. Generally adults respond to pests with feelings of disgust and a "get them out of here quick" attitude. We tried the opposite approach and found out that when you embrace what's in your path and model acceptance and appreciation for diverse animal life, marvelous things can happen. When we started, Sarah was the only one excited about the worms and ran with the children's interest in them, but by the end, the worms became part of our classroom family. Each staff member of our classroom team was able to bring a unique talent that contributed to the project's success. There was a gardener, a visual artist, a photographer, a master of crafts, and a comedian.

Thanks to the unexpected arrival of nine tomato hornworms, we were able to enjoy a truly magical, hands-on learning journey that allowed our toddlers' curiosity to blossom when exploring nature and the world around them. It's rewarding to see toddlers thrive when faced with new experiences that pique their interests. The learning process flowed so naturally, it didn't even feel like teaching. It felt like we were all just hanging out, getting excited about worms. Nature served as the third teacher, and allowed toddlers to maintain interest in an activity over an extended period of time while continuing to enrich core areas of development. This one activity excited not only our toddlers, but the rest of the school, enabling us to incorporate a diverse range of milestones for children of all ages. The worms frequently went on a field trip to another classroom, and all of the children got to observe the different stages as the small transparent worms began to turn green, grow, bury themselves as pupae, and emerge as large moths. This was a meaningful and totally organic experience in which that moment of wonder was captured and embraced within the context of relationships. The project ebbed and flowed until it ran its natural course and was time for the last moth to fly away. It was a snapshot in time, preserved forever in the hearts, minds, and memories of our children.

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