

The Nest Weighs as Much as a Fridge!

Supporting Pre-service Teachers in STEM

by Alissa A. Lange, Susan Taylor St. Lawrence, Laura Robertson, Amy Previtera, and Jasmine Armstead

Preschool students in Susan’s classroom could not stop talking about bald eagles.

“Did you see the nest?”

“Look at my arms! They are like the eagle’s wings!”

The teacher had been showing eagle cam live streams as part of her efforts to build on the children’s prior interests in birds at the bird feeder. Capitalizing on their eagle excitement, Susan set up the live feed in the classroom on February 10, 2021. After a few minutes, to everyone’s surprise, they actually saw an eagle lay one of her eggs! This fueled the students’ curiosity

even more, and kicked off a months-long, multidisciplinary study of eagles, birds, and nests. This is a particularly vibrant example of how our innovative and collaborative approach to

early childhood and elementary pre-service teacher preparation, the Early Childhood–Elementary STEM Collaboration, succeeds in real-world application.



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as an author of the Early Years column published in *Science & Children*, and through her STEM collaboration with Laura Robertson (source of this article!). She lives in Jonesborough, Tennessee, with her husband and three young children.



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she leads professional development workshops in science education for teachers in northeast Tennessee. Her research interests include integrating science with other subject areas and building collaborative partnerships.

Improving Pre-service Teacher Preparation

Our Early Childhood–Elementary STEM Collaboration started in 2017, with the goal of improving the quality of pre-service teacher preparation in STEM—science, technology, engineering, and math—for preschool through fifth grade in our region of Appalachia (Robertson, Nivens, & Lange, 2020). Over the years, our approach has evolved and expanded. Our model includes the following components (although it continues to change as we learn):

1. Multi-directional collaboration;
2. Developmentally-appropriate treatment of STEM content and theory;
3. Authentic, meaningful, and applied activities with real teachers and students;
4. Scaffolded feedback and reflection opportunities, and;
5. Professionalization experiences.

We invite you to join us as we describe each component and how it came to life with Susan and her children in the spring of 2021.

Multi-Directional Collaboration

Susan expressed an interest in building on her comfort with literacy to include

more science and integrated STEM. Not long before that, the children in her classroom had selected a book about bald eagles for morning circle time, and noted birds at the bird feeder. Our faculty team had been looking for a partner with whom we could create resources to accompany our university’s free ETSU Eagle Cams, and we saw this as the perfect opportunity to implement our project in a real-world setting. It was all very serendipitous! Susan agreed to grant our pre-service teachers access to authentic classroom experience via video recordings—something that, as faculty members, we were unable to offer due to the COVID-19 pandemic. In return, our pre-service teachers created activity plans, the university bought eagle materials and books for the classroom, and the STEM faculty supported Susan in her implementation around STEM concepts and practices.

Developmentally-Appropriate Science and Integrated STEM

Our work has had science and integrated STEM at its core because we know that skills and knowledge in early grades in these areas are critical to later learning and achievement (McClure et al., 2017; Grissmer et al., 2010). One eagle cam activity that exemplifies this is the Actual Size Nest activity, which was co-developed by pre-service teachers and STEM faculty, and then revised and implemented by Susan. The pre-service teachers’ activity plan included key ideas in

length measurement appropriate for the age group, such as the importance of starting at one end and ending at the other to compare lengths of the string to the width of their nest models.

After observing and reading about eagles, Susan directed students’ attention to the eagle’s nest. She recalled with students their observations and research on eagles’ nests and how wide they can get. Children loved the facts that an eagle’s nest can be as big as their bedroom and weigh as much as a refrigerator! They recited these facts often. The children also learned that eagles’ nests are, on average, six feet wide. Susan then used a string to show just how wide that was. As the class stood next to the string she exclaimed, “Wow! We all fit in! You are my baby eagles.” After this activity with the string, she suggested that the children might like to construct their own six-foot-wide nests using blocks in the block area, which the students readily attempted. The next day, the children took the challenge outside and



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Jasmine (Armstead) Johnson is an undergraduate student at East Tennessee State University, in the early childhood education program. She will graduate in May 2022 with a PreK-3rd grade licensure. She enjoys working with children and providing them the support they need to be successful. She lives in Johnson City, Tennessee, with her husband, their 4-year-old son, and dog.



Children construct their own six-foot-wide nests using sticks and twigs.

engineered an actual-size eagles' nest with sticks and twigs.

Susan talked with children about how nests are shaped and built. She then engaged them in the engineering design cycle to make their models, revising as needed (e.g., Mano, Molina, Nayfeld, & Lange, 2019). This tied into the crosscutting concept of form and function, as well as life science standards addressing how animals keep themselves safe. Extending this measurement and science integration, Susan incorporated the art skills of one of the



center's family members to draw actual size eagle wings, to which children could compare their own "wingspans."

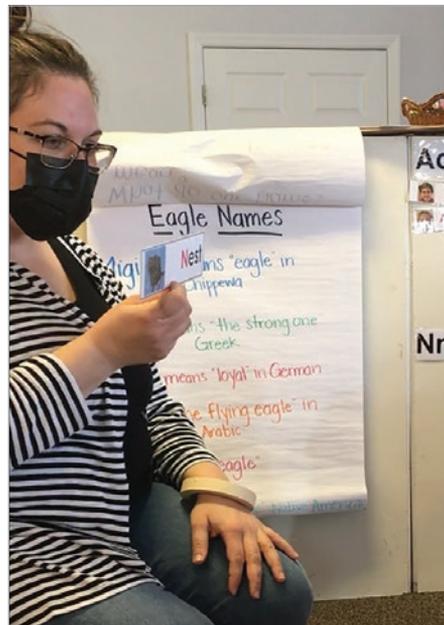
Authentic, Meaningful, and Applied Activities

This partnership allowed pre-service teachers to write plans that were really going to be taught and was a valuable adaptation during the pandemic. The teacher took the plans and extended them to suit her needs, and then she filmed the teaching process to share with the pre-service teachers.

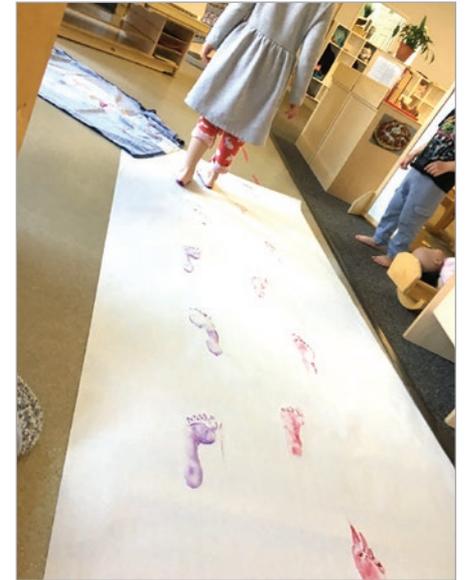
Pre-service teachers noted the power of this experience. One said, "I like that we had the ability to create lessons that she could ... use in her classroom. It makes you feel like the work you are doing is making a difference."

They also were excited to write something for children, building on their interests in birds, and felt that the fact that children were excited for so long must mean that the activities they helped to write were appropriate and engaging for these children.

The nest building activities illustrated developmentally-appropriate activities that tied into state and national standards. For example, Susan made multiple literacy and language links, including incorporating key words from the eagle study into the classroom word wall, and reading related books, such as "Nesting," by Henry Cole. With each of these instructional choices, pre-service teachers had a front-row seat to the work of a classroom teacher, bringing in applied experiences earlier than normal in their program of study.



Incorporating words and literacy into the eagle project.



Scaffolded Feedback and Reflection Opportunities

Pre-service teachers in our courses receive scaffolded supports across the semester. With support from their professor, pre-service teachers in our eagle project wrote activity plans related to eagle footprints and other animal tracks. Susan started the activity, but quickly realized that her students were not quite ready for part of the activity related to connecting where eagle tracks might be found and how they might look different from other animal tracks (since eagles fly). She adapted and expanded the activities and ended up with three days of connected activities that sprung from the original plans. For example, she showed the children images of eagle tracks and asked the children to compare them to the children's own footprints and tracks.

Pre-service teachers viewed and reflected on the videos of Susan's activities to support their teacher training. On Zoom, Susan, the pre-service teachers, and the faculty member discussed the activities, how they were implemented, and how Susan might adapt plans in the future. Her feedback to pre-service teachers was that it can be powerful to include a section in written plans to identify what children already know first. She suggested the addition of a pre-lesson or a probe early on. She also applauded the pre-service teachers' plans because they were readily adaptable for differentiation—for example, for children whose ages vary in her classroom—or those at different levels of learning.

Later in the semester, pre-service teachers built on this early experience to create their own complete, integrated units for a target grade in early childhood (K-3). Across the semester, they received feedback and support as their projects evolved, and again, they gained authentic and applied

experience actually teaching small groups of children, drawing from the unit they had created, with feedback and input from faculty and peers.

Professionalization Experiences

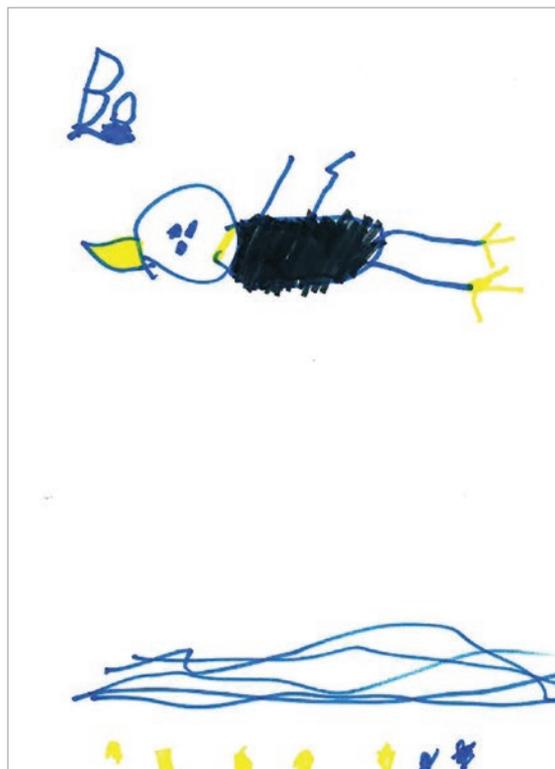
Our project prioritizes supporting pre- and in-service teachers through professionalization activities. In the eagle project, professionalization activities included co-writing this article, as well as co-presenting at conferences (this project was featured at a regional and a national virtual conference). In addition, the eagle project produced free activity plans for the thousands of other educators who use the cameras to download (ecstemlab.com/eagle-cam-project.html). Pre-service teachers in the early childhood and elementary education programs, the in-service teacher (Susan), and faculty co-authored the activity plans.

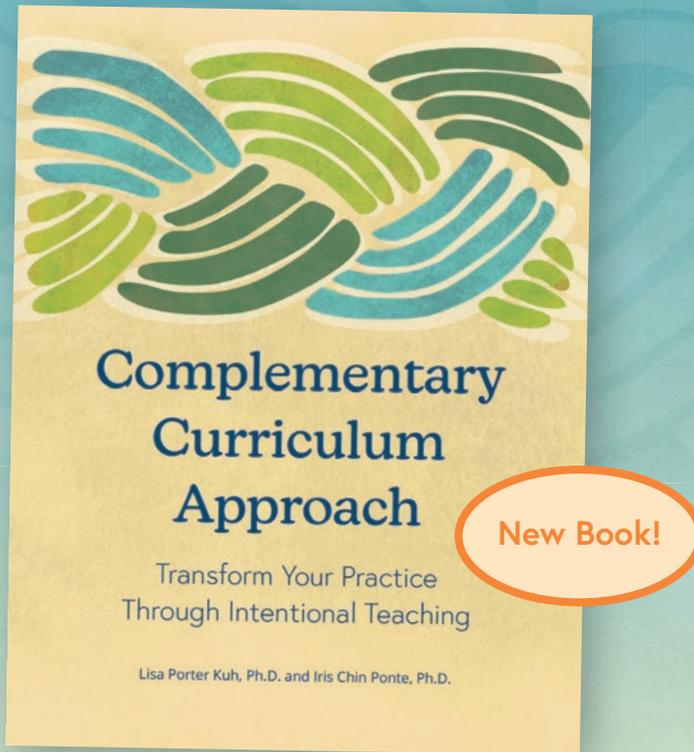
Building Connections through STEM

Early in the semester of the eagle project, the collaboration team saw a news story announcing a formal eagle-naming competition for the newly arrived male eagle at one of the nests. Susan talked with her children about possible names for the eagle. She connected this discussion to meanings of their own names. The class discussed the rich cultural and linguistic diversity behind names in other languages, such as names that stem from Native American traditions, like Migizi, which is Chippewa for eagle. In the end, the children came up with five options and participated in authentic data collection and analysis (math connection!) to choose two names from the list to submit on behalf of the class.

Although they did not “win” the competition, they benefited from participating in a series of connected activities across STEM and literacy,

which attended to cultural and linguistic diversity and incorporated math for a purpose. Even “not winning” and feeling disappointment, in addition to coping with the realities of nature that can appear on eagle cams (like losing a recently-hatched eaglet,) were social-emotional learning opportunities, which was further evidence of the massive scope of and potential for





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meaningful connections through an eagle study like this one.

In addition to benefits for the children and our collaborative team, this connection to our community and the assets of our region was notable. The children noticed the ticker at the top of the screen that shows the number of viewers of the eagle cams at any given moment, and they heard of "the eagle cam people" who facilitated the resource. They even sent a thank you card to the faculty members who helped facilitate the partnership (shown left). This approach to pre-service teacher preparation has been incredibly powerful in a variety of ways. Building on the interests of children (NAEYC, 2021)—and of all of the adults in the project—and letting the project evolve across time was enlightening and empowering for all of us. We hope that our collaboration is a model that can be individualized to suit others' local opportunities; benefits await all who participate.

Acknowledgements

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