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Engaging Young Children with Science Concepts in a Community-Based Book Distribution and Animal-Themed Literacy Intervention Program

Sunita Singh[1]

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Abstract
This descriptive case study presents findings from a 2 year research study on an intervention program, *Reading with Animals*, launched in a linguistically, ethnically, and racially diverse Central New York community. The local literacy coalition implemented the Dolly Parton's Imagination Library (IL) program in two low-income zip codes as one of the initiatives to foster literacy development across the lifespan. The program mailed a free book to families with children under the age of five once a month in an effort to increase access to books in the community. *Reading with Animals* was launched by the coalition with the specific aim of encouraging read-alouds with children's literature focused on animal-themes received from the IL to increase content area literacy, especially related to science. All program participants were enrolled in both programs. The *Reading with Animals* program was organised around active modeling of animal-themed books, interaction with live animals, and strategies woven across use of biofacts, music and movement, arts and crafts, and snack time. Data from observations, interviews, and artifacts indicated active participation of families and children in the program and engagement with science concepts. The study also pointed to implications for introducing more content-based literacy strategies for preschool children, for developing inclusive strategies for diverse classrooms, and the need for strengthening the same in teacher education programs.

Keywords Animal science · Imagination library · Book distribution · Community literacy

Introduction

The New York State Common Core Learning Standards (CCLS) in the United States have been aimed at college preparation, especially for careers in STEM (New York State Education Department, 2011). Consequently, the New York State Prekindergarten Learning Standards (NYSPKLS) (New York State Education Department, 2019) have introduced some concrete goals for preschool children. For older children who are already learning content divided into different disciplinary areas, these demands placed by the CCLS could be seen as a seamless transition. The need to focus on science education during the early childhood years has been highlighted, especially for children from low income backgrounds (Bustamante et al., 2018; Pattison & Dierking, 2019). However, for young children, for whom the focus has been mainly on "learning to read," the area of 'science' poses questions on how to strategize this learning. Further, the integration of diverse areas is key in creating learning opportunities for young children. The NYSPKLS (2019) also states that, "early development and learning are multi-dimensional. Children's learning is integrated and occurs simultaneously across all domains, which are interrelated and interactive with one another" (p. 4). The question arises regarding what specific kind of preschool experiences could prepare young children for these literacies of the CCLS. For content to be presented to young children in appropriate ways, one needs to not just conceptualize instruction in an integrated manner, but also to contextualize it in appropriate ways, because, "Children learn in the context of interactions and relationships with family members, caregivers, teachers, and other children

✉ Sunita Singh
sunitasingh@aud.ac.in

[1] School of Education Studies, Dr. B. R. Ambedkar University Delhi, Lothian Road, Kashmere Gate, Delhi 110006, India

in their immediate environment and in their community" (NYSCCLS, 2011, p. 4). This presents a dual-challenge of conceptualizing and contextualizing language and literacy practices for children.

These perspectives formed the macro context of this study, which was located in the Central New York region. This community was home to families from diverse racial, linguistic, and ethnic backgrounds. Many families had settled here as a part of the refugee resettlement program and were engaged in opportunities that would enable a transition for them and their children into the local systems, especially local area schools. This community was well-endowed, with literacy programs and interventions designed for families and children from low socio-economic backgrounds supported by the local Literacy Coalition. While most of these programs were targeted at families with young children, the objective was to engage the community in literacy development across the lifespan. One of the key initiatives for these literacy programs was the implementation of Dolly Parton's Imagination Library (IL) program in two zip codes of the city. This program delivered one free book per month to children under the age of 5 years upon registration at birth, amounting to 60 books per child (Conyers, 2012). Additional programming was necessary in order to explicate the ways of using books at home received from the IL. These programs were selected through a grant provided by the local Literacy Coalition. One of these programs, *Reading with Animals,* was launched with the specific aim of reading aloud stories focused on animal-themed books received from the IL to increase content area literacy, especially related to science. Given that young children and families were the primary audience for the program, the activities included live animals, biofacts, art, craft, movement and music. The two programs, the IL and *Reading with Animals* were launched in the same two zip codes and families were encouraged to register for both.

The underpinnings of book distribution programs lie in significance of access and exposure to print (Coleman et al., 1966; Mol & Bus, 2011), parental involvement in the reading process, and above all—the predictability of shared reading for long term reading achievement of children (Aram & Aviram, 2009; Mol & Bus, 2011; Sénéchal & Jo-Anne LeFevre, 2002). Book distribution programs such as the Imagination Library (Conyers, 2012; Ridzi et al., 2014), Book Floods (Neuman, 2017), Books Aloud (Neuman, 1999), Reach Out and Read (Needleman, Klass, & Zuckerman, 2002), Summer Book Distribution (Allington et al., 2010) have been successful in providing access to picture books to young children. Some programs have focused on coupling access to books with interventions that provide modeling support on the use of books (Elley, 2000; Neuman, 2017; Singh et al., 2015). The aspect of modeling and interaction which also provides social and psychological resource is considered key in enabling children to read (Neuman, 2017). However, there is little documentation of modeling interventions with use of information books for low-income families.

The present case study examines an intervention by the local zoo known as *Reading with Animals*. The aims of this study were to document: (1) How did the program engage children in literacy? (2) How did the program integrate animal science content in the transaction? (3) How did the program engage children in animal science content?

Background Literature

Several researchers have addressed the significance of using literacy strategies for teaching science concepts (McClure, 1982; Pattnaik, 2004) and specifically of using children's literature to support scientific inquiry across grade levels (Fang, 2013/14; Hoffman et al., 2015; Emmons et al., 2018). Due to the multifaceted dimensions of the study, the literature reviewed is focused on the use of read aloud with information books and strategies for teaching science in the classroom, especially connected with animal themes.

Information Books for Science Learning

The role of children's literature, especially information books is critical in developing scientific literacy among young children because these texts enable children to understand the progression of science concepts (Fang, 2013/14; Hoffman et al., 2015). Teachers can plan read aloud and discussion around information texts based on the science concepts they plan to focus on (Hoffman et al., 2015). Information books could be used for development of science concepts by engaging children in asking questions, observing and experimenting, summarizing, and drawing conclusions (Baker & Saul, 1994; Mantzicopoulos & Patrick, 2011). Inclusion of information books in the curriculum is critical because they enable children to build background knowledge and support content area learning (Mantzicopoulos & Patrick, 2011; Yopp & Yopp, 2012). While textbooks may be read as a part of the formal requirement, picture books related to science could be used to provide content information in an engaging manner (Parkinson & Adendorff, 2005). The use of information texts for teaching concepts of science needs a careful selection of books, selection of strategies for literacy, creation of connections to science content area, and also for the development of conceptual understandings of the teacher (Hoffman et al., 2015). There is a predominance of narrative picture books in the early grades which may not be designed to support the development of science concepts (Hoffman et al., 2015; Yopp & Yopp, 2006, 2012). Hoffman et al. (2015) point out that since the purpose of the narratives is not to provide information related to content areas, it is

challenging for teachers to introduce science concepts using narratives. In a landmark study, Duke (2000) indicated that first graders on an average spent just 3.6 min a day interacting with informational texts. The time was even less for children from low-socioeconomic backgrounds, with only 1.9 min a day.

Some of the strategies relevant for science-based information books draw from the significance and use of informational texts in general. Classroom transactions based on inquiry learning are conducive for learning content from informational texts (Maloch & Horsey, 2013). The use of information literature exposes children to academic vocabulary related to different content areas (Hoffman et al., 2015; Neuman & Roskos, 2012). This early exposure to academic vocabulary and content knowledge prepares children for academic literacies in the later grades where there is an increased reliance on textbooks (Yopp & Yopp, 2000). Familiarity with technical vocabulary is crucial at a young age because children do not get exposure to these words in their everyday conversations at home (Pappas, 2006).

Teaching Science Concepts to Young Children

The content learning from information books needs to be seen in tandem with ways of learning by young children. Information books are complementary to teaching science content to young children and not a replacement (Hoffman et al., 2015). Young children are naturally curious regarding the world around them (McClure, 1982) and often ask questions related to concepts of science (Baldwin et al., 2009). This is also a shift away from the conception that children's thought processes are too concrete to engage in scientific thinking for learning of science concepts (Baldwin et al., 2009). Early science instruction can lead to better academic gains for children in the future (Curran & Kitchin, 2019; Kaderavek et al., 2020). Teaching science involves a complex framework of developing understandings of the Nature of Science (NOS), instructional strategies for inquiry skills, and the science content itself (Abd-El-Khalick, 2013; Akerson et al., 2019). Thematic units based on the interest of children are also recommended for teaching science (McClure, 1982). A study conducted in Head Start indicated that enabling the development of approaches to learning predicted gains in science concepts (Bustamante et al., 2018) where approaches to learning were identified as effectiveness motivation, strategic planning, interpersonal responsiveness, vocal engagement and sustained focus in learning, accepting novelty and risk, and learning in a group (McDermott et al., 2011, p. 35). An examination of emergent environmental literacy involving the use of science journals by 18 kindergarten children from varied cultural backgrounds indicated that the children constructed and expressed their understandings of the science lessons in their journals by linking their experiences in the science class to their emergent literacy skills (Britsch, 2001). This was done by creating imaginary contexts through the medium of stories, relating previous experiences written in the journals to science activities, and by graphically representing their understandings of the science lessons and thus, using emergent literacy for real purposes. Thus, it is important to encourage the development of science concepts among young children early on so that they are able to connect with concepts from the information books in an engaging manner.

A meta-analysis of research literature by the National Research Council (2009) indicated that informal learning environments and institutions or non-school settings could also promote science learning across the lifespan. Some of the informal spaces that have been identified included museums, science centers, zoos, aquariums, and others which could enable students to reflect on the experiences, understand science as a way of knowing, and engage in science inquiry. They also highlighted the need for partnerships between science institutions and the local community for creating inclusive science learning spaces.

Animal-Themed Science Books and Animals in Classrooms

A study designed to examine the selection of information books used for read aloud in preschool to third grade classrooms indicated that among the informational titles, science read-alouds were most prevalent, with life sciences being the most popular (Yopp & Yopp, 2012). The study was conducted with 1144 teachers across 13 diverse school districts in the United States indicated that, overall, 77% of the teachers were using narratives for read alouds. The books sent by the Imagination Library program had a wide selection of animal themes and many of these were used in the *Reading with Animals* program.

A study exploring the multiple facets of science curriculum focused on the perceptions of 17 teachers in an Australian primary school where each of the classrooms had an animal (Herbert & Lynch, 2017). A phenomenographic analysis of the data indicated that teachers perceived animals in the classrooms to be of value for science education, humane education, and cross-curricular learning, and also provided opportunities for linkages to contexts outside the classroom. While the presence of animals enabled children to understand ethics and foster socioemotional development, some challenges related to the financial burden and upkeep of the animals were also pointed out in the study. Another study (Wilson et al., 2011) with 496 first grade students across 10 schools in an urban school district examined an intervention with live zoo animals on students' early and emergent writing in comparison with classrooms without live animals. The project involved placing small live animals

from the children's zoo to be incorporated into the science curriculum along with training and care for the animals. Students were asked to write about the science topics that were being taught or about the live animal. Results of the study indicated that students who were exposed to the zoo animals wrote longer and more coherent texts including more science concept vocabulary in comparison with students who were taught in more traditional ways. Wilson et al., (2011) also pointed out that the unique animals in the classroom provided informal exposure to the live animals and increased their schema regarding animals. Pattnaik (2004) refers to the significance of engaging children in animal welfare and advocacy, keeping in mind the humanistic and environmental purposes of education. She points out that across cultures, there is evidence of children's bonds and relationships with animals which could be a way to engage children in curricular activities through children's literature and other activities.

Methodology

This study was based upon a descriptive case study approach (Yin, 2003, 2018), using qualitative methods to collect and analyze data for exploring the intervention program, *Reading with Animals*, in Central New York. Data collection began after approval of the research proposal and protocols from the College Institutional Review Board. In addition, written permission was obtained from the literacy coalition before conducting the research. All participants signed a consent form before the interviews. Pseudonyms have been used for the program name, setting, and participants. During the study, I focused on the objectives of the program, strategies used in the intervention program, and the interaction of children with the same.

Program and Participants

The *Reading with Animals* program sessions were held once every month in two shifts, morning and afternoon, and were open to the families in the two zip codes. The morning session was conducted at the local public library and the afternoon session was held at a local school. The purpose was to engage a wider audience across sites. The program target was families with children from birth to 5 years, but often older children also accompanied their siblings. No entry fees were charged. Snacks and arts and craft materials were provided to all participants.

A typical session of *Reading with Animals* had informational texts with animals as a central theme. These included books about snakes, hedgehogs, salamanders, frogs, birds, and insects. The sessions lasted for about two hours and consisted of read aloud, live animals, rhymes and songs, arts and crafts, and sharing of biofacts aligned with the main text. Arts and crafts time also included worksheets where children could write or create their own drawings. The book readings were interspersed with biofacts and activities, depending upon how the sessions were planned. However, the showstopper of the session was the live animal brought in by the Zoo personnel towards the end of the book reading. The presence of biofacts such as animal skin, feathers and skeleton coupled with live animals enabled children to relate the book reading tangibly. All activities were conducted in a large group format except for arts and crafts and snacks.

The participants of the study included two volunteers from the Zoo, Anne and Kay, who facilitated the sessions. Anne had a Master's degree in Curriculum development and instructional technology and had completed an internship with a wild life rehabilitator in college. She had previously worked at a zoo in another city and had gained a lot of her knowledge about animals being a trainer. Kay had completed a Master's degree in literacy education and had worked at the zoo for several years. With different strengths, they complemented each other during the sessions and carefully supervised the interaction between animals and children. Participant numbers varied from session to session. While the sessions were open to all in the neighborhood, approximately 15–25 families with young children from the neighboring areas were regular participants—most also enrolled in the IL program. These mainly included African American, European American, Latino, and Burmese families. A Burmese translator helped in translating stories for children and generally sat in one corner with the families.

Data Collection

Multiple data sources were used in the study (Patton, 1990; Yin, 2003), including observations, interviews, and artifact collection. The primary data source for this study included participant observations of 16 *Reading with Animals* sessions over the 2 years of the study. During and after the sessions I wrote field notes (Patton, 1990) that described information about each visit including (1) the session plan, materials used, and the modalities of instruction, (2) response and participation of children and families in the session, and (3) transcription of dialogues where possible. The second data source was interviews with the two instructors and parents. The interview protocol for the instructors included questions related to their educational background and training, their instructional philosophy, preparation for the program, and their experiences conducting the program. The interview protocol with the parents included questions on their background, literacy practices at home and reasons for joining the sessions. Interviews with the Burmese families were conducted with assistance from the interpreter if parents did not speak English. While the focus of the case study was not on documenting home literacies, it was

necessary to understand the parental perspectives regarding the program. All interviews were conducted either after the session, during craft activity time, or during snack time.

Data Analysis

The process of data analysis proceeded simultaneously with data collection. The research questions of the case study were central in guiding the data collection (Yin, 2018). Field notes from the observations, transcriptions of the audiotaped interviews, and artifacts were the primary data sources. An inductive strategy of data reduction, analysis, and interpretation were key in identifying salient patterns (Merriam, 2009; Yin, 2003). Observations of the program over the 2 years provided insights into the organization, instruction, interactions, role of books, flow of the sessions, and participation of the families. In addition, interviews with the instructors from the zoo enabled an understanding of the philosophical and strategic underpinnings of the program. Interviews with parents highlighted the participation and interest of the children. There were three phases of the data analysis process which proceeded simultaneously. In the first phase, observations and transcribed interviews were read and identified by segments and activity units. Both observations from the same day of data collection were analyzed. Open codes were assigned to each segment of data. These included read aloud by instructor, questions during read aloud/interaction, children's response during read aloud/interaction, use of biofact, science concept, use of senses, science vocabulary, parent participation, greetings, inclusion, and physical movement, among others.

In the second phase, some broader categories were developed from these initial codes and matrices were developed to compare and contrast data across units (Miles & Huberman, 1994). The data matrices helped to juxtapose the data from the diverse sources and explore the connections between the literacy practices based on information books, science content related to the use of live animals and biofacts and the nature of interaction and participation in the program. In the third phase, broader themes were culled out by comparing data codes from the observations and interviews which have been illustrated in the following section.

Results

The widely-advertised monthly program featured an animal on its flyer, with a catchy title such as, "Creepy Crawlies" "Animal Hunters," "Creatures of the Night" and so on. The sessions focused on a different type of animal each time. Some of the animals introduced over the 2 years included hedgehogs, frogs, snakes, salamanders, birds, and various insects. The sessions always incorporated children's literature, biofacts related to the animal in focus, the live animal, music and movement, materials for the craft, and snacks. The holistic nature of the sessions and the integrated approach followed by the two instructors were evident in the sessions. The themes focus on three salient but interconnected aspects of the sessions including use of children's literature, use of biofacts and live animals, and the inclusive nature interaction with the children and families as they conducted the activities (Fig. 1).

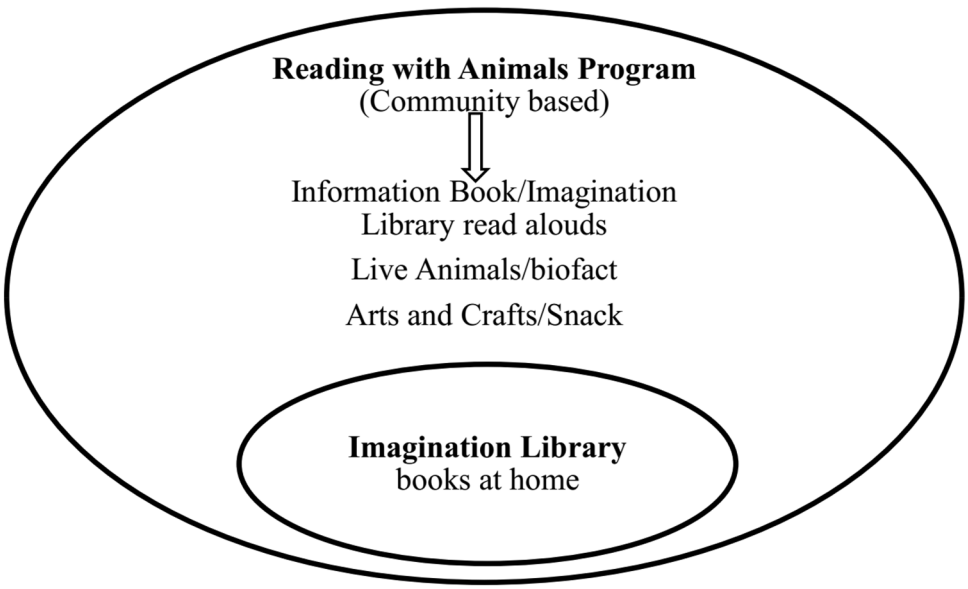

Fig. 1 The two intervention programs

Interaction and Participation in the Program with Information Books

One of the goals of the program was to encourage families to read the books they received in the mail from the IL to their children. Modeling read aloud with the IL books was one of the key components of the sessions. The instructors also often brought additional literature related to the theme. Typically, they read two or three books in every session. During one of the sessions on owls, the instructors brought in three books including *Owls*, *Owl Moon*, and *The Littlest Owl*. The excerpt below exemplifies some of the central ways of interaction using picture books.

(Children sit with their families. After introductions, warm up and Animal Boogey, the two instructors read *Owls*, while showing the pictures to children)
Kay: *(After reading the first page)* Nocturnal. Can you all say nocturnal?
Children: Nocturnal *(Goes on to explain they are night animals and reads on)*
Anne. Who knows when owls are awake?
Child: Night
Kay: How do owls get around?
Child: They fly
Anne: Owls are birds. What do owls have on their wings and all over their body?
Child: *(Kay shows pictures in the book)* Feather *(Anne bring out some feathers and allows children to touch them; Kay continues reading)*
Kay: Do they eat pizza?
Child: No
Kay: Do they eat burgers?
(Children laugh)
Child: This one is eating a rat *(pointing to a picture)*.
Mother: Yum yum
Kay/Anne: So what can an owl eat?
Children: Mice, rat, lizard, bugs.
Anne: And they eat things that are around in the night. And you know when an owl flies, you can't hear him. They are very quiet when they fly. That way, they can hunt.
Anne: Can you flap like an owl? *(does action) (Children "flap" quietly)*
Anne: Now let's flap like a bird *(Children "flap" noisily)*
Anne: What do you do when you put food in your mouth?
Child: Mom tells me to chew
Anne: *(Pointing to a picture of an owl)* They eat the whole thing. So, do you know what they do after they eat? They spit it out…what is not food—fur, bones. *(Kay shows pictures of owl pellets. Anne brings in some feathers and bones to show the children)*
Anne: Do you know what an owl's favorite cereal is? Mice crispies!!
Anne: Do you guys want to read a story about an owl? *(Kay reads 'Owl Moon' and 'the Littlest Owl' where the children discuss the concepts of long and short shadow, snow, darkness, nocturnal, flying and so on.)*

The interaction described above was typical of conversations around all picture books in the session. Most interactions were inquiry focused sessions where children were engaged in information books (Maloch & Horsey, 2013). In these well-planned sessions, strategies were used to connect children with the theme and involve them throughout the session. Children were expected to participate by answering the questions asked—yet, they were not expected to know the answers. In the beginning of the session, we note that Kay asks a question about feathers as she goes around showing the pictures of the book to all children. At the same time, Anne actually brings feathers for children to see and touch. Children participate eagerly as they peer into the book while questions are being asked, indicating a high level of motivation (Caswell & Duke, 1998). The centrality of picture books provided them with knowledge of the wonders of animals. Noticeably, the engagement is not just verbal, children also participate actively in 'flapping' as they interact with the content of the picture book. There is an attempt to enable children to connect the concepts with their own personal experiences for example, when Anne asks children what they do when they put food into their mouth. By connecting pictures, oral language, and actions, the instructors were also facilitating the development of oral language and vocabulary (Yopp & Yopp, 2000) among children. Kay asked all children to repeat the word 'nocturnal', probably knowing that this was not a word from their day-to-day vocabulary. Further, keeping in mind the interests of the children, the instructors would bring in elements of fiction, such as when Kay asked if owls ate pizza and burgers, even though the book was non-fiction. After just a little bit of this playful engagement, the instructors brought back the attention of the children to the factual details. The selection of the three texts of different types was intentional to enable children to not just know some factual details of owls but to introduce owls in the sessions with characteristics children could relate to.

Learning About Science with Animals

The sessions were characterized by a clear statement of the objectives at the beginning. The theme of the sessions was woven across the different activities, typically involving the live animal, the biofacts, music and movement, and, arts and crafts activities. Conversations with the children

were a critical strategy to keep them engaged throughout the sessions. When the instructors introduced the animal to the children, they included specific science vocabulary and engaged them in an inquiry-based learning. The following vignette illustrates one such interaction:

The instructors had hung posters of 'Amphibians', 'Fabulous Frogs' on the walls of the library. After reading of 'Frogs' and 'Icky Sticky Frog', Anne and Kay take out a plastic model of the lifecycle of a frog and take it around showing it to each child. All children look eagerly.
Anne: Have you seen a frog? Who can tell me how a frog moves? *(Pauses for a response)* Who can show me how a frog jumps? *(Children jump)* Who knows what a baby frog looks like?
Child: A small frog *(Some murmurs from some other children)*
Anne: You see the eggs in the water? *(pointing to the plastic model)* It's not easy being an egg
Kay: What does a frog eat?
Child: Insect! *(Takes out tongue)*
Kay: What did you just learn about a frog's tongue? What does a frog's tongue do?
Child: It sticks!
Anne: We are going to meet some frogs. When the frogs are out, we need to practice staying very quiet.
Child: Very scared
(Anne and Kay bring out three frogs and children look at them. All three frogs are introduced to the children by their names)
Anne: You know what…frogs use their eyeballs to push down the food
Kay: Every single frog has a different kind of pup, you know, a tadpole.
Child: I saw a frog that looked like a fish. Took water through their skin
Child: Frogs eat with tongue.
Kay: What part is sticky?
Child: The tongue

The session introduced children to the concept of a life cycle of a frog and some unique characteristics. While the instructors used distinct strategies during the sessions, the different components of the sessions—reading of information books and use of biofacts and live animals were connected integrally. In addition, how the information was woven together varied from theme to theme. For example, in this excerpt, to explicate upon the nature of a frog's tongue, the instructors relied on the information children would have gained from the interaction with the picture book on frogs before this segment of the session. Similarly, for introducing the concept of a life cycle, the instructors connect across the pictures in the information books, model of the life cycle and children's own experiences.

On a different day, the instructors conducted a session on snakes. After reading the book, *Snakes*, the following discussion took place:

Anne: There are all kinds of snakes. What do snakes do with their tongue? *(does actions as she asks the questions)* Snakes smell with their tongue. Some snakes live on trees. Some live in our backyards. Snakes can wiggle their bodies and
move forward. Can you feel your ribs? *(feels ribs)*. We have 12 ribs. Snakes have 200 ribs. They use all those muscles and more. Snakes have cover. Feel your fingernails. That's what a snake has all over its body.
Child: Snakes bite!
Anne and Kay roll out a long python skin and allow children to touch it.
Anne: Think about how snakes get their food. Do you know, boa constrictors squeeze their food? Some snakes are venomous. You have to be very careful of them *(Whispers)*
(A mother smiles and points to the book to the child sitting on her lap).
Child: (*pointing*) This is my rib.
Anne: What do snakes use to smell? Does anyone remember how many ribs snakes have?
Children: 200 ribs
Anne: Today we are going to meet 2 snakes. *(Anne and Kay bring out two snakes, a father and a daughter. They are sand boa.)*
Anne: Do you see, the tails are really bumpy…just like a basketball field. Shows a basketball and allows kids to touch it.
Mothers look really excited with the snakes and point to them to their children, talking at the same time.

Bringing animals into the classroom enables children to develop relationships, observation skills, and a deeper understanding about the complex systems of life (Wilson et al., 2011). Interaction with animals has implications for children's learning. Given the complex nature of the sessions, a transaction that included engagement of the children was critical. Participation of children was evident in their responses. In introducing snakes and their characteristics, the instructors used various strategies such as read aloud and questioning. Comprehension checks on concepts were used frequently. Relevant here is a study by Kisiel et al. (2012) which focuses on the stimulation of family interactions in the context of physical interaction with live animals. During the session, the instructors used strategies that focused on senses as we see from the vignette above. Children were allowed to touch the python skin and the baseball. Parents and children

together enjoyed the experience with the live animals. Concepts were reinforced throughout the session through repetition. Change in the activities and constant reinforcement of the concepts kept the students engaged throughout the session. Use of gross motor activities to connect to the content was built into most activities.

Engaging Children and Families: Inclusion and Respect

The two instructors at the programme worked with a shared understanding that the content delivered needed to be comprehensible to all the young participants in the activities. The sessions were especially designed to address the audience—diverse in age, ethnicity, race, class, and language. While the sessions were aimed at children under the age of five, other family members were also an eager audience and their involvement was critical.

Most families that attended the program were already enrolled in the Imagination Library and were receiving one book per month. The instructors were conscious of the fact that even though many of the parents did not speak English, or may have difficulty in spoken English and were probably not familiar with the culture of book reading, they should know about the strategies to use while reading a book. Because of the variety of hands-on learning activities, students who were from non-English-speaking backgrounds were able to connect with the instruction. The goal was to convey the significance of book reading in the school culture and its role in enhancing literacy skills as an additional practice for fostering family literacy (Reyes & Torres, 2007). A sizable number of Burmese refugee families also participated in the program regularly. An interpreter was present for the families and she would translate for them. The idea was to encourage mediation by parental involvement. Several parents reported that their children would often do some of the routines from the session at home. According to one parent, "I have been around these animals all my life and I never learnt so much about them."

Inclusion of participants was a key concern for the instructors and one way to accomplish this was by using appropriate strategies. Some of these included asking questions, using hand gestures, biofacts, and encouraging participation. According to Anne, "We don't do a whole lot of talking without having something to show. So, there are a lot of hand gestures and pointing to things. We try not to just stand there and talk." Kay echoed a similar instructional pattern, "I start by saying they should be quiet. Make sure… that they're focused on the book. I try to point to the things and interact…you know, have the children help me count or do the actions…." During read alouds, the instructors made sure to read the text with expression and also to show the pictures or biofacts to children along with the reading. An important strategy was to involve children in the process of prediction. During the read aloud sessions I noticed the two instructors would pause while reading and ask, "what do you think is going to happen next" to foster comprehension skills.

Since their audience was mixed, they wondered if they were able to reach all, as Katie reflected, "the biggest challenge for me is trying to make sure we are reaching all of our children because that's always, you know, when you are teaching, you always have the quiet kids who fall by the way." One of the strategies they employed was to connect with all the families, as pointed out by Jane,

> So during craft time, one of the things that Katie and I try to do is walk around and talk to all of the families. And at least touch base with them. If they are new, ask them how they found out about us. At least have a one on one time, even if it is a minute or two with all of our families. It is important for us.

According to some parents, their children also played with the craft at home. One parent reported that she attempted to create the same craft with her daughter at home. According to another parent, her daughter would be the "teacher with the book at home." Families were critical mediators in connecting children with the session and also the IL books that were reaching the homes. While the two instructors were mindful of ensuring the participation of the children in the program, their instructional strategies were not restricted to oral participation. Respect was a significant component of the interactions—between individuals and also with animals. One of the key aspects of the engagement was teaching about respect for animals. This was evident in several ways, for example, in asking children to stay quiet when they took out the animals, not touching the animals, and so on. It is necessary to enable young children to grow into compassionate, humane and responsible individuals (Pattnaik, 2004). Schwan and et al., (2014) highlight that these kinds of spaces lend towards the learning process of the participants as they provide the physical environment, the sociocultural contexts for mediation and spaces for individual engagement and motivation.

Discussion and Implications

While the larger goals of the Literacy Coalition were raising literacy levels across age groups in the community, the IL played a critical role in this course by mailing free books every month which would increase knowledge regarding the use of books at homes. The imagination of programs such as *Reading with Animals* draw impetus from research on children's emergent literacy development (Teale & Sulzby, 1986), the innate curiosity of young minds (McClure, 1982),

and their instinctive nature to ask questions related to science concepts (Baldwin et al., 2009). In order to prepare young children for successful college and careers thereafter, the requirement for many families is not just access, but also ways by which children could be engaged.

This case study on *Reading with Animals* as a pedagogical intervention to the IL indicated that a well-crafted program can heighten children's interest in responding to information books and science concepts—not only fiction. The use of information books in the sessions on the animal themes engaged children in conversations around science concepts (Parkinson & Adendorff, 2005) and also introduced technical vocabulary (Neuman & Roskos, 2012), pointing to the need for integration of science and literacy (Hong et al., 2019). The study has implications for other communities that implement the IL program. The pairing of IL with other programs, such as *Reading with Animals* or other community-based programs would enable children to develop a more nuanced understanding of early literacy integrated with science or other content. With the growing diversity across the country and the need to address CCLS, this study also has policy implications for communities developing programs to focus on early literacy, family literacy, and community literacy.

The program context and the content allowed for insights into a multidimensional model of introducing young children to science concepts. These included interaction with information literature, modeling the reading process, support from live animals, connected arts and craft activities, and the community setting. The sessions provided evidence of experiential learning, building of curiosity, inquiry based learning, community support, family engagement, and connecting diverse areas of learning to introduce science concepts. The organization of the sessions enabled children to think and do tasks on their own (Maloch & Horsey, 2013). The community-based sessions allowed children to engage with the program with their families, which also provided scaffolding for them. The broad spectrum of pedagogical engagement has implications for a science reading program for young children which could be based upon inquiry-based learning and draw upon local community resources to mediate the content.

The study has implications for providing preservice teachers ways to integrate science content with children's literature and to organically connect with the community and community resources in order to make the content accessible to young children. While the staff members from the zoo were trained in integrating instructional resources and strategies, the study lays out a pedagogical framework for preservice teachers. A study conducted by Akerson et al. (2019) showed that inclusion of Nature of Science (NOS) in children's literature in a science methods course enabled preservice early childhood teachers to develop their understandings of NOS concepts and strategies for the same. This study also supported development of teachers' understanding of science concepts by providing professional development opportunities during the early childhood years. Research has pointed to the need for preservice teachers in early childhood programs to create supportive classroom environments using inquiry-based learning and by integrating science experiences (Eckhoff, 2017). The need for attention to teacher's content knowledge and practice in the professional development of teachers is critical for the implementation of a content pedagogy (Neuman & Danielson, 2021). Further, the implementation of content pedagogy, as explicated in the New York State Education Department (2019), needs concerted efforts beginning with preservice teacher preparation and extending to the in-service years.

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