

# **Exploring the Use of Citizen Science and Technology to Connect Preschool Classrooms at Two University-Based Programs**

**Meg Gravil**

*College of Education and Human Development, University of Louisville*

**Tamala North**

**Rebecca Crawford**

*Applied Human Sciences, Eastern Kentucky University*

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## **Abstract**

*The COVID-19 pandemic and resultant restrictions limited the ability of teachers to collaborate on activities for children attending center-based care. In response to such constraints and to encourage outdoor learning, researchers and teachers at two university-based early childhood programs partnered to simultaneously implement a citizen science project in two preschool classrooms. Teachers and children engaged in Project FeederWatch counts and other bird-related activities influenced by children's interests. The two classrooms participated in virtual meetings to share their birding "research" and observation data. Children were engaged in the birding project for longer than expected and many included their families in birding activities at home.*

**Keywords:** citizen science, collaboration, COVID-19, nature education, outdoor education, social learning, technology in early childhood

## **Introduction**

Responses to the COVID-19 pandemic have necessitated changes in daily routines for many people across the globe. We have adapted to working from home, oftentimes dually managing our children's schooling while non-traditional instruction is instituted. For our youngest children, many childcares and preschools have remained open, often with modified limits on classroom capacity in accordance with social distancing guidelines (Centers for Disease Control & Prevention [CDC], 2020). Further, the intermingling of children across these classrooms has been discouraged to reduce possibilities of exposure to the virus.

While the use of technology in learning has increased because of the pandemic, the use of outdoors as a learning tool may be underemphasized (Siskind et al., 2020). The irony is evident, as the CDC suggests that it is easier to implement group distancing efforts, and virus transmission is less likely, in outdoor settings. Despite the everyday affordances currently unavailable to learners because of the pandemic, another literal door has opened to increased possibilities for outdoor learning. This field report describes one study utilizing a combination of a citizen science project and technological platforms in preschool classrooms, with primary goals of using nature as a learning tool; dual-campus researcher, teacher, and child collaboration; and child socialization via technology.

Citizen science projects allow the observation and/or collection of data for inquiry purposes by all interested individuals (Silvertown, 2009). An adaptable and flexible concept, citizen science frequently involves outdoor, environmental projects. As children are innately curious about the natural world, citizen science provides an opportunity for place-based learning while contributing to a greater environmental cause (Makuch & Acze, 2018).

## **Theoretical Framework**

The theoretical framework for this project was inspired by the Reggio Emilia approach and included documenting children's activities and learning while engaged in emergent and project-based curriculum. Documentation used to track "traces" of learning is a key principle in the Reggio Emilia approach (Wein, 1997). Strategies to document traces of learning include observation, anecdotal records, and samples of children's work (Fyfe, 2012). The Reggio Emilia approach was developed in the municipal system of infant-toddler centers and preschools in Reggio Emilia, Italy. The success of the approach has brought it worldwide attention and it is practiced around the globe (Edwards et al., 1998).

## **Description of Activities**

In a collaboration between researchers, teachers, and children, we implemented the Project FeederWatch citizen science project in two preschool classrooms at university-based early learning centers, one urban and one rural. Project FeederWatch is hosted by the Cornell Lab of Ornithology and includes tallying bird counts over a specified period of time as birds are wintering (Cornell Lab of Ornithology, n.d.). This study utilized design-based research wherein researchers and early childhood educators collaborated on the research design, which remained fluid to accommodate teacher and child input for refinement (Edelson, 2002). Such

collaboration supports positive outcomes for all involved stakeholders (Herrenkohl et al., 2010).

Teachers and children were tasked with choosing classroom activities related to Project FeederWatch. In addition to the respective locale bird counts, children engaged in specific species research, compiled their observances via journals and artwork, and contemplated what diversity means in both the avian and human realms. Teachers used technology to schedule live bird-cam watching in addition to indoor and outdoor observations. Technology was also used for children to communicate across classrooms. Meetings using virtual platforms included children sharing their bird research, bird watch bingo results, and artwork. These meetings served as a time for children to swap stories and further communicate with children at the other campus-based early learning center, thus providing peer socialization outside of their respective classroom “bubbles.”

### **Figure 1. Project activities implemented with children**

- Bird counting
- Making bird feeders/bird feeding
- Bird house design and construction
- Creating 3-D nests using clay and other natural materials
- Observing birds with binoculars
- Studying and imitating bird movement
- Nature hikes to observe birds
- Observing and studying birds using live webcams (e.g., All About Birds Cams at Cornell, Audubon Bird Cams, etc.)
- Reading about birds (narrative and expository)
- Painting with feathers
- Researching bird habitats
- Making hummingbird nectar
- Investigating different beaks

### **Child Engagement and Outcomes**

Teachers from both university-based child development programs collaborated virtually to discuss their own knowledge about birds and share bird-related activities they had implemented in the past. Teachers continued to virtually meet several times throughout the project to discuss ideas and compare children’s engagement in their respective classrooms.

Teachers presented children with activities related to birding and the citizen science project, Project FeederWatch. The teachers initially engaged children in the project by provoking their interest in birds using questioning strategies that included inquiries such as:

- What is a bird? What does a bird look like?
- Where do birds live?
- What do birds eat?

Project FeederWatch provided a context for children in both campus-based programs to participate in many bird-related activities. Congruent with the Reggio Emilia philosophy, activities incorporated loose parts from the natural environment as well as drama, music, sculpting, and painting.

The teachers and children in both programs enjoyed synchronous remote meetings with each other on a weekly basis. They shared the latest news on their bird “tallies”; ideas that included how to build their own nests, how to “dance” like a bird, and fun bird games and activities; read books related to birds; and shared bird-related art projects they had completed. The children and teachers looked forward to the remote meetings. They enjoyed sharing their own activities and ideas in addition to seeing and hearing about the activities completed by children in the other classroom.

Children and teachers learned about citizen science and that being a scientist involves many types of work. The children kept daily tallies of birds that came to their feeders and uploaded that information to Project FeederWatch. They learned that to have good data you need to become a good observer. Children learned about observation and not only observed birds at school, but voluntarily reported on the birds they saw at home in the evenings. Families and caregivers shared with teachers that children came home from school eagerly talking about birds and pointing out different birds on the way to and from school. Throughout the project children experienced using binoculars and were fascinated by the way binoculars work. Over time teachers noticed that engagement in observation was initiated by the children, and they remarked upon birds around them even when engaged in activities unrelated to birds or this project. One teacher indicated:

*As students began learning the names of certain birds, the more fascinated they became with them. Students naturally gravitated to the birds they shared a personal connection with. For example, one student was particularly curious about woodpeckers because he had seen one at his grandparents'. Another child was enamored by hummingbirds because they could beat their wings "as fast as a race car." These conversations helped spark the collaborative art/music activity inspired by real birds and their wings.*

The teacher in the urban setting stated, “I was surprised by the level of students’ engagement. Students in our classroom remained interested in birds for at least six weeks. However, I was shocked to learn how many different kinds of birds lived by our school building.”

**Figure 2. Using binoculars during a nature walk**



Though teachers provided some provocation, the children led the activities and projects based on their interests. One program spent weeks building and discussing 3-D nests and one program spent weeks designing, making, and dancing with bird wings representing different species. These projects inspired other smaller projects such as the study of paper airplanes, and the behavior of squirrels.

**Figure 3. Child's cardinal wings created for movement activity**



Many bird-specific misconceptions were resolved during this project. The children in this study were fascinated to learn that all birds do not fly, that birds do not live in the same place they eat, that all things with wings are not birds, and that birds look very different when they are born versus when they are ready to fly on their own. Teachers had opportunities to resolve these misconceptions during art, dancing, observation, and circle time discourse.

Throughout the project children were presented with a variety of new vocabulary words from the discourse that teachers initiated, as well as both narrative and expository texts that were used in the classrooms. Some child misconceptions and prior "funds of knowledge" (Gonzalez et al., 2005) children brought to the project surprised the teachers. For example, children's knowledge about birds at the inception of the study was "very superficial." Most children thought birds' vocalizations were limited to "tweet-tweet," and did not know what kinds of foods birds consumed. Many children replied, "I don't know" to the latter query, and additional replies included "cantaloupe," "leaves," "eggs," and "gingerbread men." When asked these questions at the end of the study, children spoke about specific species of birds, including woodpeckers ("he has some beaks and pecks the tree sometimes"), macaws, hummingbirds, doves, blue jays, cardinals, and toucans. In addition to "tweet-tweet," children shared that birds said "coo-coo-coo," "peck peck peck peck," and "birdie-birdie-birdie." At the end of the project children reported that birds ate seeds, fish, bugs, and worms. In addition, children could now describe different types of bird beaks and could demonstrate how they function by manipulating common household tools and utensils (e.g., turkey baster (Figure 4), pliers (Figure 5), and child-sized tweezers (Figure 6)). The majority of children at the inception of the project indicated that birds had "mouths." Very few children initially mentioned the term "beak."

**Figure 4. Turkey baster to represent extracting nectar like a hummingbird**



**Figure 5. Pliers to represent the grasp and reach of a toucan bill**



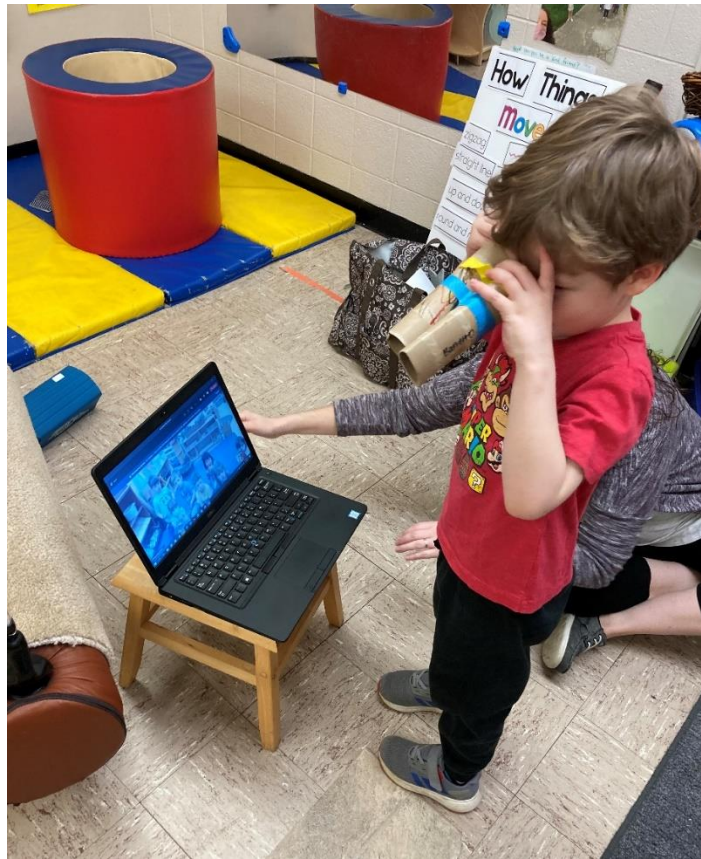
**Figure 6. Child tweezers to represent eating like insectivorous and small seed eating birds**



### Recommendations for Practice

Teachers responded to project conclusion questions and shared what did/did not go well, what children most enjoyed, and study limitations. Based on children's interest and capacity for learning, inviting an ornithologist to the classroom would be something both teachers would recommend for future science projects related to birds. Though they could not have visitors due to COVID-19 rules, in retrospect, setting up a virtual meeting with an ornithologist or other expert would have benefitted the project. Teachers from both programs indicated that additional prior research about birds and birding in general would have been helpful to each of them. They were surprised by the complexity of birding and birds in general. Children in both programs were very interested in using binoculars, even the cardboard ones they created. Teachers agreed they would like to have actual, working binoculars for each child to use or enough sets for two children to share while birding. A large part of the project involved observation, whether on walks or on the playground, so the importance of having binoculars to see things that change and quickly move is important.

**Figure 7. Sharing "binoculars" with children in collaborating center via virtual meeting platform**



Regarding technology, teachers in both classrooms reported that the children wanted to be the ones who shared/talked on camera during virtual meetings rather

than listen to their peers. This provided opportunities for teachers to talk with children about the value of listening to others, both in-person and while communicating virtually. Rather than utilizing the mute option during a virtual meeting, teachers can use such occasions to allow children to practice patience, turn-taking, and other social skills.

## **Conclusion**

Researchers and classroom teachers from two university-based early childhood programs partnered to implement a citizen science project in preschool classrooms. The children remained interested in birds and birding for much longer than teachers anticipated. This project demonstrates that young children can engage in, and understand, complex science activities such as those found in citizen science opportunities. Citizen science projects are ideal for launching an activity that begins in the classroom, but easily extends into the learners' home environments.

Additionally, projects like the bird study described in this field report engage teachers and children in place-based learning, which fosters both child and family engagement while increasing the relevancy of learning for children (Connolly, 2020).

Restrictions in place due to the pandemic prohibited community birding experts from visiting classrooms. In retrospect, teachers realized they could have planned for such a visit to occur virtually to further learn about birds. The project demonstrated that collaboration done remotely can be as beneficial and engaging as learning side-by-side in the classroom. One teacher stated, "by participating in this study, classroom teachers were able to expand the children's understanding of birds by providing *meaningful* and *quality* learning opportunities rather than theme-related activities."

**Meg Gravil, Ph.D.**, is a Clinical Assistant Professor in the College of Education and Human Development at the University of Louisville. She is a Kentucky Master Environmental Educator with research interests including equitable access to nature-based play spaces, early science learning, and using nature and environmental education as part of an integrated curriculum.

**Tamala North, Ph.D.**, is an Assistant Professor in Applied Human Sciences at Eastern Kentucky University. Her early childhood philosophy and educational framework is inspired by the Reggio Emilia approach and nature-based education related to children birth through kindergarten age.

**Rebecca Crawford, Ph.D.**, is clinical faculty in Applied Human Sciences at Eastern Kentucky University. Dr. Crawford has experience as a preschool teacher as well as a director of a childcare center. She advocates for early intervention and inclusion of all children.

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